Annex 5

REPORT OF THE BILLFISH WORKING GROUP WORKSHOP

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

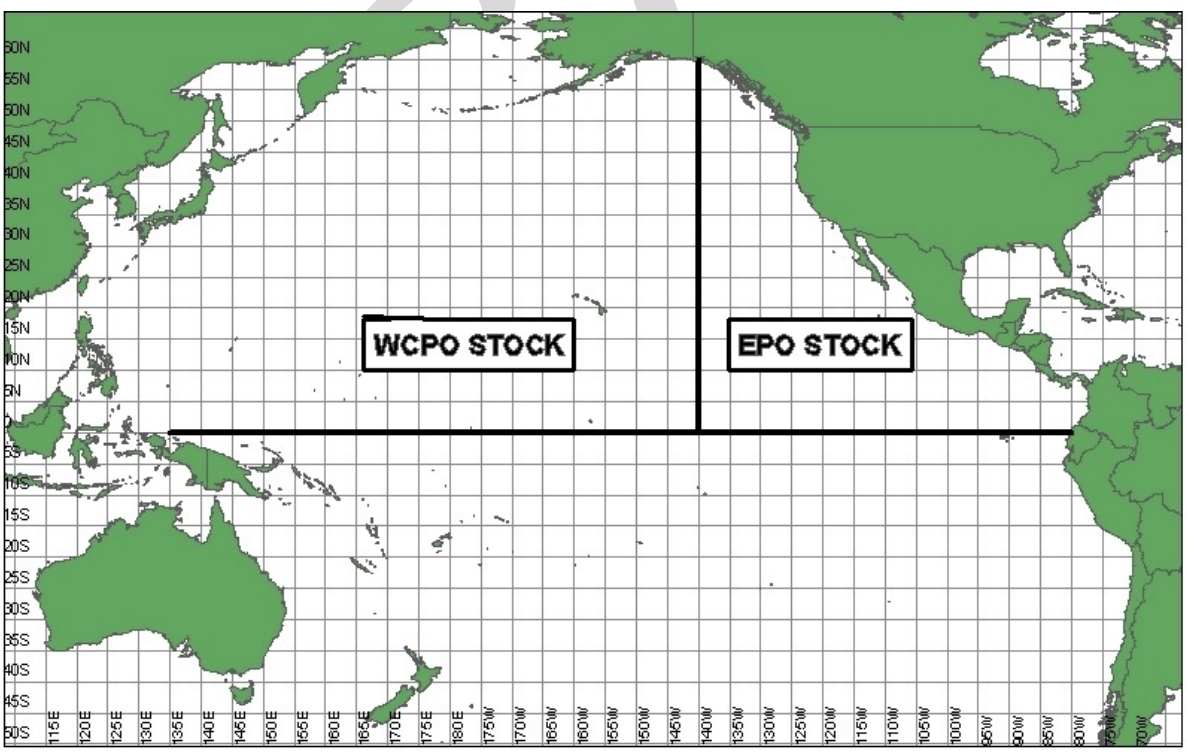
13-20 January 2015
Honolulu, Hawaii, USA

1.0 INTRODUCTION

An intercessional workshop of the Billfish Working Group (BILLWG) of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) was convened in Honolulu, Hawaii, USA during 13-20 January 2015. The goal of this workshop was to prepare fishery data for the stock assessment of Western and Central North Pacific striped marlin in 2015 including catch by quarter data, CPUE standardization, size frequency data, tagging data, and life history parameters.

Jon Brodziak, Chair of the BILLWG, welcomed participants from Chinese Taipei, Japan, the United States of America (USA) and the Inter-American Tropical Tuna Commission (Attachment 1). The Chair noted that there were no meeting participants from China or Korea.

Figure 1. The stock area of the WCNPO striped marlin stock is the region west of 140°W and north of the equator in the North Pacific Ocean.



2.0 ADOPTION OF AGENDA AND ASSIGNMENT OF RAPPORTEURS

Rapporteuring duties for the working group (WG) were assigned to Jon Brodziak, Yi-Jay Chang, Annie Yau, Gerard DiNardo, Russell Ito, Minoru Kanaiwa, Chi-Lu Sun, Darryl Tagami, William Walsh, Seiji Oshimo, and Kotaro Yokawa. The meeting agenda was adopted (Attachment 2).

3.0 COMPUTING FACILITIES

Computing facilities included a Google drive for distribution of working papers and other meeting documents and information and a Wi-Fi wireless network access point to connect to the Internet.

4.0 DISTRIBUTION OF WORKING PAPERS AND STATUS OF ASSIGNMENTS

Working papers were distributed and numbered (Attachment 3) and it was agreed that all working papers would be posted on the ISC website and made available to the public.

The work assignments to be addressed at the January 2015 workshop were as follows:

- Submit all outstanding catch, standardized catch-per-unit effort (CPUE), and size composition data for the striped marlin stock assessment to the BILLWG Chair.

- Provide draft working papers, noting that all working papers submitted at this meeting will need to be finalized by February 10, 2015.

- Prepare information to revise the North Pacific striped marlin catch, CPUE, and size composition data table for the April 2015 BILLWG stock assessment meeting.

The ISC BILLWG Chair reported that the assignments for submitting all catch, standardized catch-per-unit effort (CPUE), and size composition data for the striped marlin stock assessment were completed through working paper presentations. The Chair noted that all data needed to be submitted to the data coordinator Darryl Tagami in electronic format by February 1, 2015.

The ISC BILLWG Chair reported that the assignments for providing draft working papers were completed. The Chair noted that the draft working papers needed to be finalized by February 10, 2015.

5.0 REVIEW OF RECENT FISHERIES

Three working papers on the topic of a review of recent billfish fisheries were presented to the WG by Ito, Yau, and Tagami. The WG reviewed the working papers and discussed the information presented by Ito, Yau, and Tagami.

5.1 USA commercial fisheries for marlins in the North Pacific Ocean
Presented by Russell Ito (ISC/15/BILLWG-1/1)

This working paper presents catch, effort and catch-per-unit-effort information on USA commercial fisheries for marlins in the North Pacific Ocean. The major gear types employed by USA fisheries for marlins were longline, troll and handline of which the longline fishery being the largest fishery for marlins in the North Pacific Ocean. The two largest components of the marlin catch were blue marlin *Makaira nigricans* and striped marlin *Kajikia audax*. Striped marlin was caught primarily by the longline fishery while blue marlin was caught by the longline and troll fisheries. CPUE for the longline and troll fisheries declined during the 1990s and remained low thereafter. The size distribution of striped marlin and blue marlin landings by the longline and troll fisheries were similar. This report summarizes historical trends and recent developments for each of these fisheries.

Discussion

The WG noted that the striped marlin catch by the Hawaii-based longline fishery during 1991-2013 was significantly lower in Quarter 3 than the other quarters; the catch in Quarter 3 was less than half of any of the other quarters. The WG suggested various possible reasons for this including: migration from the fishing grounds after summer spawning; lower fishing effort due to less vessels fishing in Quarter 3; and vessels fishing in areas of low striped marlin concentrations.

It was noted that there is a declining trend in the nominal striped marlin CPUE for the Hawaii-based longline fishery with low CPUEs since 2007. However, there has been no decreasing trend in the catch or the number of vessels in the time series.

