Annex 6

REPORT OF THE SHARK WORKING GROUP WORKSHOP

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

7-14 January, 2013
La Jolla, California USA

1.0 INTRODUCTION

An intercessional workshop of the Shark Working Group (SHARKWG) of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) was convened at the Southwest Fisheries Science Center (SWFSC) in La Jolla, California, USA from 7 – 14 January, 2013. The primary goal of the workshop was to agree to the data to be used in the north Pacific blue shark assessment data, finalize all time series provisionally, establish an assessment data submission deadline, estimate catch of fleets that have not provided data, and conduct some exploratory Bayesian Surplus Production (BSP) runs with the provisional data.

Kristen Koch, the Deputy Director of SWFSC, welcomed SHARKWG participants. Meeting participants included Chinese Taipei, IATTC, Japan, Mexico and United States of America (USA) (Attachment 1). Kristen extended her greeting and apologies on behalf of SWFSC Science Director Dr. Cisco Werner who was out of the country. In her address, she thanked members for their commitment to supporting this working group. She emphasized the importance of assessing the status of blue sharks, which is an important commercial species in many nations. In the USA, blue shark is not utilized; however, they are a significant portion of the catch in several US fisheries and there is a blue shark nursery area in southern California waters. She acknowledged the challenges facing the group since catch, effort and even basic life history information are difficult to collect and wished the group a successful meeting.

2.0 DISTRIBUTION OF MEETING DOCUMENTS

Nine working papers and one information paper were distributed and numbered (Attachment 2). Several oral presentations were also made during the meeting. Most authors who submitted a working paper agreed to have their papers posted on the ISC website where they will be available to the public. The authors of working papers ISC/13/SHARKWG-1/09 and ISC/13/SHARKWG-1/INFO 1 declined posting on the ISC website due to either data confidentiality concerns and the preliminary nature of the results, or because the paper was being prepared for publication elsewhere.

3.0 REVIEW AND APPROVAL OF AGENDA

The draft meeting agenda was reviewed and adopted with minor revisions (Attachment 3).

4.0 APPOINTMENT OF RAPPORTEURS

Rapporteuring duties were assigned to nearly all participating working group (WG) members. The approved agenda (Attachment 3) indicates the rapporteurs for each item in parentheses.

5.0 SUMMARY OF THE MAY 2012 AND JULY 2012 WORKSHOPS

Suzanne Kohin, Chair of the SHARKWG, provided a summary of the May 2012 and July 2012 workshops. The May 2012 meeting was a blue shark data preparatory meeting held in Shizuoka, Japan May 28 through 4 June, 2012. The primary goals of the workshop were to: 1) review blue shark fishery data including size data, catch estimates and estimation procedures; 2) review models for CPUE abundance indices; 3) make decisions regarding fishery data, life history assumptions, model type, structure and parameterization for the blue shark assessment; and 4) review fishery and biological information on mako sharks and other ISC species. Participants from Canada, Chinese Taipei, Japan, and United States of America (USA), as well as the ISC Chairman, members of the STATWG and ISC peer reviewers attended. Significant progress was made on reviewing the CPUE indices, developing plans for a base case production model assessment, and discussing blue shark biological parameters. A work plan for completing the blue shark assessment before the 2013 Plenary was developed.

The SHARKWG also met in advance of the 2012 Plenary in Sapporo, Japan for one day to finalize some unresolved work from the May meeting and to conduct work for the Plenary. During the short meeting, two papers provided updates to some Japan fishery catch data and the Japan longline abundance indices. Further work on finalizing the blue shark data was hindered by lack of participation from many member scientists and a lack of species-specific shark data for many member and non-member fleets. Consequently, a revised assessment work plan was developed that included holding another data preparatory meeting with the assessment to be completed in spring 2013. A very preliminary catch table was developed for the Plenary based on blue shark retained landings data provided by several members and derived from National Reports.

6.0 SUMMARY OF BAYESIAN SURPLUS PRODUCTION MODEL WORKSHOP

Report from the Bayesian Surplus Production model (BSP) workshop: Yokohama, Japan Nov. 2012 (ISC/13/SHARKWG-1/01), Tim Sippel

Summary:

The ISC Shark Working Group decided a Surplus Production (SP) model would be constructed as the base-case for its initial North Pacific blue shark assessment. Given the variable quality of fishery and biological data available for the assessment, it was decided this would be an appropriate starting point from which supplemental analyses and future assessments could be constructed. A state-space Bayesian Surplus Production (BSP) model has been developed by Prof. Murdoch McAllister at University of British Columbia and colleagues. The software is referred to as BSP2 and is considered an appropriate application for this assessment. BSP2 fits either a Schaefer or Fletcher/Schaefer model to time-series of catch and indices of abundance (CPUE), with CVs if available. The parameters that can be fit include carrying capacity (K), intrinsic rate of increase (r), biomass in the first modeled year defined as a ratio of K (alpha.b0), the shape parameter for the surplus production function for the Fletcher/Schaefer fit (n), the average annual catch for years prior to recorded catch data (cat0), and catchability for each CPUE series (q). Priors can be used for all parameters. The biomass trajectory can be projected under any catch or harvest policy, with confidence bounds. Decision tables with policy performance at given time horizons, such as stock rebuilding are included in the outputs. A key aspect of BSP2 is assessing different model scenarios and determining criteria for objectively selecting and rejecting different models. The primary diagnostic for comparing model fits is calculating and comparing Bayes factors amongst different model likelihoods. The workshop covered a lot of ground, ranging from theory of Sampling Importance Resampling (SIR) algorithm which underpins how parameter space is estimated in BSP2, to running SP models in spreadsheets, to developing a provisional model of BSP2 using sample blue shark data. An important outcome was learning that the provisional, but representative blue shark data was of good quality relative to other assessments Prof. McAllister has conducted.

Discussion:

The WG asked if the BSP model could incorporate the uncertainty in total catch in the estimation of the population dynamics. The authors clarified that catch is assumed known but uncertainty in the catch levels could be addressed through sensitivity analysis. The authors further reported that uncertainty in CPUE is included in the likelihood function, including both observation error for the simplified and state-space models and process error when using the state-space model. It was also noted that the BSP model is a generalized model with an estimable shape parameter, and that Dr. McAllister offered support for the assessment modeling efforts. A manual describing the methods of the BSP model which was prepared for ICCAT in 2006 was provided to this WG.

7.0 REVIEW OF FISHERY DATA FOR BLUE SHARK STOCK ASSESSMENT

In this section, several WG papers addressed both CPUE models and catch estimation procedures since estimating catch depended upon applying CPUE to a time series of effort. In those cases, the summary and discussion addressing both are included in section 7.1 below.