It was noted that the deep-set sector of the Hawaii-based longline fishery started to convert to circle hooks in 2005, primarily to mitigate false killer whale interactions. It was also noted that some Japanese studies showed that circle hooks can have lower catchability for marlins, but not tunas.

5.2 Summary of striped marlin (*Kajikia audax*) catch and size data from the Western and Central Pacific Fisheries Commission
Presented by Annie Yau (ISC/15/BILLWG-1/5)

Data on striped marlin (*Kajikia audax*) catch and length frequency data were provided by the Western and Central Pacific Fisheries Commission (WCPFC) to the ISC Billfish Working Group for the purposes of conducting a 2015 stock assessment update. The results of Category 1 data from 1950-2013 (annual total catch by fleet) and Category 3 data from 1992-2013 (size composition data aggregated by month and spatial 5º grids) are summed up here for visualization and exploration purposes. Striped marlin catches peaked in 1971 at 12,093 tons, and in 2013 there were 2,070 tons caught. Japan has historically and recently caught a large proportion of the total striped marlin catches, with Taiwan, the United States, and Korea catching the next highest proportions. The reported lengths of striped marlin varied between 40 cm and 315 cm, with an overall average and standard deviation of 140.1 cm ± 26.5 cm. The average size of striped marlin varied by country, and also through time by year and quarter.

Discussion

The presentation summarized data by category as provided by the WCPFC during 1958-2013. Results showed that the Japanese catches were the largest of any country by far, and that most of the USA catch was taken by the Hawaii-based pelagic longline fleet.
Category III data were presented as box plots. It was noted that the trend for the pooled data from all countries exhibited a “split” around 2005, with larger striped marlin reported thereafter. This heterogeneity in size data may have resulted from sampling different fleets or sampling according to different regimens. When displayed on a quarterly basis, the pattern was no longer evident.

The size data for striped marlin varied among countries in terms of annual coverage. The Japanese data for the 1993-2013 period included gaps in 1999, 2003, 2004, and 2008. The USA data were sparse in 2003 and have been since 2006. This may reflect use of lengths rather than weights; this possibility will be investigated. The average size for USA striped marlin was the smallest of all countries, and with a large sample size (n=12,000 fish lengths).

The plots of sizes in relation to fishing areas indicated that large fish were taken in near-equatorial waters. These may have come from purse seiners. This must be checked with the WCPFC. The plots indicating large fish caught near the equator may also have resulted from small sample sizes because the plots did not reflect the numbers of fish caught.
The Chair averred that prudence regarding use of the size data from the WCPFC for the stock assessment may be necessary, and use of these data in the stock assessment may require further discussion.

Yao and Chang used WCPFC data and summarized catches by country (1958-2013). The Japanese catches had the largest catches by far. Most of USA catch originated from Hawaii. The summary of Category 3 (size composition data) was done with box plots which seemed to be a split around 2005, with larger striped marlin thereafter. The heterogeneity was pointed out as the reason for this split and the Chair agreed. This may have resulted from different fleets or sampling regimens. Quarterly box plots did not exhibit this pattern. Size of fish by country showed USA with the smallest average size although it was the largest sample (>12,000). The size data from Japan showed years without data (1993-2013): gaps 1999, 2003, 2004, 2008. The USA size data was sparse in 2003 and since 2006. This could be due to use of lengths rather than weights. It will be investigated if conversions of landings data from weight into length were done for this data. Plots of mean size of fish by area for each country were done. The USA plots with data points along the equator were surprising and these may come from purse seiner data. This will be checked with the WCPFC. Several other countries also had catches of the largest fish near the equator.

The group noted that the annual mean lengths of striped marlin for all countries from 2006-2013 were higher than the annual mean lengths from 1992-2005. This pattern was not apparent when examining the box plots of striped marlin size by year and quarter.

It was noted that there were gaps in the years that size data were submitted to the WCPFC by many countries including Japan, Chinese Taipei and USA. It was noted that spatial distribution of mean size of striped marlin indicated that the largest mean sizes were found near the Equator for most of the countries. It was also noted that the mean size of the striped marlin caught by USA primarily around Hawaii was the smallest at 130 cm. It was noted that the source of the size data from USA just north of the Equator from 140-180 degrees East longitude needs to be verified.

5.3 Spatial distribution of striped marlin catches in the North Pacific from WCPFC data
Presented by Darryl Tagami (ISC/15/BILLWG-1/12)

This working paper presents catch summaries and distribution plots of striped marlin in the North Pacific from non-ISC member countries. The data was provided by the WCPFC for longline catches of striped marlin only. The purpose was to provide the ISC Billfish Working Group with billfish catch data not available in the ISC or ISC WGs data holdings. This represents an update of the striped marlin catch data that was provided by the WCPFC for the ISC stock assessment in 2011.

Discussion

Data acquisition from the WCPFC is an important process for the assessments. The process has become increasingly formalized (and cumbersome) in recent years and the WG noted various inconsistencies in the Category I and II data provided by the WCPFC to the ISC: missing years in the annual catch time series, validity of zero catches, inconsistent representation of countries between the Category I and II data, and discrepancies in annual catch of countries between Category I and II data. The group also identified the presence of size data (WCPFC Category III) from the USA in the western Pacific just north of the Equator but the absence of catch and effort data (WCPFC Category II) from the USA in the same region. It was recommended that these issues be further investigated with the SPC by the ISC Statistics WG. It was noted that the missing data was considered to be negligible for non-ISC countries. Collaboration with Southeast Asian Fisheries Development Center was mentioned as a possible opportunity to improve data collection in the tropical western Pacific and it was recommended that the ISC Chair pursue this collaboration.

It was noted that underestimation of striped marlin is possible because purse seine bycatch data was either not available or not investigated; however, most purse seine activity occurs in the Southern Hemisphere. Upon review of the IATTC Category I data available on their website and consultation with the IATTC representative at this meeting, it was concluded that there was no purse seine fishing by IATTC members north of the Equator between 150 and 140 degrees West longitude.

It was noted that only national observers are allowed on many of the ISC member vessels fishing in the North Pacific. However, these ISC member vessels are required to carry FFA observers when fishing in waters under the jurisdiction of the FFA. Much of the size data (Category III) from the WCPFC may have originated from FFA observers. This may account for the consistent presence of striped marlin size data in the western Pacific just north of the Equator.

6.0 FISHERY STATISTICS FOR WCNPO STRIPED MARLIN

Nine working papers on the topic of fishery statistics for WCNPO striped marlin were presented to the WG by Chang, Walsh, Oshimo, Kanaiwa, Sun, and Yokawa. The WG reviewed the working papers and discussed the information presented by Chang, Walsh, Oshimo, Kanaiwa, Sun, and Yokawa.

6.1 Updated time series associated with Hawaii-based longline vessels and striped marlin nominal CPUE based on the fishery observer data system
Presented by Yi-Jay Chang (ISC/15/BILLWG-1/2)

This working paper presents time series associated with Hawaii-based pelagic longline vessels and striped marlin nominal catch-per-unit-effort based on the fishery observer data system from 1995 through 2013. It is intended to provide supplementary information regarding the covariates in the CPUE standardizations for striped marlin in the Hawaii-based pelagic longline fishery (Langseth 2015; Walsh and Chang, 2015).

Discussion

A question was raised on the difference of striped marlin CPUE by quarter for the deep-set sector (see Figure 2 in the working paper) and shallow-set sector (see Figure 3 in the working paper). It appeared the shallow-set striped marlin CPUE was high all year round while the deep-set sector CPUE was high in quarters 1, 2, and 4 but lower in quarter 3. While existing data cannot explain this difference, it was suggested that spatial pattern analyses and interviews with fishermen be conducted.

6.2 Standardization of striped marlin CPUE for the Hawaii-based longline fishery during 1995-2013 using Generalized Linear Models: An update from 2011
Presented by William Walsh (ISC/15/BILLWG-1/3)

This working paper presents catch-per-unit-effort (CPUE) standardizations for striped marlin *Kajikia audax* in the Hawaii-based pelagic longline fishery during 1995–2013. The results are intended for use in a striped marlin stock assessment to be conducted in 2015 that will update one from 2011. Analyses were conducted using catch and operational data reported by the NOAA Fisheries Pacific Islands Regional Observer Program. Catch rates were standardized using delta-lognormal and Poisson generalized linear models because the catch data included many zeros (delta-lognormal) and was reported as counts (Poisson). The fishing year, fishing (i.e., calendar) quarter, and fishing region were significant, important factor variables; the sea surface temperature, hooks per float, and hooks per longline set were significant, important continuous predictor variables. Results include descriptive catch statistics, analyses of deviance for the fitted CPUE standardization models, residuals plots, and graphical presentations of the nominal with the standardized CPUE trends. The discussion includes comparisons of catch rates in recent years to the previously analyzed long-term CPUE trend and of the standardized trends from both GLM analyses in relation to the nominal catch rates and each another.

Discussion

This presentation was updated from the 2011 analysis with 4 more years of observer data. A point was raised as to why the entire observer data set was used when the rate of coverage was much lower level in the 1990s than 2000s. The lower sample sizes prior to 2002 are reflected in Walsh's working paper via the larger confidence intervals around estimated standardized CPUE prior to 2002. These larger confidence intervals translate into a down weighting of this earlier data in the stock synthesis model. The previous assessment included USA CPUE data prior to 2002 and while the sample sizes for striped marlin are considered to be sufficient for standardization purposes, further investigation is warranted. It was also noted that the normal distribution of the quantile residuals conformed to the statistical assumption.

6.3 Update of standardized CPUE of striped marlin in northwest Pacific Ocean based on the coastal small longline fishery from 1994-2013
Presented by Seiji Oshimo (ISC/15/BILLWG-1/4)

This working paper is an update of standardized CPUE and decadal distribution change of striped marlin (Kajikia audax) caught by Japanese coastal longline fisheries (defined as the longliners less than 20 tons) in the Northwestern Pacific Ocean from 1994 to 2013. The operations of Japanese coastal longliners widely covered the northwest Pacific west of 160E until the end of the 1990s when the coverage of its effort started to shrink. The relative size of the high CPUE areas appears to have decreased in the period analyzed perhaps due to the shrinking distribution of striped marlin caused by the decrease of its abundance. Annual trends of CPUEs standardized by different methods and models generally were similar. The increasing trend since 2009 may indicate the recovery of the abundance of striped marlin in the area analyzed.

Discussion

This presentation summarized a CPUE standardization update for the Japanese coastal small longline fishery during 1994-2013. The analyses were computed as negative binomial and delta-lognormal models.

In the discussion, several requests were made to provide additional information in order to meet ISC CPUE standardization criteria, i.e. best practices; these requests were met and presented the following day. The additional information provided included confidence intervals, analysis of variance and analysis of deviance tables, and correlation analyses for the fitted standardized CPUE trends.

While CPUE was standardized using two model structures, the negative binomial GLM was chosen over the delta-lognormal model because this was an update and it was used in the 2011 assessment. It was also noted that the standardized CPUE trends from the various models were very similar. It was also explained that hooks-per-basket information was not included in the delta-lognormal models because those models did not converge.

The presentation showed decadal changes of CPUE by area, quarterly distribution of CPUE trends, and gave a description of the standardization model. A reference to a 2013 simulation study which supported the use of a negative binomial GLM was presented at the 5th Billfish Symposium and that this paper was made available to the WG (unpublished manuscript by Kanaiwa). The addition of information requested by the Chair will also inform the selection of this model. Chang commented that the standardized CPUE was similar and even though it used a different method, the results were similar. There was concern about the conclusions stating that a “steady increasing trend” was apparent. This was not warranted given a decrease in CPUE in recent years and the conclusion was changed from “steady increasing” to a “general increasing” trend.

6.4 Standardization of striped marlin (*Kajikia audax*) CPUE in the Hawaiian longline fishery II: Additional covariates, distribution, and use of data from the deep-set fishery sector only
Presented by Yi-Jay Chang (ISC/15/BILLWG-1/6)

This working paper is a compliment to Walsh and Chang (2015), and adds additional considerations to the standardization of catch per unit effort (CPUE) for striped marlin (Kajikia audax) in the Hawaiian longline fishery. First, set type and second order interactions of year-quarter, quarter-region, set type-hooks per float, and set type-vessel length, were included as additional explanatory covariates. Second, the zero-inflated negative binomial (ZINB) model was used in addition to the Poisson and delta-lognormal distributions. Third, due to the closure of the shallow set sector from 2001 to 2004, standardizations from only the deep-set sector of the fishery were compared to standardizations from both sectors. All covariates were selected for the best models based on forward and backward model selection, but year, region, and season explained the most deviance. Indices were similar across all three distributions and across the two data choices, with only slight differences in the first five years between the indices produced using deep-set data and the indices produced using all data. Residual plots showed uniform patterning across covariates, with the exception of a bimodal pattern in hooks per float when using all data, and smaller residuals for the first five years when using deep-set data. Overall, the results suggested that the trend in striped marlin CPUE was robust to the choice of distribution and the choice of which data to analyze and that meaningful covariates were not excluded from previous standardizations. It is recommended that the existing methodology for standardizing striped marlin CPUE for the Hawaiian longline fishery be maintained for the stock assessment update. For future standardizations, use of the delta-lognormal is recommended, as is use of the combined dataset with set type included as a covariate.

Discussion

A recommendation to stay with the strict update analysis was made. Boxplots of diagnostics would be more informative than simply plotting raw results. A question was raised about the distribution of Pearson residuals for the deep-set sector and why the spread for the earlier years is smaller than for later years. The presenter replied that each year has a different pattern and that in earlier years, the proportion of shallow set is likely higher and the sample size is smaller. Future work could consider random vessel effects and finer spatial scales.

6.6 Update of Standardized CPUE of Striped Marlin in North Western Central Pacific Ocean by Japanese offshore and distance longline
Presented by Minoru Kanaiwa (ISC/15/BILLWG-1/7)

Updated estimates of standardized CPUE for the Japanese offshore and distant water longline fleets during 1975 to 2013 are provided. For the standardization model, year, sub-area, quarter and hooks per basket are used as the independent factors to predict the response of log-transformed CPUE. The normal distribution is used as the model error distribution. Three areas, which were estimated using the GLM-tree algorithm, and three time blocks were used in the standardization model. The model settings and assumptions were the same as in the previous standardization analyses in 2011. There were different CPUE trends in each area. The CPUE trend in area 3, which includes Hawaii, showed a small decrease and this suggested that some local depletion may have occurred.