7.1 Catch and discard data and total catch estimation procedures

7.1.1 Chinese Taipei

Catch and abundance index of the blue shark by Taiwanese small-scale longline fishery in the North Pacific Ocean (ISC/13/SHARKWG-1/08), Kwang-Ming Liu

Summary:

This study estimated the blue shark catch and abundance index of the small-scale Taiwanese longline fishery from 2001 to 2010. Almost all sharks caught by these fleets landed in Nanfanao, Chengkung and Tungkang fishing ports located at eastern and southwestern Taiwan. The landing data indicated that the shark landings of offshore fisheries were dominated by blue sharks comprising 62.2% of landed sharks. All blue sharks landed at Chengkung were whole fish, but 89.5% of those landed at Nanfanao were frozen (processed). The mean conversion factor (0.41) between processed and whole weight was used to convert frozen landings to catch in whole weight. Annual blue shark catch by Taiwanese small-scale longline fisheries ranged from 8847 mt to 16081 mt, with an average of 12314 mt in 2001-2010. Fishing effort was estimated by the multiplication of fishing days of each trip and numbers of hooks per day. The standardized CPUE of blue shark ranged from 20.75 (kg/1000 hooks) to 63.57 (kg/1000 hooks) from 2001 to 2003, and increased to 40.63 (kg/1000 hooks) to 64.67 (kg/1000 hooks) from 2005-2010.

Discussion:

The WG asked why the standardized CPUE of the small-scale fleet which targeted blue shark was low in comparison to Japan and HI deepset longline CPUEs. One possible reason was that a seasonal effect was incorporated in the standardization model to account for targeting of the Taiwan coastal fleet. Because the fishery includes foreign-based vessels not targeting shark, the seasonal effect may not have adequately accounted for targeting in the model result. Similar to the large-scale fleet, there was a request for Taiwan to investigate a reason(s) why standardized CPUE of the Taiwanese small-scale fleet was much lower than that of Japanese training vessels which operated in the same seasons/area. The WG discussed whether the estimated catch and standardized CPUE of Taiwanese small-scale fleet should be used for the blue shark assessment. **The WG agreed the standardized CPUE is not to be used for the assessment. The WG agreed to use the estimates of catch as they are based on weighed landings information. The WG requested Taiwan provide information regarding the coefficients and the model diagnostics, including why several interaction terms showed too few degrees of freedom. The WG reviewed some diagnostics that were subsequently provided and requested that Taiwan prepare a new document describing the fishery including its operational coverage, and the standardization methods, and recommended further research to improve the index for the next assessment.**

The WG discussed how to deal with the low CPUE. If the values are for some reason biased, one possible way to deal with this is to introduce an inflation factor. However, there may be no way to determine the correct reference value.

The WG noted that there were no estimates for past catch (prior to 1980). **Taiwan scientists agreed to estimate past catch based on effort information.**

The WG discussed how the whole weight of landings was calculated. Sixty-two fresh sharks were measured before and after being dressed and frozen to calculate whole weight from frozen trunks. It was noted that the dressed to whole weight ratio presented is comparable to those found in the Indian and Atlantic Oceans, although the ratio is much higher for blue sharks landed in California. **The WG requested ongoing investigations of weight-weight conversion factors for dressed sharks by different size categories.**

Catch and standardized CPUE of the blue shark by Taiwanese large-scale longline fishery in the North Pacific Ocean (ISC/13/SHARKWG-1/07), Kwang-Ming Liu

Summary:

In the present study, the blue shark catch and effort data from observer records of the Taiwanese large-scale longline fleets operating in the North Pacific Ocean from 2004-2010 were analyzed. Due to the large percentage of zero shark catch, the catch per unit effort (CPUE) in number of sharks caught per 1,000 hooks, was standardized by the zero inflated negative binomial model. The standardized CPUE showed a stable increasing trend for blue sharks during the time period. The blue shark catches of 1991-2003 were back estimated by the multiplication of the mean standardized CPUE and annual fishing effort from logbooks. Blue shark bycatch by Taiwanese large-scale longline fleets ranged from 6 tons (1994) to 686 tons (2002) in the North Pacific Ocean.

Discussion:

In response to a question regarding the characteristics of this fleet, the author responded that the large-scale fishery (distant water) represents vessels more than 100 tons, targeting tunas and the small-scale one means offshore plus foreign-based vessels less than 100 tons. Observer coverage in the large-scale fleet is approximately 5% of the vessels. **The WG would like catch to be estimated pre-1991 (back to 1971).** Effort was small, but there was considerable swordfish catch, and therefore blue shark bycatch may not be insignificant. Two ways to estimate these data could be; 1) using a ratio of blue shark to swordfish catch, or 2) by applying the Japanese CPUE standardization model to Taiwan effort data. There is some negligible discard info from observers, but they do not distinguish between dead and live discards, and logbooks don't record discard information. It was estimated that 80% of shark bycatch is blue shark. The WG remarked that catch and CPUE seemed unexpectedly low compared to Japan and US longline CPUEs, but there is not enough information available to request additional analysis. Hooks-per-basket was not included as a factor in the standardization due to differences between fishing in the north and south regions. A targeting effect was accounted for in the standardization by an area term. Logbook nominal CPUE was lower than based on observer records, giving more reason to use observer data to reconstruct catch. The large-scale longline corresponds to the 'distant water' LL fishery in Billfish WG, and the small-scale longline corresponds to the 'offshore' LL fishery in Billfish WG.

The CPUE time-series is considered relatively short and not understood well enough to be used as an abundance index in the assessment. The WG requested further diagnostics be provided (i.e. residuals, model coefficients, trends in positive catch by 2 areas), and to consider including interaction terms. The WG requested that Taiwan investigate reasons why the nominal and standardized CPUEs were much lower (roughly 1/10) than that of the Japanese training vessel fleet which operated in the same time-area. Furthermore, the CPUE based on logbook data was even lower. The WG recommended further research to improve this index prior to the next assessment.

7.1.2 USA

Preliminary catch estimates of north Pacific blue shark from California experimental shark longline fisheries (ISC/13/SHARKWG-1/02), Steve Teo

Summary:

Two experimental longline fisheries targeting sharks were developed in California during two periods: 1979-1980 and 1988-1991. The first fishery from 1979-1980 (hereinafter called the SK fishery) consisted on a single vessel that was funded by a Saltonstall-Kennedy grant to investigate the development of a commercial fishery for north Pacific blue shark (*Prionace glauca*). The second fishery from 1988-1991 (hereinafter called the CFGC experimental permit fishery) developed after the California Fish and Game Commission (CFGC) issued permits for an experimental longline fishery targeting shortfin mako (*Isurus oxyrinchus*) and blue sharks starting in 1988. A report by the West Coast Fisheries Development Foundation provided direct records of number of blue sharks caught and landed weight by the SK fishery. Logbook data were used to estimate catch, dead discards, and total removals by the experimental permit fishery. The catch of this SK fishery in round weight was estimated to be 36.6 and 99.2 mt for 1979 and 1980, respectively. The estimated catch of the experimental permit fishery ranged from 35.18 mt in 1991 to 77.77 mt in 1988. However, due to the high discard rate and high

proportion of discarded fish in good condition, the estimated total removals for this fishery ranged from 4.22 mt in 1991 to 37.91 mt in 1988.

Discussion:

The WG accepts these estimates.