Discussion

This WP considered Japanese offshore and distant-water longline fisheries in 1975-2013. The GLM was fitted with three interactions. The plot of CPUE (fish/hook) over time by areas used response scales that differed by orders of magnitude. Differences in these response scales, especially in Area 1, may have caused the "spike" in the graph. It was also suggested that the spike in Area 1 looked like a biological impossibility, which led to an additional suggestion for the exclusion of the 2011 data point from the relative abundance indices. There was also a higher standard deviation around that year. A point was raised about degree of freedom in area 1. A request for additional information on the hooks per float for area 1 might help elucidate pattern and the speaker agreed to provide these results. There was a mistake in sub-area designation and as a result, the standardized CPUE series needed to be re-calculated. All required recalculations were completed and provided to the WG. These indices were adopted by the WG.

6.7 Catch and length data of striped marlin (Kajikia audax) from Taiwanese fisheries in the western and central North Pacific Ocean
Presented by Chi-Lu Sun (ISC/15/BILLWG-1/8)

Catches of striped marlin from the distant-water longline fishery were lower than those from the offshore longline fishery, both of which showed an increasing trend in the early 2000s, but decreased since 2007. A proportion of striped marlin was taken by coastal harpoon fishery, with an average catch of around 100 mt for 1967-2013. In contrast, only a small amount of striped marlin catch was reported for the offshore and coastal gillnet, set-net, and all the other fisheries in the WCNPO. The eye fork length data for striped marlin were collected from the Taiwanese distant-water tuna longline fishery in the western and central North Pacific Ocean, with sample sizes ranging from 162 to 847. Although the smallest and largest striped marlin measured from this fishery varied among years, the mean lengths of measured fish seem relatively stable (from 160.8 to 175.3 cm EFL) during 2006-2013.

Discussion

It was noted that the size distribution in 2013 was narrower than previous year and truncated on both upper and lower tails, with few large or small fish, but had a similar mean size. The WG noted that data for 2013 is preliminary and sample size of length data (n=286) is smaller than those for previous years (2006-2012, n=458 in average).

A question was raised whether the striped marlin catch data was revised or not because the swordfish catch by the Taiwanese offshore longline fishery was revised last year. The answer was that the catch of striped marlin in the offshore fishery was believed to be small because the fishery targets tunas. Swordfish catch by the Taiwanese offshore fishery needed to be updated because catch data for foreign-based longline fishery for 2000-2002 were available but not included in previous data set, while the catch of striped marlin from the offshore fishery was minor compared to the catch of swordfish. The WG noted that sampling coverage of the offshore longline fishery has increased and supported these sampling efforts.

6.8 Standardized CPUE of striped marlin for the Taiwanese distant-water tuna longline fishery in the western and central North Pacific Ocean
Presented by Chi-Lu Sun (ISC/15/BILLWG-1/9)

Catch and effort data for the Taiwanese distant-water tuna longline fisheries in the North Pacific Ocean were obtained from the Overseas Fishery Development Council, and the CPUE of striped marlin for the western and central North Pacific Ocean stock was standardized using the generalized linear models. Year, quarter, latitude, longitude, and the two-way interaction between latitude and longitude were included as predictors in the standardization models. Information on hooks per basket (HPB) has been available since 1995, and was thus incorporated in the CPUE standardization model for 1995-2013. All the factors considered in the models were statistically significant. The standardized CPUE of striped marlin derived from various models showed very similar abundance trends for this stock. In general, the standardized CPUE of striped marlin decreased gradually in the 1990s, but showed an obviously increasing trend from 2001 with a peak occurring during 2004-2005, and then decreased but increased again from 2009 until recent years.

Discussion

One analytical detail is that hooks-per-basket information first became available in 1995. The standardized CPUE series similar from all periods during the 1989-2013 study period. Discussion centered on the length of the time series to be used in the assessment. The revised 1989-2013 CPUE standardization had the highest amount of CPUE variance explained (22%), however, the latter period of 1995-2013 was chosen by the WG because it was consistent with the previous assessment and because the HPB information was available. The longer time series can be used as a scenario for a sensitivity analysis. The WG agreed to use the 1995-2013 CPUE time series for the stock assessment update of the 2011 stock assessment.

6.9 CPUE of the North Pacific striped marlin caught by Japanese coastal drift netters
Presented by Kotaro Yokawa (ISC/15/BILLWG-1/10)

Standardized CPUE of striped marlin caught by Japanese coastal drift net fishery is updated to 2013. Data in 2011 were not used in the analysis because data were not available due to the Great Eastern Japan Earthquake. GLM model with log-normal assumption with the effect of year, month, latitude and longitude being incorporated. Three approach was conducted, e.g., all data standardized by model of main effects, data of core fishing season of striped marlin standardized by model of main effects, and data of core fishing season and fishing area standardized by model of main effects and two way interactions of year*month and latitude*longitude. Though the trends of standardized CPUE standardized by three approach were similar, the model with two way interactions attained better residual pattern than others.

Discussion

This WP presented spatio-temporal information for striped marlin catch, CPUE, and effort for the Japanese coastal drift net fishery, which is a major fishery in Japan. There was usually high CPUE in the third quarter of the year. Spatial patterns, in contrast, were not consistent. It was noted that this fishery operates in an oceanographically complex region, with a cold current, a warm current, and low salinity water from land.

It was explained that some years and seasons had been deleted from the analyses to improve the residuals patterns. One question raised was whether concentrating on the core area and season may have given rise to hyperstability; the presenter agreed that this was a possibility.

A strict update of the 2011 CPUE calculations was provided (see Figure 7 in the working paper). The WG noted that the revised CPUE standardization model with interactions had better residual patterns (see Figure 8 in the working paper) and that the model with interactions was preferred by the WG as a potential abundance index.

6.10 Update of input information of the North Pacific striped marlin caught by Japanese fisheries to stock assessment
Presented by Kotaro Yokawa (ISC/15/BILLWG-1/11)

Size and catch information in the period between 2009 and 2013-2014 of striped marlin caught by Japanese fisheries in the northwest and central Pacific, which was updated one form last stock assessment, was reviewed. As in the previous assessment, almost size data collected by longline and coastal drift net, data widely covered the operational area of these fisheries except for southern and southeastern areas of longline. In the latitudinal band of 10N – 30N in the north central Pacific, mode of smaller sized fish observed which supposed to indicate entries of some higher level of recruitments in recent years. Japanese total catch of striped marlin showed continuous decreasing trend since last stock assessment primarily due to the decrease of offshore and distant-water longline and coastal drift net fisheries. The catch of coastal drift net fishery largely dropped in 2011 due to the Great Eastern Earthquake.

Discussion

This WP presented striped marlin size information, primarily from Japanese longline fisheries. The size data are obtained by sampling aboard longline vessels and in ports. The scales of geographic resolution differed between onboard data sampling and port samplers
Some graphs were bimodal in appearance. These may represent areas with young fish and recruitment. An appendix provides a catch table by fisheries. Some sex-specific information was presented. This is obtained by onboard sampling. An inquiry was raised about sex ratios by size; there is no information presently available.

There was a bimodal size distribution in middle of Pacific. It may have been related to recruitment or selectivity in the fish sampled. Most size data comes from longline fisheries. Selectivity across all areas is likely similar. If no sex of fish was available, it may be port sampling data where gonads have already been discarded.

7.0 REVIEW OF LIFE HISTORY PARAMETERS FOR WCNPO STRIPED MARLIN

Two presentations on WCPO striped marlin assessment life history parameters were presented to the WG. The WG discussed the presentations by Brodziak and Chang.