Catch statistics, length data, and standardized CPUE for the blue shark taken by longline fisheries based in Hawaii and California (ISC/13/SHARKWG-1/02), Steve Teo

Summary:

This working paper presents an update to previously reported compilations of catches, length distributions, catch per unit effort (CPUE) standardizations and other information for blue shark *Prionace glauca* in US Pacific longline fisheries based in Hawaii and California. The blue shark catch in waters near Hawaii from 1975 through 2011 was estimated by using fishery observer data and self-reported data from mandatory commercial logbooks. CPUE was standardized by the delta lognormal method for both the deep-set (target: bigeye tuna) and shallow-set sectors (target: swordfish) of the Hawaii-based longline fishery. The haul year, haul quarter, and region of fishing were factor variables, and a cubic function of SST was a continuous explanatory variable in all models. The indices of relative abundance decreased over time in both sectors. Mean total lengths of both sexes in the two sectors of the Hawaii-based longline fishery varied by 9.7% (shallow-set sector males: 211.9 cm; shallow-set sector females: 207.5 cm; deep-set sector males: 227.7 cm; deep-set sector females: 211.8 cm). Blue shark sex ratios were characterized by a predominance of males in tropical waters (0–10°N) and above 30°N in the deep-set sector and a predominance of females at 20–30°N in the shallow-set sector. Other results from Hawaii include maps of observed catches and CPUE in 1996, 2001, 2006 and 2011, and a summary of the typical bias in self-reported blue shark catch data. In addition, catch data from the California pelagic longline fishery during 1991–2004 are included. The estimated catch from experimental longline fisheries in the Southern California Bight was reported in ISC/13/SHARKWG-1/02.

Discussion:

The WG recommended using the catch estimated for the assessment once the discard mortality is accounted for. Diagnostics of the indices were sound. However, the WG also noted that the area covered by the each fishery is small relative to those used for Japanese and Taiwanese indices, and may not be representative of the stock abundance as a whole. In addition, the WG noted that there were numerous regulations applied to the shallow set fleet and that would probably affect catchability. Noting that the HI deepset longline index was the only candidate index with a negative trend in recent years, the **WG recommended that the HI deepset index be used in a sensitivity run but not used in the base-case run**. The trend in this index differs from that for the other north Pacific longline fisheries, thus t**he WG would like the authors to continue to explore the effect of the regulatory changes on the CPUE trend.**

7.1.3 Japan

Re-estimation of abundance indices and catch amount for blue shark in the North Pacific (ISC/13/SHARKWG-1/02), Yuko Hiraoka

Summary:

The objective of this WP is to provide abundance indices by standardizing CPUE of blue shark caught by Japanese surface longliners registered in the Tohoku and Hokkaido areas and to estimate catch numbers using the standardized CPUE for use in the stock assessment of blue shark. In order to clarify the most appropriate model for the abundance index and the catch estimations, three types of formulae were compared. It is considered that the negative binomial model would be the best formula from the perspective of the estimation of blue shark catch because the delta-lognormal model resulted in under estimation. In addition, the filtering method, which was addressed by SPC and adopted by WCPFC SC in 2011, was introduced into this study to remove data for operations with unrealistically high zero catches, which was pointed out in the last ISC SHARKWG meeting in July 2012. The newly introduced filtering method succeeded in reducing the number of unexpected data with zero catch.

Discussion:

The WG requested that the fishery and methods for these abundance indices be well described as they are the most important indices used for the assessment. The WG Chair will determine if previously submitted WG papers adequately contain all the needed information including showing the effect of data filtering on proportion of zero catch that ends up in the standardization, diagnostics, observed & predicted CPUE, and the description of area coverage and catch composition.

7.1.4 Mexico

Estimates of Mexico's blue shark catch from 1976 – 2010 (ISC/13/SHARKWG-1/04), Tim Sippel

Summary:

The purpose of this document is to detail how blue shark catches have been estimated for Mexico from 1976-2010, using a combination of catch statistics from INAPESCA (Mexico) and publicly available information. Catch is estimated for three vessel size classes: small (artisanal: shark target); medium (drift gillnet and longline: swordfish and shark target); and large (longline: tuna and swordfish target). While there are many assumptions and uncertainties about these data, these estimates are the only ones currently available to the SHARKWG about the amount of blue shark catch from Mexico's fisheries.

Discussion:

The WG discussed the GLM methods used to estimate catch, noting that some additional explanation of the model used may be necessary to be sure it is appropriate for estimating catch for years with missing data since year was a factor. It was noted that the trends in estimates for the small and medium fleets were highly correlated due to the fact that they were both estimated based on a ratio of the total aggregated shark catch. The WG noted that the recent catch trend is due to increasing catches in the Tiburon shark category. It was explained that the increase is due to spatial expansion of the fishing grounds and increased targeting of blue shark.

Unofficial estimates of Mexico's blue shark catch from 1976 – 2010 (oral presentation), Oscar Sosa-Nishizaki

Summary:

Estimates of Mexico's blue shark catch in artisanal, mid-size drift and longline, and large longline fisheries were presented to the SHARKWG. It was noted that these estimates had not been reviewed or agreed upon by Mexico's national fisheries scientists of INAPESCA, thus they are considered unofficial. Estimates were made based on the national total shark landings statistics for 1976-2010 and the distribution in effort of the fisheries which changed during the time series from relatively greater shark catch in the Gulf of California early in the time series to relatively higher shark catch in Pacific waters off Baja California later in the time series. Blue shark catch is considered significant in 5 Mexican Pacific states: Baja California, Baja California Sur, Sinaloa, Nayarit and Colima. A number of factors contributed to changes in the fisheries over time including efforts to conduct joint venture longline fishing with Asian fleets in the 1970s and 1980s, and a switch from finning to total utilization in the 1980s. The estimates are considered to accurately include large longline fishing catch for vessels based out of Colima (Manzanillo port), but may underrepresent catch from Ensenada-based large longliners in the 1980s conducted jointly with Japan. The derived estimates across all fisheries and states ranged from roughly 300 mt through the late 1980s increasing to nearly 5000 mt in recent years.

Discussion:

The WG noted that the estimates of blue shark catch from WP 04 are very close to the unofficial estimates presented here, particularly for the recent 20 years. The WG discussed the level of discarding in Mexican fisheries. The author indicated that prior to 1985, discard is likely negligible for the midsize vessel fleet because the fleet didn't fish in high density areas. However, the large fishing vessel joint venture operations may have taken significant numbers of blue sharks, and their catch and discard is not currently included in these estimates. The author further clarified, that between 1985-1992 the drift gillnet fleet increased effort, which may have resulted in some level of discard not included in the estimates of catch. After 1993, discard may again be negligible as markets changed to favor shark retention. To estimate discard of blue shark in the period 1985-1992, a ratio of blue shark to swordfish could be used. **The WG recommends using the catch estimates presented in this paper for small and medium vessels after adding an estimate of the unrecorded discard in 1985-1992 for Ensenada vessels. Furthermore, the WG recommends using the estimates of large vessel catch from this paper (representing the Colima fleet) after adding the Japan joint venture fleet data ~1971-1990 catch for Ensenada if they are not already included in Japan's catch. The SHARKWG Chair will follow up with Mexico scientists to help finalize the catch time series.**

The WG noted that Mexico appears to have a lot of fishery information for blue and mako sharks, including size information and life history studies. The WG encourages presentations of Mexico and US fishery and biological information at future WG meetings as little information is currently available for the EPO.

7.1.5 IATTC

Estimates of blue shark catch by EPO purse seine fleets (ISC/13/SHARKWG-1/INFO-01), Cleridy Lennert-Cody

Summary:

The number of blue sharks caught by purse seiners in the north EPO from 1971-2010 was estimated from observer bycatch data, and observer and logbook effort data, both archived by the

IATTC. Some assumptions regarding the relative bycatch rates of blue sharks were applied based on their temperate distribution and catch composition information. Estimates were calculated separately by set type, year and area. Small purse seine vessels, for which there are no observer data, were assumed to have the same blue shark bycatch rates by set type, year and area, as those of large vessels. Prior to 1993, when shark bycatch data were not available, blue shark bycatch rates assumed to be equal to the average of 1993-1995 rates were applied to the available effort information by set type, area and year. The estimated number of blue sharks caught annually ranged from 20 to 585 individuals.

Discussion:

The WG noted that the BSP model needs total removals in tons. **The WG asked that the catch in numbers be converted to weight using the observed lengths and the agreed upon length-weight relationship. The WG recommends that observed size data be aggregated to derive the average size of a fish to estimate total catch in tons**. Bias in estimated population dynamics resulting from this aggregation will be negligible because catch is small relative to total NPO catch.

7.1.6 SPC

Longline catch estimates for non-ISC members fishing in WCPO north Pacific waters

Summary:

The SHARKWG Chair showed 1994-2012 estimates provided by SPC of longline blue shark catch from non-ISC members in the WCPO. Catch estimates ranged from a low of 161 mt in 1994 to 5846 mt in 2004. A figure was also provided showing the range of the fisheries included in the catch. Size data aggregated across all years (n=1233 sharks) were also provided but it was cautioned that they may not be representative of all fleets.

Discussion:

The WG was concerned that these longline data may also be reported in Taiwan’s small scale longline fishery data, which includes catch from foreign flagged vessels. **The SHARKWG Chair will follow up with the SPC data manager to find out if more information can be provided regarding the fleets. Effort will be made to compare the Taiwan data with the SPC data in order to minimize the chance of double counting foreign flagged longline catch.**

7.2 Estimation of catch of fleets without direct observations

7.2.1 China

Estimate of annual catch of blue sharks by China longliners

Summary:

The ISC data managers received China’s catch and effort data in 5x5 blocks in the Pacific for high seas longline fisheries from 2001-2010. Catch and effort were tabulated for north Pacific waters as provided to WCPFC and IATTC. For 2009 and 2010 these data also included a small experimental fishery based in the EEZ of Kiribati. Along with effort (longline hooks), blue shark catch was provided for 2008-2010. This information was used to calculate an average CPUE for 2008- 2010. The average CPUE was multiplied by effort for 2001-2007 to estimate blue shark catch in these years.

Discussion:

The WG discussed the method proposed to estimate blue shark catches of the China longline fishery. The WG noted that this fishery started relatively recently, in about 2000, so the reported effort information is the best information available. After much discussion, **the WG agreed that the proposed method be used to estimate blue shark catches for this fishery, given the limited amount of information available.**

7.2.2 Korea

Estimate of annual blue shark catch weight for Korean longliners

Summary:

The ISC database contains the annual catch weight of species aggregated sharks as well as the amount of effort (number of hooks) by Korean longliners between 1973 and 2011. The Korean annual reports to the two past WCPFC SC meetings (Korea 2010, Korea 2011) indicated that the catch of major shark species includes only blue and porbeagle sharks based on logbooks, and 65% of the catches of major shark species was comprised of blue shark based on observer records for one year (Korea 2010). The Korean annual report in 2010 also reported that the average CPUE of blue shark caught by Korean longliners was 0.07 (number/100 hooks) based on the observer data. The main operational area of Korean longliners is 150E – 100W and 10N – 10S.

Based on these information, it was assumed that all Korean reported catch of species aggregated sharks are blue sharks, because porbeagle sharks are not distributed in the north Pacific. Estimated CPUE by year in number of blue sharks per 1000 hooks caught by Korean longliners was calculated using reported catch and an assumed average weight of blue shark of 30 kg. The estimated CPUE values ranged from 0.0 to 0.89 which is comparable to the average CPUE obtained by the Korean observer data.

Discussion:

The working group noted that reported aggregated shark catches in the ISC database should be used for estimation purposes. Korean National Reports to WCPFC seem to indicate that all NPO shark catch is likely blue shark. **Thus the WG decided to use reported annual catch of species aggregated sharks data by Korea as the total removals for the base case. The possible maximum and minimum catches were also estimated for sensitivity analyses.** The maximum values were obtained by assuming additional catch as dead discards using the same discard ratio as Japanese deepset longliners. The minimum values were obtained by reducing the base case catch by removing discards based on the Japanese discard ratio assuming all discards survive. **The working group recommends additional research to improve Korean catch estimates for future assessments**.

7.2.3 Costa Rica

Summary:

An ISC Shark WG member had a brief, informal discussion with a fishery scientist from Costa Rica (CR) who was visiting the IATTC in late 2012. The CR scientist had recently begun estimating shark catches, including blue sharks, in a collaborative effort with IATTC. From 2004-2011, longline catches ranged from 1000-1300 mt. However, CR scientist indicated the majority of this catch was from foreign flagged vessels, with CR accounting for only 10-20% of this and the rest being of uncertain flag or reporting source. CR is continuing efforts to expand on these very preliminary estimates. CR indicated Panama could be another source of Central American blue shark catch to account for in the future.

Discussion:

There appears to be a lot of uncertainty regarding north Pacific blue shark catch landed in Costa Rica and other Central and South American nations. Information is not available on what proportion of the reported catch represents only Costa Rica catch or foreign flagged vessels. It was thought that some of the catch may already be included in foreign fleets catch accounted for in the other catch time series (i.e. in member fisheries, IATTC or SPC data). The WG discussed the need for additional catch information from other nations fishing in the EPO. It is unlikely that better estimates will be available by the data submission deadline. **Due to the expected lower catch rates of nations in the lower latitudes and the lack of good information, the WG agreed to not include estimates for other EPO non-member nations in this assessment. Research into the Central and South American shark catch should continue in order to provide improvements to the catch data time series for future assessments.**

7.3 Size Data

7.3.1 Chinese Taipei

Size and sex of blue sharks measured in the Taiwan longline fisheries (oral presentation), Kwang-Ming Liu

Summary:

Chinese Taipei presented the sex-specific length frequency distributions of blue sharks from the small-scale longline fishery in Taiwanese offshore waters, and from logbooks and observers for large-scale longline fishery. Sizes range from 90 cm to 320 cm TL with a mode of 200-210 cm TL for the small-scale fishery. Sizes reported by observers range from 60 to 340 cm TL with a mode of 220 cm TL for the large-scale longline fishery. These data were further separated by latitude at 30° N.

7.3.2 USA

Size and sex of blue sharks measured in the US fisheries (oral presentation), Tim Sippel

Summary:

US presented sex-specific blue shark size data from US West Coast drift gillnet fisheries (1990-2010), Hawaii longlines (deep and shallow set, 1995-2010), and juvenile shark longline survey (1993-2010) have been tabulated in 1 cm bins (PCL). For each year, the number of trips, number of sets, and number of fish measured are included to enable calculation of effective sample size for the 2013 blue shark assessment alternative model.

Discussion of all size data:

In response to a request from Japan, the basic plan for the use of size data in the alternative modeling was discussed. The alternative modelers responded that they will use the most detailed information provided to make the best assumptions for the simulation modeling. **The WG requested that member countries submit their size data in PCL by three areas (Areas 1&2**

combined, Areas 3&4 combined, and Area 5), quarter, sex and fisheries. A 1 cm bin is most desirable, but if the measured resolution is not as fine, then larger bins will still be useful.