7.1 Stock-recruitment resilience of North Pacific striped marlin based on reproductive ecology
Presented by Jon Brodziak (Presentation only)

This presentation provides some updated information on the probable distribution of stock-recruitment steepness for WCNPO striped marlin based on Brodziak et al. (2014). The resilience of a stock-recruitment relationship is a key characteristic for modeling the population dynamics of living marine resources. Stock-recruitment steepness was the primary uncertainty for the determination of stock status and biological reference points in recent stock assessments of Western and Central North Pacific striped marlin (*Kajikia audax*). The method Mangel et al. was applied to estimate probable values of steepness (h) for striped marlin using new information on the mean batch fecundity, spawning frequency, and spawning season duration under an assumption of Beverton–Holt stock-recruitment dynamics. Results indicated that the median steepness was h=0.87 and mode was h=0.98 with an 80% probable range of (0.38, 0.98). It is very likely that North Pacific striped marlin is highly resilient to reductions in spawning potential. Variation in reproductive and life history parameters had an important influence on the distribution of steepness. Sensitivity analyses showed that steepness was most sensitive to body girth, mean egg weight, and most importantly, early life history stage survival. Sensitivity analyses showed that the effects of changes in life history parameters on steepness were consistent with expected increases or decreases in reproductive output due to changes in body weight or fecundity.

Discussion

This information was presented at the Fifth International Billfish Symposium in Taiwan in 2013. The WG noted that potential autocorrelation among parameters was not accounted for in this method and that this may be something for future work. The WG asked about the amount of uncertainty assumed for the input parameters. The presenter clarified that several different CVs were used. Increasing CV increases the spread of steepness. A CV of 10% was selected as the base case.

The WG noted that the new information was consistent with the value of steepness used in the previous assessment. The presenter noted that the fitted beta density could be used as a prior for steepness instead of assuming a single fixed value. The WG also noted that the estimated distribution of steepness was most sensitive to the distribution of early life history stage survival rates. The WG concluded that the use of a steepness of h=0.87 for WCNPO striped marlin was supported by the information presented.

7.2 Biology and model tables
Presented by Yi-Jay Chang (Presentation only)

The WG was provided with summary tables describing descriptions of life history parameters (Table 1), catch data (Table 2), abundance indices (Table 3), and size composition data (Table 4) by fleet. The presenter suggested adding the spatial coverage notation to description of each fleet.

<u>Discussion</u>

The WG noted that China has provided catch data during this assessment. Discussions were raised whether China should be separated out into its own fishery. A separate fishing mortality will be estimated if separate out Chinese catch as its own fleet. This would provide some information on the impacts of the Chinese fleet on striped marlin mortality. It was suggested that the Chinese catch be treated as a separate fleet. Life history table now indicates whether parameter was fixed or estimated. The WG agreed to consider this as a sensitivity analysis for the base case.

It was suggested that the Richards growth model has better fit than von Bertalanffy in previous working paper. The previous assessment used von Bertalanffy growth, mostly because there was no Richard's growth curve option available to implement in Stock Synthesis. Although there is a Richard's growth option in Stock Synthesis, the functional form is not same to the Richard growth curve used in the Sun et al. working paper. It was shown that the mean size-at-age in previous assessment growth curve (a re-parameterized von Bertalanffy) is the same as the Richards growth curve suggested as the best fit by Sun et al. (2011). The definition of the reference age (a1) in SS3 model was asked and clarified.

It was noted that the previously used growth curve do not level off at highest ages, leaving uncertainty in the asymptotic length estimate. It was noted that striped marlin older than ~12 years were not obtained via sampling to create this curve, but estimates of L1 and L2 are likely close to accurate.

Table 1. Life history parameters and model structure used in the previous 2011 WCNPO striped marlin base case assessment model (ISC, 2012).

Parameter	Value	Comments	Source
Gender	1	Female only	ISC(2012)
Natural mortality	0.54 (age 0) 0.47 (age 1) 0.43 (age 2) 0.40 (age 3) 0.38 (age 4-15)	Age-specific natural mortality	Piner and Lee (2011)
Reference age (a1)	0.3	Fixed parameter	Refit from Sun et al. (2011a); ISC(2012)
Maximum age (a2)	15	Fixed parameter	
Length at a1 (L1)	104	Fixed parameter	Refit from Sun et al. (2011a); ISC(2012)
Length at a2 (L2)	214	Fixed parameter	Refit from Sun et al. (2011a); ISC(2012)
Growth rate (K)	0.24	Fixed parameter	Refit from Sun et al. (2011a); ISC(2012)
CV of L1 (CV=f(LAA))	0.14	Fixed parameter	ISC (2012)
CV of L2	0.08	Fixed parameter	ISC (2012)
Weight-at-length	$W=4.68e\text{-}006\times L^{3.16}$	Fixed parameter	Sun et al. (2011a)
Size-at-50% Maturity	177	Fixed parameter	Sun et al. (2011b)
Slope of maturity ogive	-0.064	Fixed parameter	Sun et al. (2011b)
Fecundity	Proportional to spawning biomass	Fixed parameter	Sun et al. (2011b)
Spawning season	2	Model structure	Sun et al. (2011b)
Spawner-recruit relationship	Beverton-Holt	Model structure	Brodziak et al. (2011); Brodziak et al. (2015)
Spawner-recruit steepness (*h*)	0.87	Fixed parameter	Brodziak et al. (2011); Brodziak et al. (2015)
Log of Recruitment at virgin biomass $\ln(R_0)$	6.31642	Estimated	ISC (2012)
Recruitment variability (σ_R)	0.6	Fixed parameter	ISC (2012)
Initial age structure	5 yrs	Estimated	ISC (2012)
Main recruitment deviations	1975-2008	Estimated	ISC (2012)
Selectivity	Dome-shaped: F1, F4, F16, F12; Time-varying Dome-shaped: F2, F3; Asymptotic: F5, F11, F13, F17	Estimated	ISC (2012)
Catchability		Solved analytically	ISC (2012)

Discussion of a collaborative life history growth study for striped marlin was brought out during the meeting. The current growth curve from Sun et al. (2011) was based on sampling the Taiwanese fishing grounds. A new UH graduate student is conducting research on growth curves and reproduction of striped marlin in the broader spatial scale. It was also suggested an otolith dating analysis collaborative study. Japan has one scientist who can work on this issue; there have also been small striped marlin collected that can be used for this purpose. The WG agreed to use the previous modified von-Bertalanffy growth curve for this next assessment. The WG also reached general agreement of the conduction of collaborative study on growth of striped marlin in WCNPO. Coordination of sampling and analysis of sample will be discussed in next meetings.

The WG agreed there was no major new life history information presented, so the information used in the last assessment will remain (Table 1), with perhaps the exception of changing the steepness from a fixed parameter to a prior distribution based on the steepness analysis in section 7.1.

8.0 FINALIZE WCNPO STRIPED MARLIN FISHERY STATISTICS

8.1 Fishery Catch

The WG discussed and agreed upon the fishery statistics to be used for the stock assessment of the WCPO striped marlin stock. The WG produced a summary of the annual catch time series that were available for the previous 2011 stock assessment (Table 2). The WG produced a consensus summary of the current status of the fishery catch data by country.

<u>Catch Table: Annual catch by country and fleet, 2009-2013</u>

1. **China**
   - Longline catch data (2009-2013) was received prior to the meeting via email.
   - The data needs to be summarized.