The template of size data was reviewed and the deadline for all final data submission was set to February 8, 2013.

7.4 Abundance indices and CPUE estimation procedures

The WG reviewed 6 candidate abundance indices that were proposed to be used in the upcoming assessment to represent relative abundance of north Pacific blue shark. In order to determine which of the candidate abundance indices to use for the assessment, the WG evaluated the pros and cons of each index. It was suggested that the WG examine and discuss other RFMO's criteria and guidelines on evaluating abundance indices. A paper describing ICCAT guidelines for evaluating the quality of candidate abundance indices was reviewed (ICCAT 2010). After some discussion of ICCAT's and other criteria, the WG developed a table of criteria with which to evaluate the indices (Table 1). The characteristics of each candidate index with respect to each criterion was collated and used to populate the table. Several working papers were presented at this and previous meetings that documented the data and analysis used to derive these indices (Table 1 and see section 7.1 above).

Discussion:

After substantial discussion on each criteria and index, **the WG decided to use the Japanese early longline index from the offshore shallow-set longline fleet from Hokkaido and Tohoku (1976-1993) and the Japanese late longline index from the offshore and distant-water shallow-set longline fleet from Hokkaido and Tohoku (1994-2010) (Table 1) as the primary indices for the upcoming assessment.** The main reasons for using these as the primary indices are that the spatial and temporal coverage of these indices are large (covering most of the stock range), the relatively large catch of blue shark, the large range of sizes caught, no known changes in catchability, and sound statistical analysis using filtered data to remove data from trips that did not record blue shark data. In contrast, the longline indices from Hawaii were of relatively small spatial coverage and changes in regulations have likely affected the catchability of the Hawaii shallow-set index. The indices based on the Taiwan longline fisheries have good characteristics for many criteria (e.g., large spatial coverage and the use of observer data) but have relatively short time-series. For the Taiwan indices, there were questions about whether blue sharks discarded or total effort were consistently sampled throughout the time series, and the documentation did not have sufficient details addressing all necessary information. Since the Hawaii longline indices were the only indices that showed a negative trend in recent years, **the WG decided to use the Hawaii deep-set longline index as an alternative index to be used in sensitivity runs**. The Hawaii deep-set index was preferred to the Hawaii shallow-set index because of the likely impacts of regulations on the shallow-set index.

Table 1. Characteristics of candidate abundance indices proposed to represent relative abundance of north Pacific blue shark and criteria used to evaluate the indices.

	Hawaii Deep-set Longline	Hawaii Shallow-set Longline	Taiwan Large-scale Longline	Taiwan Small-scale Longline	Japan Early Offshore Shallow (Hokkaido & Tohoku)	Japan Late Offshore & Distant Water (Hokkaido & Tohoku)
Quality of Observations	Good because observer data is used with ~5-20% observer coverage and discards are recorded	Good because observer data is used with ~5-100% observer coverage and discards are recorded	Good because observer data is used but recorded discard data may not be representative	Catch data are representative but effort data were estimated	Relatively reliable because 94.6% filtered data applied, logbook data more reliable by filtering	Relatively reliable because 94.6% filtered data applied and logbook were validated by training vessel and observer data
Spatial distribution	Relatively small (Areas 4 & 5)	Relatively small (Areas 2 & 5)	Large (Areas 1-5)	Large (Areas 1-5)	Medium (Area 1 & 3)	Large (Area 1, 2, 3 & 4)
Size/age distribution	90% of catch from females: 175-275 cm TL; males: 175-300 cm TL	90% of catch from females: 100-275 cm TL; males: 100-300 cm TL	60 to 340 cm TL	90 cm to 320 cm TL	no information	90-170 cm PCL
Statistical soundness	Yes. Delta-lognormal model was used and model diagnostics were good	Yes. Delta-lognormal model was used and model diagnostics were good	Some diagnostics provided	Diagnostics provided	Yes	Yes
Temporal coverage	1995-2011	1995-2001; 2004-2011	2004-2010	2001-2003; 2005-2010	1976-1993	1994-2010

Catchability Changes (due to management, fishing practices, etc.)	Finning ban from 2000 (probably limited effect on Q)	Ban in shark finning from 2000 (probably limited effect on Q); Shallow-set longline ban from 2001-2004 (likely affects Q); hooks and bait requirements after 2004; limits on turtle bycatch	Ban in finning from 2005 (probably limited effect on Q)	Ban in finning from 2005 (probably limited effect on Q)	No regulation, gear or targeting change	No regulation, gear or targeting change
Relative catch contribution	~1500 to 2000 mt annually	~1500 to 2000 mt annually	<500 tons from 2003	>10,000 tons from 2004	19,000-55,000 mt	13,000-24,000 mt
Decision	Use in sensitivity run	Not used	Not used	Not used	Used in base-case model	Used in base-case model
Decision reason	Use in sensitivity run because it has some desirable characteristics and has different trend from others, but area too small to be primary index	Multiple management changes likely affected catchability	Time-series is relatively short and some questions remain about the representativeness of recorded number of discards	Time-series is relatively short, especially since the index in the early period (2001-2003) should not be used due to incomplete sampling of effort	Large spatial and temporal coverage	Large spatial coverage
			Working papers need to include the following elements:			
Fishery description	ISC/11/SHARKWG-1/05, ISC/11/SHARKWG-2/02, ISC/12/SHARKWG-1/02	ISC/11/SHARKWG-1/05, ISC/11/SHARKWG-2/02, ISC/12/SHARKWG-1/02	ISC/11/SHARKWG-1/06, ISC/13/SHARKWG-1/07	ISC/12/SHARKWG-1/15, ISC/13/SHARKWG-1/08	ISC/11/SHARKWG-2/10	ISC/11/SHARKWG-2/11

Analysis description	ISC/11/SHARKWG-2/02, ISC/12/SHARKWG-1/02	ISC/11/SHARKWG-2/02, ISC/12/SHARKWG-1/02	ISC/13/SHARKWG-1/07	ISC/13/SHARKWG-1/08	ISC/12/SHARKWG-1/07, 08, 09 ISC/12/SHARKWG-2/02 ISC/13/SHARKWG-1/03	ISC/12/SHARKWG-1/08, 09 ISC/12/SHARKWG-2/02 ISC/13/SHARKWG-1/03
Treatment of outliers or data filtering	ISC/11/SHARKWG-2/02, ISC/12/SHARKWG-1/02	ISC/11/SHARKWG-2/02, ISC/12/SHARKWG-1/02	ISC/13/SHARKWG-1/07	ISC/13/SHARKWG-1/08		
Remarks			Discard rate is suggested to be higher than recorded by observers because CPUE is unexpectedly low	Negligible discard rate; more confidence in late compared to early time series due to higher coverage of effort sampling in the late period		

8.0 REVIEW BIOLOGICAL PARAMETERS FOR BLUE SHARKS

Genetic population structure of blue sharks in the Pacific Ocean inferred from the microsatellite DNA marker (ISC/13/SHARKWG-1/9), Kotaro Yokawa

Summary:

To investigate the genetic population structure of blue shark (*Prionace glauca*) in the Pacific Ocean, a total of 471 individuals from 10 fishing grounds were genotyped at twelve microsatellite loci. Two loci were excluded from data analysis because of the evidence of deviation from Hardy-Weinberg equilibrium and/or linkage disequilibrium, although all microsatellite loci genotyped in the present study were polymorphic. An exact test of population differentiation based on allele frequencies indicated no genetic divergence across the Pacific Ocean. A Bayesian clustering analysis also inferred that the blue sharks in the Pacific Ocean assigned to one population. In contrast, hierarchical cluster analysis based on pairwise F_{st} estimates and AMOVA showed a weak genetic structuring of blue shark in the western Pacific Ocean. Taking together prior mtDNA results with these microsatellite results, the Pacific blue shark appears to have a weak genetic structure in the western Pacific Ocean. Additionally, the difference of genetic structure between the present microsatellite and the previous mitochondrial analyses would come from different aspects which both markers reflect, i.e., maternal population history for mitochondria, and more recent population dynamics of both sexes for microsatellites.

Discussion:

A comment was made this study was not designed to examine fine scale genetic differentiation, and that genetics studies in general are known to be of limited value in identifying stock structure. **However, the WG believes that evidence in the paper should be taken in combination with other evidence (e.g. CPUE patterns, tagging data, etc.). Ongoing sample collection and analysis are encouraged as larger sample sizes may help understand genetic structure.**

9.0 DISCUSS PRIORS FOR THE BSP MODEL

Summary:

The WG discussed BSP modeling parameters including priors, base case configuration, tentative sensitivity analyses and future projection scenarios. Once a draft catch table was prepared based on all the estimates reviewed in section 7.1, and the abundance indices selected, the WG conducted some trial runs to make sure the code was behaving correctly and that priors were appropriately specified. Some of the runs were conducted to identify how influential the priors were and the interplay between r and B_{init}/K. Refinements to the initial choices were made based on the outcomes of preliminary runs and the best scientific information available.

Discussion:

The WG requested clarification on how the proposed priors were developed and if the priors represented the final priors for the base case modeling. In particular, the WG noted that the prior on the ratio of initial biomass to carrying capacity assumes the stock was unfished prior to 1971. Catch of blue shark had been reported in some fleets prior to 1971. The authors clarified that the proposed priors (Table 2) were the starting points but were subject to change with new information. The authors also noted that the proposed prior on *r*, 0.34, is the same as the prior used by Kleiber et al. 2009. Runs conducted with the provisional data during this meeting demonstrated that the data appear to be driving the results which were relatively stable across a wide range of priors.

10.0 DECIDE ON MODEL CONFIGURATION FOR BASE CASE

The WG had tentatively agreed in previous meetings to use the Bayesian Surplus Production model software that was used in the previous assessment by Kleiber et al. (2009). In order to develop the base-case model for the upcoming assessment, the WG conducted several preliminary model runs based on specifications and parameterizations from Kleiber et al. (2009) as well as alternative parameterizations. In particular, emphasis was put on investigating the effect of using different priors (more diffuse priors and priors with different means; see Section 9) and understanding the relative influence of the data and priors on model results. **Based on these preliminary runs, the WG tentatively agreed to use the following specifications and parameterization for the base case model (Table 2). However, it should be noted that these specifications and parameterizations may be subject to change with further analysis by the WG.**

The WG agreed to investigate the best model to use to describe the shape of the production model function: the Schaefer model or the Fletcher/Schaefer model. The WG agreed to estimate K with a uniform prior of log(K) and *r* with a lognormal prior with a mean of 0.34 and SD of 0.3, which were used in Kleiber et al. (2009). Taiwan scientists provided preliminary analysis of the life histories and growth rates of several sharks and *r* was estimated to be approximately 0.35 for northwestern Pacific blue. The WG requested that Taiwan prepare a working paper on their study at the April assessment meeting. The B_{init}/K sets the relative proportion of initial biomass to K and was previously set with a normal prior with a mean of 1 and SD of 0.2 (bounds at 0 and 1) by Kleiber et al. (2009). However, preliminary runs suggest that the data tend to pull the mean of the B_{init}/K posterior towards the region between 0.5 and 1.0. Therefore, the WG recommended using a prior with a mean of 0.8 and SD of 0.5 for the B_{init}/K parameter in order to reduce the influence of this prior on model results.

Based on the analysis and review by the WG, the WG recommended that the catch data to be used in the base case model are the total dead removal estimates provided by WG members or estimated by the WG if these estimates were not provided (see Sections 7.1 and 7.2). The WG also recommended using the Japan early and late longline indices as the indicators of stock relative abundance (see 7.4).

Table 2. Tentative base case model specifications and parameterizations.

Specifications and Parameters	Mean	Uncertainty	Comments
K			Uniform on log(K)
r	0.34	SD=0.3	From Kleiber et al. 2009
B_{init}/K	0.8	SD=0.5	Lower mean and more diffuse prior than Kleiber et al. 2009, based on preliminary runs
Catch			Total dead removals estimated by WG members (see section 7.1 & 7.2)
Abundance Indices		CVs (TBD)	Japan early and late indices

11.0 DECIDE ON TENTATIVE SENSITIVITY ANALYSES

The WG discussed the sensitivity analyses to be performed for the upcoming stock assessment. Based on these discussions and the results from several preliminary runs, **the WG tentatively agreed to perform sensitivity runs based on the following scenarios:**

1) <u>Maximum catch.</u> This scenario assumes that the total dead removals estimated by the WG are underestimates due to extremely high discard mortality. Therefore, for this scenario, discard mortality is assumed to be 100% for fisheries with estimated discards (e.g., Japan longline, US longline, US gillnet). For fisheries without information on discard rates or mortality, the WG will assume that these fisheries have similar discard rates to similar fisheries (e.g., inflate the China longline catch based on the Japanese longline discard ratio).

2) <u>Minimum catch.</u> This scenario assumes that the total dead removals estimated by the WG are overestimates due to negligible discard mortality. Therefore, for this scenario, discard mortality is assumed to be 0% for all fisheries and only landed or finned fish are assumed to be removed from the population. In the case of Korea, the low catch time series would be decreased relative to the base case by the Japan discard ratio assuming that the Korea reported catch includes discarded fish.

3) <u>Priors for r.</u> The WG recommended that sensitivity runs be performed using biologically plausible maximum and minimum values (e.g., 0.15 and 0.5), as well as using less informative (more diffuse) priors with higher SDs. Since the number of sensitivity runs is relatively small and to check for possible interactions with other priors, the WG also recommended doing the runs for this scenario in conjunction with Scenario #4 (Priors for B_{init}/K) so that a matrix of sensitivity runs with a range of priors can be developed.

4) Priors for B_{init}/K. The WG recommended that sensitivity runs be performed using biologically plausible maximum and minimum values (e.g., 0.5 and 1.0), as well as using less informative (more diffuse) priors with higher SDs. Since the number of sensitivity runs is relatively small and to check for possible interactions with other priors, the WG also recommended doing the runs for this scenario in conjunction with Scenario #3 so that a matrix of sensitivity runs with a range of priors can be developed.

5) Abundance indices. The WG recommended performing a sensitivity run with the Hawaii deep-set longline index (1995-2011) replacing the Japan late longline index (1994-2010).