2. **Korea**
   - Longline catch data (2009-2013) was received prior to the meeting via email.
   - The data needs to be summarized.

3. **Japan**
   - Catch tables are presented in the Working Papers.
   - Electronic spreadsheets for 12 fleets need to be provided to the WG.

4. **Chinese Taipei**
   - Catch tables are presented in the Working Papers.
   - Electronic spreadsheets for 3 fleets were provided to the WG.

5. **USA**
    - Catch table is presented in the Working Paper.
    - Electronic spreadsheet data for Hawaii longline were provided to the WG at this meeting.

6. **Non-ISC countries**
    - Catch table is presented in the Working Paper.
    - Electronic spreadsheet data for longline were provided to the WG at this meeting.

Discussion

It was noted that China's annual catch for striped marlin was grouped with the other non-ISC countries (WCPFC members) for the 2011 ISC stock assessment. It was also noted that China's catch could be separated from the non-ISC countries for the 2015 ISC stock assessment which would entail combining the 2009-2013 catch submitted by China to the ISC Billfish Working Group with the pre-2009 catch time series from the WCPFC.

It was noted that Indonesia's catch time series (about 965 mt of total catch for the time series) and Belize from the WCPFC was used in the 2011 ISC stock assessment, but there is no reported catch for Indonesia and Belize in the Category I data provided by the WCPFC to the ISC Billfish Working Group in 2015. It was recommended that inquiries be made to the SPC regarding this issue.

8.2 Fishery CPUE

The WG produced a summary of the standardized CPUE time series that were available for the previous 2011 stock assessment (Table 3). The WG produced a consensus summary of the status of the standardized CPUE data by country.

Standardized CPUE Table

1. **China**
    - CPUE table was not provided.

2. **Korea**
    - CPUE table was not provided.

3. **Japan**
    - CPUE tables are presented in the Working Papers.
    - Electronic spreadsheets for 12 fleets need to be provided to the WG.

4. **Chinese Taipei**
    - CPUE tables are presented in the Working Papers.
    - Electronic spreadsheet data for distant water longline were provided to the WG.

Table 2. Description of the sources of catch and fisheries used in the WCNPO striped marlin assessment update.

Fishery number	Reference Code	Fishing Countries	Gear	Catch Units	Source
F1	JPN_DWLL1	Japan	Offshore and distant-water longline in area 1	numbers	Yokawa et al. (2015)
F2	JPN_DWLL2	Japan	Offshore and distant-water longline in area 2	numbers	
F3	JPN_DWLL3	Japan	Offshore and distant-water longline in area 3	numbers	
F4	JPN_CLL	Japan	Coastal longline	biomass	
F5	JPN_DRIFT	Japan	High Sea large-mesh driftnet and coastal driftnet	biomass	
F6	JPN_OLL	Japan	Other longline	biomass	
F7	JPN_SQUID	Japan	Squid drift net	biomass	
F8	JPN_BAIT	Japan	Bait fishing	biomass	
F9	JPN_NET	Japan	Net fishing	biomass	
F10	JPN_TRAP	Japan	Trap fishing	biomass	
F11	JPN_OTHER_early	Japan	Harpoon and trolling in quarter 1 and 2	biomass	
F12	JPN_OTHER_late	Japan	Harpoon and trolling in quarter 3 and 4	biomass	
F13	TWN_LL	Taiwan	Distant-water longline	biomass	Su et al. (2015)
F14	TWN_OSLL	Taiwan	Offshore longline	biomass	
F15	TWN_CF	Taiwan	Offshore & coastal gillnet, coastal harpoon, coastal set net and other	biomass	
F16	HW_LL	USA	Longline	biomass	Ito (2015)
F17	WCPO_OTHER	Philippines, Indonesia, China, Vanuatu, Federated States of Micronesia, and Belize	Miscellaneous longline	biomass	Tagami and Wang (2015); Yau and Chang (2015)
F18	KOR_LL	Korea	Longline	biomass	Sang Chul Yoon, pers. comm., Jan 6,

					2015

5. **USA**
    - CPUE table is presented in the Working Paper.
    - Electronic spreadsheet data for Hawaii longline were provided to the WG at this meeting.

6. **Non-ISC countries**
    - CPUE tables are not available from the WCPFC.

Discussion

It was noted that Korea also did not provide any CPUE time series for the 2011 ISC stock assessment for striped marlin. It was also noted that Korea has not participated in recent ISC Billfish Working Group meetings, and has only submitted one Working Paper in 2009. It was noted that Korean CPUE data may be available through the IATTC or WCPFC.

8.3 Fishery Size Composition

The WG produced a summary of the fishery size composition data that were available for the previous 2011 stock assessment (Table 4). The WG produced a consensus summary of the status of the size composition data by country.

Size Composition Table

1. **China**
    - Size data were not provided.
    - The ISC Billfish Working Group will formally request size data next year.

2. **Korea**
    - Some size data (2009-2013) was received prior to the meeting via email.
    - The data needs to be summarized.
    - The ISC Billfish Working Group will formally request size data next year.

3. **Japan**
    - Size data is available.
    - Electronic spreadsheets need to be provided to the WG.

4. **Chinese Taipei**
    - Electronic spreadsheet data were provided to the WG.

5. **USA**

- Electronic spreadsheet data were provided to the WG at this meeting.

6. Non-ISC countries

- Size data (Category III) for longline was received from WCPFC prior to this meeting via email.

Table 3. Available standardized indices (CPUE) of relative abundance for the WCNPO striped marlin in this assessment update.

Index	Fishery Description	Time series	Unit	Reference
S1	JPN_DWLL1 (F1)	1975-1986	number	Kanaiwa et al. (2015)
S2		1987-1999		
S3		2000-2013		
S4	JPN_DWLL2 (F2)	1975-1986	number	Kanaiwa et al. (2015)
S5		1987-1999		
S6		2000-2013		
S7	JPN_DWLL3 (F3)	1975-1986	number	Kanaiwa et al. (2015)
S8		1987-1999		
S9		2000-2013		
S10	JPN_CLL (F4)	1994-2009	number	Oshimo et al. (2015)
S11	JPN_DRIFT (F5) (high Sea large-mesh driftnet)	1977-1993	number	Yokawa (2005)
S12	JPN_DRIFT (F5) (coastal drift netters)	2001-2013	number	Yokawa and Shiozaki (2015)
S13	TWN_LL (early) (F13)	1975-1984, 1987, 1989-1993	number	Sun et al. (2011c)
S14	TWN_LL (late) (F13)	1995-2009	number	Sun et al. (2015)
S15	HW_LL (F16)	1996-2009	number	Walsh and Chang (2015)

<u>Discussion</u>

The WG noted that the fishery statistics were provided in several working papers. All members of the WG agreed that the annual catch by country and fleet (2009-2013), standardized CPUE, and size composition data, would be provided in electronic format to Darryl Tagami, the WG's data coordinator, by 1-February-2015. It was noted that all size data needs to be verified that the units of length observations are eye fork lengths, and not lower jaw fork lengths.

The WG also finalized the set of input data for the base case Stock Synthesis model and this information was summarized (Tables 1, 2, 3, and 4).

Table 4. Available size composition information for the WCNPO striped marlin assessment update.