12.0 DISCUSS FUTURE PROJECTION SCENARIOS AND BRPS

The WG discussed the projections to be performed for the upcoming stock assessment. Based on these discussions and the results from several preliminary runs, **the WG tentatively agreed to perform projections based on the following scenarios:**

1) Base case catch. The WG recommended performing projections using the base case model, with future catches at status quo, +20% and -20%.

2) Maximum and minimum catch. The WG recommended performing projections using the maximum and minimum catch models (sensitivity scenario #1 and #2), with future catches at status quo.

The projection period (number of years and starting year) and the years used to determine catch for future projections will be determined by the WG at the upcoming assessment meeting.

13.0 PLANS FOR ALTERNATIVE MODELING

Examining size-sex segregation among blue sharks (Prionace glauca) from the Eastern Pacific Ocean using drift gillnet fishery and satellite tagging data (ISC/13/SHARKWG-1/06), Laura Urbisci and Rosa Runcie

Summary:

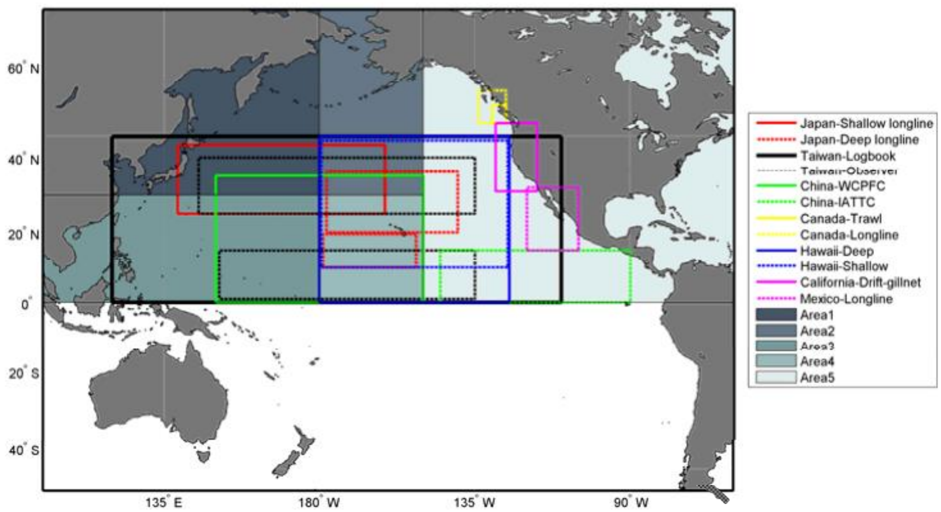
A study on the spatial distribution of blue sharks along the US West Coast was presented. Biomass dynamic (BD) models assume that fishery captures are taken from a temporally stationary distribution of age and sex classes. Nakano (1994) described a blue shark population in the North Pacific Ocean that showed significant size and sex structure that may violate the assumptions of a BD model. Fishery-dependent size composition for the US West Coast drift gillnet fleet and electronic tag data were used to validate the spatial model of Nakano (1994) which does not extend to coastal waters. Results support the conclusions of significant size-sex structure in the North Pacific Ocean and thus it is recommended that the SHARKWG consider this when assessing blue shark stock status.

Discussion:

There was much discussion about the results of this relatively small study and also evidence from other fisheries that show segregation by size and sex of blue sharks in the North Pacific. While Nakano's model was developed from sampled sharks in the central Pacific predominately, there may be different patterns in the coastal boundary areas. It was also noted that from a previous SHARKWG paper, an opposite pattern of segregation was observed with immature males predominating in the northern areas and immature females to the south of the immature males. In addition, in Mexico waters, pregnant females are captured in both the spring and fall, at latitudes that were not identified as parturition grounds in the Nakano model. It was acknowledged that the distribution of blue sharks by size and sex may be more complicated than can be described by a simple model, and that our knowledge is limited. For the planned alternative modeling, the most important thing will be to try to identify the characteristics of the majority of the catch for each of the fisheries. The first draft of a map outlining the extent of the known fisheries was reviewed (Figure 1) and, coupled with information on the size and sex composition of blue sharks in the catch, will be used to guide decision-making regarding the selectivity patterns of fisheries used in the alternative modeling. The authors were asked if seasonal movement was considered in this study and they responded that there are plans to incorporate seasonal movements in the future. **The WG recommended continued research on the spatial pattern of blue sharks in the North Pacific.**

The WG also discussed conducting alternative modeling efforts to investigate how changing biological catch composition (size and sex) may affect the BSP model results. The authors proposed using the information on size and sex structure of the fleets to construct a simulation model to evaluate the effect of changes in aggregate fishing location on BSP model results. These results would be used as validation and supporting evidence of the BSP results. It was further clarified that this effort would not be used as an alternative assessment but as part of the supporting documentation for the BSP assessment model.

Figure 1. First draft of map showing the extent of ISC member known fisheries catching blue shark in the North Pacific. The map will be updated to show all fisheries used in the stock assessment in order to develop hypotheses regarding spatial assumptions in the alternative modeling.



14.0 WORK PLAN FOR BLUE SHARK STOCK ASSESSMENT

<u>SHARKWG Members</u>

- All final assessment data are to be sent to the SHARKWG Chair and Tim Sippel by February 8, 2013. This includes total dead removal estimates, abundance indices and size and sex data by fishery.
- All time series data are to be to be prepared for 1971-2011. The 2010 value will be carried forward if 2011 is not available.
- All members conduct updated analyses based on requests made during this meeting.
- Japanese modelers will take the lead on the BSP modeling. BSP correspondents are Norio Takahasi and Minoru Kanaiwa (Japan), Chien-Pang Chin and Kwang-Ming Liu (Chinese Taipei) and Tim Sippel (USA).
- Conduct base case and sensitivity runs in advance of assessment workshop.
- Conduct projections in advance of the assessment workshop.
  US modelers will take the lead on the alternative modeling.
- Conduct supporting alternative model runs in advance of the assessment workshop.
- All members ensure that working group reports describing any data used in the assessment adequately describe estimation methods with appropriate detail and diagnostics.

<u>SHARKWG Chair</u>

- Compile and distribute final assessment data within one week of the February 8 submission deadline.
- Distribute outline for assessment report based on the striped marlin assessment report.
- Contact SPC regarding cooperation on the ISC north Pacific blue shark assessment.

- Contact SPC regarding information on the longline fleets reporting blue shark catch in the north Pacific and compare with Taiwan's data in order to minimize the chance of double counting foreign flagged longline catch.
- Update metadata tables and draft map in advance of assessment workshop.
- Work with Mexico's scientists to derive their best estimates by the data submission deadline.
- Contact Korea and China correspondents for data updates by the data submission deadline.
- Review past working group reports to determine if they adequately describe methods and have appropriate detail and diagnostics. Follow up with WG members in advance of the assessment workshop if reports with greater detail are needed.

15.0 FUTURE SHARKWG MEETINGS

The WG discussed the need to keep on schedule to complete a shortfin mako assessment in 2014. In order to do so, up to 3 meetings may be needed to review shortfin mako biological and fishery information, finalize data and conduct the assessment. The WG felt that 3 meetings after completing the blue shark assessment and prior to the 2014 Plenary is too many meetings, thus came up with the tentative schedule below.

Dates (tentative location)	Objectives
April 16-24 2013 (Shimizu)	6 days blue shark assessment, develop conservation information and report writing, 2 days mako shark information gathering
July 11-14 2013 (Korea)	1 day finalize work for the Plenary on blue sharks, 3 days mako information gathering
Fall/Winter (Mexico or La Jolla)	mako shark data prep meeting
Spring 2014 (TBD)	mako shark assessment meeting

16.0 OTHER MATTERS

The WG discussed the WCPFC's SC work plan that includes conducting a Pacific-wide blue shark assessment this year. When asked by the SHARKWG Chair, SPC scientists indicated that they plan to conduct separate age structured assessments of the south and north Pacific stocks before the August 2013 SC meeting. The SHARKWG was surprised and does not agree with this decision given the understanding that there was agreement for ISC to focus on temperate north Pacific sharks and encourage collaboration with IATTC and SPC scientists on the assessments. Conducting two stock assessments for north Pacific blue sharks in the same year is not productive. ISC Chair Gerard DiNardo expressed his disagreement with this decision at the NC8 meeting. The SHARKWG welcomes participation by all members and observers in the stock assessment meeting to be held in April 2013, however detailed data will not be distributed beyond the SHARKWG for independent use by other organizations. The SHARKWG Chair will follow up with SPC to reiterate the invitation to work within the ISC SHARKWG on a north Pacific blue shark assessment.

Similarly, the WG does not agree with the decision of the SC to plan for a north Pacific shortfin mako shark assessment in 2014. The WG is moving forward with a north Pacific shortfin mako shark assessment expected to be completed in spring 2014 and encourages cooperation by all members and observers.

17.0 CLEARING OF REPORT

The Report was reviewed and the content provisionally approved by all present. The Chair will make minor non-substantive editorial revisions and circulate the revised version to all WG members within 2 weeks. Chinese Taipei delegates will be allowed to propose minor changes to content if there appear to be errors relevant to their fisheries or requests. The report will be finalized once agreed upon by all members in no more than 30 days.

18.0 ADJOURNMENT

The Chair thanked all participants for attending and contributing to a very productive meeting. She also thanked the SWFSC participants for assisting with meeting logistics throughout the week.

The meeting was adjourned at 12:47, January 14, 2013.

19.0 LITERATURE CITED

ICCAT 2010. Report of the 2009 ICCAT working group on stock assessment methods. Collect. Vol. Sci. Pap. ICCAT, 65(5): 1851-1908.

Kleiber, P., S. Clarke, K. Bigelow, H. Nakano, M. McAllister, and Y. Takeuchi. 2009. North Pacific blue shark stock assessment. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-17, 74 p.

Korea 2010. Annual report to the Commission, Part 1: Information on fisheries, research and statistics. WCPFC-SC6-AR/CCM-15, 17p.

Korea 2011. Annual report to the Commission, Part 1: Information on fisheries, research and statistics. WCPFC-SC7-AR/CCM-11, 15p.

Nakano, H. 1994. Age, reproduction and migration of blue shark in the North Pacific Ocean. Bulletin National Research Institute of Far Seas Fisheries. 31:141-256.

Attachment 1. List of Participants

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Attachment 2. Meeting Documents

WORKING PAPERS

ISC/13/SHARKWG-1/01	Report from the Bayesian Surplus Production model (BSP) workshop: Yokohama, Japan – November 2012. Tim Sippel and Norio Takahashi (tim.sippel@noaa.gov)
ISC/13/SHARKWG-1/02	Preliminary catch estimates of north Pacific blue shark from California experimental shark longline fisheries. Steven L. H. Teo (steve.teo@noaa.gov)
ISC/13/SHARKWG-1/03	Re-estimation of abundance indices and catch amount for blue shark in the North Pacific. Yuko Hiraoka (yhira415@affrc.go.jp)
ISC/13/SHARKWG-1/04	Estimates of Mexico's blue shark catch from 1976 - 2010. Tim Sippel (tim.sippel@noaa.gov)
ISC/13/SHARKWG-1/05	Catch Statistics, Length Data and Standardized CPUE for Blue Shark *Prionace glauca* taken by Longline Fisheries based in Hawaii and California. William A. Walsh and Steven L. H. Teo (william.walsh@noaa.gov)
ISC/13/SHARKWG-1/06	Examining size-sex segregation among blue sharks (*Prionace glauca*) from the Eastern Pacific Ocean using drift gillnet fishery and satellite tagging data. Laura Urbisci, Rosa Runcie, Tim Sippel, Kevin Piner, Heidi Dewar and Suzanne Kohin (lurbisci@gmail.com and suzanne.kohin@noaa.gov)
ISC/13/SHARKWG-1/07	Catch and standardized CPUE of the blue shark by Taiwanese large-scale longline fishery in the North Pacific Ocean. Wen-Pei Tsai and Kwang-Ming Liu (kmliu@mail.ntou.edu.tw)
ISC/13/SHARKWG-1/08	Catch and abundance index of the blue shark by Taiwanese small-scale longline fishery in the North Pacific Ocean. Chien-Pang Chin and Kwang-Ming Liu (kmliu@mail.ntou.edu.tw)
ISC/13/SHARKWG-1/09	Genetic population structure of blue sharks (*Prionace glauca*) in the Pacific Ocean inferred from the microsatellite DNA marker. Mioko Taguchi and Kotaro Yokawa (tagu305@affrc.go.jp)

INFORMATION PAPER

ISC/13/SHARKWG-1/INFO-1	IATTC Purse Seine estimates (clennert@iattc.org)

Attachment 3: Agenda

SHARK WORKING GROUP (SHARKWG)

INTERNATIONAL SCIENTIFIC COMMITTEE FOR TUNA AND TUNA-LIKE SPECIES IN THE NORTH PACIFIC

INTERCESSIONAL WORKSHOP AGENDA

7 – 14 January, 2013
NOAA Southwest Fisheries Science Center
3333 North Torrey Pines Court
Large Conference Room
La Jolla, CA

1. Opening of SHARKWG Workshop
   - Welcoming remarks
   - Introductions
   - Meeting arrangements
2. Distribution of documents and numbering of Working Papers
3. Review and approval of agenda
4. Appointment of rapporteurs
5. Summary of the May 2012 and July 2012 Workshops (Kohin)
6. Summary of Bayesian Surplus Production Model Workshop (Piner, Kanaiwa) **WP01**
7. Review fishery data for blue shark stock assessment
   - Catch and discard data and total catch estimation procedures (Sippel, Takahashi) **WP07, 08, 02, 05, 03, 04, INFO01**
   - Estimation of catch of fleets without direct observations (Piner, Teo)
   - Size data (Liu, Hiraoka)
   - Abundance indices and CPUE estimation procedures (Teo, Yokawa) **WP07, 08, 05, 03**

Goal is to have catch time series and abundance indices finalized by end of workshop

8. Review biological parameters for blue sharks (Liu, Sippel) **WP09**
9. Discuss priors for the BSP model (Piner)
10. Decide on model configuration for base case (Teo, Hiraoka)
    - Conduct some model runs
    - Discuss problems/parameterizations
11. Decide on tentative sensitivity analyses (Teo, Hiraoka) **WP06**
12. Discuss future projection scenarios and BRPs (Teo, Hiraoka)
13. Plans for alternative modeling (Piner)
14. Work plan for blue shark stock assessment (Kohin)
15. Future SHARKWG meetings (Kohin)

16. Other matters (Kohin)
17. Clearing of report
18. Adjournment