Fleet	Time series	Source
JPN_DWLL1 (F1)	1975-1990 1992-2000 2002; 2004; 2006; 2011; 2012 (years with *n* < 10 were omitted)	Yokawa et al. (2015)
JPN_DWLL2 (F2)	1975-2013	Yokawa et al. (2015)
JPN_DWLL3 (F3)	1975-2013	Yokawa et al. (2015)
JPN_CLL (F4)	1986-2013	Yokawa et al. (2015)
JPN_DRIFT (F5)	1980-1983; 1991; 2000; 2004; 2005-2013	Yokawa et al. (2015)
JPN_OTHER_early (F11)	1976-1990; 1992-1995; 2000 (years with *n* < 10 were omitted)	Yokawa et al. (2015)
JPN_OTHER_late (F12)	1977-1979; 1982-1987; 1992 (years with *n* < 10 were omitted)	Yokawa et al. (2015)
TWN_LL (F13)	2006-2013	Su et al. (2015)
HW_LL (F16)	1994-2013	Eric Fletcher, pers. comm., Jan 13, 2015
WCPO_OTHER (F17)	1993-2013	Yau and Chang (2015)
KOR_LL (F18)	2009-2013	Sang Chul Yoon, pers. comm., Jan 6, 2015

9.0 FINALIZE WCNPO STRIPED MARLIN FISHERY STATISTICS

The WG discussed and reached consensus on the set of life history parameters to be used for the stock assessment of the WCPO striped marlin stock.

9.1 Growth

The same modified von Bertalanffy curve previously used in 2011 will be used for this assessment. That growth curve closely mirrors the Richards growth curve described in Sun et al (2011a) which provided the best fit to the data. The WG noted that the Stock Synthesis 3 model did not currently accommodate the use of a Richards growth curve.

The WG discussed whether the CV of 0.08 around L2 is too constraining and could lead to possible model misfits. It was noted that deciding how much to increase the CV would be a subjective decision. In the previous assessment, a sensitivity analysis with an L2 CV of 0.12 (50% higher) was run, resulting in slightly lower estimates of biomass compared to the base case. The WG noted that the model results may be sensitive to the CVs of size-at-age, and a sensitivity of these CVs should be run, noting that a CV of 0.08 for L2 may be low. Sensitivity runs for the L1 CV can also be considered. The WG agreed to use the same growth curve values and CVs as used in the previous assessment.

9.2 Length-Weight Relationship

The WG noted that since no new length-weight information has been presented, the same length-weight relationship used in the previous 2011 assessment will be used again in this assessment.

9.3 Maturity and Fecundity

The WG noted that since no new information about the maturity ogive or fecundity relationship (which was assumed proportional to female body weight) has been presented, the same relationships used in the previous 2011 assessment will be used again in this assessment.

9.4 Natural Mortality Rate

The WG noted that since no new information about age-specific natural mortality rate was presented, the same natural mortality rates used in the previous 2011 assessment will be used again in this assessment.

9.5 Stock-Recruitment Resilience

A new analysis about stock-recruitment resilience (steepness) was presented which indicated the median of steepness was 0.87, but the mode was much higher at 0.98. The WG noted that since the median was shown to the same as the steepness value previously used, the same steepness parameter used in the previous 2011 assessment will be used again in this assessment.

No new information about recruitment variability (σ_R) was presented, so the WG agreed to use the same recruitment variability used in the previous 2011 assessment in this assessment. That is, a Beverton-Holt stock-recruitment curve with $\sigma_R = 0.6$. The main recruitment deviations period will be modified to 1975-2012 to account for new years of data.

9.6 Life History Parameter Summary Table

The WG noted that a table of life history parameters to be used in the 2015 stock assessment was agreed upon (Table 4).

9.7 Input Data for Stock Synthesis

The WG produced a consensus summary of the finalized life history parameters for WCNPO striped marlin (Table 4).

10.0 WORK ASSIGNMENTS FOR WCNPO STRIPED MARLIN

10.1 Stock Synthesis Model Inputs

The WG discussed stock synthesis model inputs for the WCNPO striped marlin stock assessment. This information was summarized in agenda item 8.3.

10.2 Ecosystem Indices

While no working papers were presented on ecosystem indices, the WG noted the importance of incorporating these indices into assessments. Future billfish research should be conducted to identify the types of environmental indices to include in billfish assessments, as well as their structure.

10.3 Working Subgroup for Assessment Modeling

The WG decided that Yi-Jay Chang (USA) will be the lead stock assessment scientist for the striped marlin stock assessment update. Depending on availability, support for the stock assessment will likely be provided by Jon Brodziak (USA), Brian Langseth (USA), and Annie Yau (USA).

11.0 OTHER BUSINESS

The WG discussed other business, including future assessments, future meetings, and other issues.

11.1 Future Assessments

WG Chair suggested Pacific Blue marlin assessment update is generally due in next year based on the past assessments pattern of WG. It was also suggested that given blue marlin's stock status, an update may not provide much additional useful information. WG chair also suggested other possibilities such as conduction of age-structured assessment of swordfish in the northwest and central Pacific, conduction of assessment sailfish or dolphinfish in the north Pacific. Questions were raised about necessity of conduction of MSE (Management Strategy Evaluation) on billfishes as well as necessity to investigate for limit and target reference points of billfishes. Plenary chair answered these are not urgent topics for billfish but request by WCPFC NC about these topics will be come down in near future. It was suggested that conduction of research topics could be another possibility for the plan of next year because this could give medium term benefit for WG by enhancing the scientific level of WG through collaboration and cooperation among members. Conduction of capacity building could also have similar effect. The ISC Plenary chair noted that the WG had been conducting assessments of billfish stocks every three years but this time frame could be extended to every five years. It was agreed that this topic would continue to be discussed at the next BILLWG meeting.

11.2 Future Meetings

The next meeting to conduct the stock assessment of the WCNPO striped marlin was originally planned for April 20-29, 2015 at Shanghai Ocean University, Shanghai, China. The ISC Plenary chair explained the meeting venue and date were set right after ISC Management Strategy Evaluation workshop to be held April 16 – 17 in Yokohama, Japan so that participants for the workshop can save travel costs. Concern was raised about internet facility in China, especially its restriction of email software and Google drive. The WG confirmed that email access in China was not adequate for holding the meeting. Japan graciously offered to host the next BILLWG meeting in Yokohama during April 20-28, 2015.

11.3 Other Issues

<u>Discussion of CIE Reviews of the 2011 Benchmark WCNPO Striped Marlin Stock Assessment</u>

The WG quickly overviewed the previous CIE reviews. All CIE reviews were generally positive. Reviewer suggested using the Bayesian approach, especially for model projections. Reviewer also suggested using a prior distribution for the key model parameters (e.g., steepness). Sensitivity analysis of growth parameter (different k values) was also suggested by the reviewers. Reviewers also suggested further exploring the model convergence issue.

<u>Management Strategy Evaluation Workshop</u>

The Plenary chair provided information on the upcoming ISC MSE workshop and also informed the WG about current status about the ISC collaboration with PICES.

12.0 ADJOURNMENT

The workshop was adjourned at 1:30 PM on 20 January 2015. The BILLWG Chair expressed his appreciation to the rapporteurs and to all participants for their contributions and cooperation in completing a successful meeting.

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Attachment 1. List of Participants

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Attachment 2. Meeting Agenda

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

BILLFISH WORKING GROUP

INTERCESSIONAL WORKSHOP ANNOUNCEMENT

Meeting Site:	Pacific Beach Hotel 2490 Kalakaua Avenue Honolulu, Hawaii 96815 Telephone: 808-922-1233
Meeting Dates:	January 13-20, 2015
Goals:	Prepare fishery data for the stock assessment of Western and Central North Pacific striped marlin in 2015 including catch by quarter data, CPUE standardization, size frequency data, tagging data, and life history parameters.
Attendance Deadline:	Please respond to Jon Brodziak if attending by **Friday, December 19, 2014.**
Working Paper Deadline:	Working papers shall be submitted to Jon Brodziak (email: Jon.Brodziak@noaa.gov) by **Tuesday, January 6, 2015.** Authors who miss the January 6 deadline must bring 20 copies to the meeting.
Local Contact:	Jon Brodziak Pacific Islands Fisheries Science Center 1845 Wasp Boulevard, Building 176, Honolulu, Hawaii 96818, USA Tel: (808) 725-5617, Email: Jon.Brodziak@noaa.gov

AGENDA

January 13 (Tuesday), 1000-1030 – Registration

January 13 (Tuesday), 1030-1700

1. Opening of Billfish Working Group (BILLWG) Workshop
   a. Welcoming Remarks
   b. Introductions
   c. Standard Meeting Protocols

2. Adoption of Agenda and Assignment of Rapporteurs

3. Computing Facilities
    a. Access
    b. Security Issues

4. Numbering Working Papers and Distribution Potential

5. Review of Recent Fisheries
    a. Review of Recent Developments and Issues
    a. Review of Availability of 2011-2013 Fishery Data by Country
    b. Review of Information on BILLWG Web Page:
    http://isc.ac.affrc.go.jp/working_groups/billfish.html

6. Fisheries Statistics for WCNPO Striped Marlin, as Time Permits
    a. Fishery Data and Definitions
        (1) ISC Countries
        (2) Non-ISC Sources
    b. WCNPO Striped Marlin Catch by Fishery
        (1) ISC Countries
        (2) Non-ISC Sources
    c. Standardized CPUE by Fishery
        (1) ISC Countries
        (2) Non-ISC Sources
    d. Other Biological Information

January 14 (Wednesday), 930-1700

6. Fisheries Statistics for WCNPO Striped Marlin, Continued
    a. Fishery Data and Definitions
        (1) ISC Countries
        (2) Non-ISC Sources
    b. WCNPO Striped Marlin Catch by Fishery
        (1) ISC Countries
        (2) Non-ISC Sources
    c. Standardized CPUE by Fishery
        (1) ISC Countries
        (2) Non-ISC Sources
    d. Other Biological Information

January 15 (Thursday), 930-1700

7. Review of Life History Parameters for WCNPO Striped Marlin
    a. Growth
    b. Length-Weight Relationship
    c. Maturity and Fecundity
    d. Natural Mortality Rate
    e. Stock-Recruitment Resilience

January 16 (Friday), 930-1700

7. Review of Life History Parameters for WCNPO Striped Marlin

a. Growth
b. Length-Weight Relationship
c. Maturity and Fecundity
d. Natural Mortality Rate
e. Stock-Recruitment Resilience
f. Input Data for Stock Synthesis

8. Finalize Summaries of WCNPO Striped Marlin Fishery Statistics
    a. Catch Table
    b. Standardized CPUE Table
    c. Size Composition Table
    d. Input Data for Stock Synthesis

January 17 (Saturday), 930-1300

8. Finalize Summaries of WCNPO Striped Marlin Fishery Statistics
    a. Catch Table
    b. Standardized CPUE Table
    c. Size Composition Table
    d. Input Data for Stock Synthesis

9. Finalize Life History Parameters for WCNPO Striped Marlin
    a. Growth
    b. Length-Weight Relationship
    c. Maturity and Fecundity
    d. Natural Mortality Rate
    e. Stock-Recruitment Resilience
    f. Life History Parameter Summary Table
    g. Input Data for Stock Synthesis

January 18 (Sunday), No Meeting

January 19 (Monday), 930-1700

8. and 9. Complete All Work

10. Work Assignments for WCNPO Striped Marlin
    a. Stock Synthesis Model Inputs
    b. Ecosystem Indices
    c. Working Subgroup for Assessment Modeling

11. Other Business
    a. Future Assessments
    b. Future Meetings
    c. Other Issues

12. Rapporteurs and Participants Complete Report Sections

January 20 (Tuesday), 930-1500

13. Clearing of Meeting Report
14. Adjournment

Attachment 3. Working Papers

ISC/15/BILLWG-1/01 — USA commercial fisheries for marlins in the north Pacific Ocean.
Russell Y. Ito
russell.ito@noaa.gov

ISC/15/BILLWG-1/02 — Updated time series associated with Hawaii-based longline vessels and striped marlin nominal CPUE based on the fishery observer data system.
Yi-Jay Chang, William A. Walsh, and Jon Brodziak.
yi-jay.chang@noaa.gov

ISC/15/BILLWG-1/03 — Standardization of Striped Marlin Kajikia audax CPUE for the Hawaii-based Longline Fishery during 1995–2013 using Generalized Linear Models: An Update from 2011
William A. Walsh and Yi-Jay Chang.
william.walsh@noaa.gov

ISC/15/BILLWG-1/04 — Update of standardized CPUE of striped marlin in the Northwestern Pacific Ocean, based on coastal small longline fishery from 1994 to 2013.
Seiji Ohshimo and Kotaro Yokawa.
oshimo@affrc.go.jp

ISC/15/BILLWG-1/05 — Summary of striped marlin (Kajikia audax) catch and size data from the Western and Central Pacific Fisheries Commission.
Annie J. Yau and Yi-Jay Chang.
annie.yau@noaa.gov

ISC/15/BILLWG-1/06 — Standardization of striped marlin (Kajikia audax) CPUE in the Hawaiian longline fishery II: additional covariates, distribution, and use of data from the deep-set fishery sector only.
Brian Langseth.
brian.langseth@noaa.gov

ISC/15/BILLWG-1/07 — Update of Standardized CPUE of Striped Marlin in North Western Central Pacific Ocean by Japanese offshore and distance longline.
Minoru Kanaiwa, Seiji Oshimo, and Kotaro Yokawa.
m3kanaiw@bioindustry.nodai.ac.jp

ISC/15/BILLWG-1/08	Catch and length data of striped marlin (Kajikia audax) from Taiwanese fisheries in the western and central North Pacific Ocean. Nan-Jay Su, Chi-Lu Sun, and Su-Zan Yeh. nanjay@ntu.edu.tw
ISC/15/BILLWG-1/09	Standardized CPUE of striped marlin for the Taiwanese distant-water tuna longline fishery in the western and central North Pacific Ocean. Chi-Lu Sun, Nan-Jay Su, and Su-Zan Yeh. chilu@ntu.edu.tw
ISC/15/BILLWG-1/10	CPUE of the North Pacific striped marlin caught by Japanese coastal drift netters. Kotaro Yokawa. yokawa@affrc.go.jp
ISC/15/BILLWG-1/11	Update of size information of striped marlin caught by Japanese fisheries in the North Pacific. Kotaro Yokawa, Ai Kimoto, and Ko Shiozaki yokawa@affrc.go.jp
ISC/15/BILLWG-1/12	Spatial distribution of striped marlin catches in the North Pacific from WCPFC data. Darryl Tagami and Haiying Wang darryl.tagami@noaa.gov