Annex 8

REPORT OF THE SHARK WORKING GROUP WORKSHOP

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

17-24 March 2017
NOAA Fisheries Southwest Fisheries Science Center
La Jolla, California, U.S.

1. OPENING AND INTRODUCTION

1.1 Welcome and Introduction

The Shark Working Group (SHARKWG or WG) of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) held an 8-day meeting at the National Oceanic and Atmospheric Administration (NOAA) Southwest Fisheries Science Center in La Jolla, California, from 17-24 March 2017. The primary goal of the workshop was to complete a benchmark north Pacific blue shark (BSH) stock assessment. A secondary objective was to discuss plans for the upcoming shortfin mako shark assessment.

Suzanne Kohin, SHARKWG Chair, opened the meeting. Participants included members from China, Chinese Taipei, Japan, Mexico, United States of America (USA), as well as scientists from the Inter-American Tropical Tuna Commission (IATTC) and the Western and Central Pacific Fisheries Commission (WCPFC). Participants are listed in Attachment 1. SHARKWG Chair, Suzanne Kohin, and Acting Deputy Director of the Southwest Fisheries Science Center, Toby Garfield, welcomed SHARKWG participants and wished everyone a productive meeting and pleasant visit to La Jolla.

1.2 Distribution of meeting documents

Six working papers and one information paper were distributed and numbered (Attachment 2). Several oral presentations were also made during the meeting. All papers with the exception of Info1 were approved for posting on the ISC website, where they will be available to the public.

1.3 Review and approval of agenda

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

1.4 Appointment of rapporteur

T. Sippel, M. Slack, H. Yokoi, and S. Kohin served as rapporteurs. The approved agenda indicates the rapporteurs for each item in parentheses.

2. SUMMARY OF CURRENT MEETING OBJECTIVES

The Chair of the SHARKWG reviewed the current meeting objectives and the desired outcomes. They included: 1) review two preliminary assessments of the North Pacific blue shark stock, one conducted using Stock Synthesis (SS) and the other using a Bayesian State-space Surplus Production Model (BSSPM); 2) improve the assessment model(s) through careful review of model diagnostics and re-analysis; 3) decide on the best run(s) to put forward to represent the stock dynamics; 4) summarize the stock status; 5) draft conservation information; 6) develop an outline of the stock assessment report and a plan to complete the report before the ISC Plenary; and 7) develop plans for conducting the shortfin mako assessment in 2018.

3. STOCK SYNTHESIS (SS) MODELING OF NORTH PACIFIC BLUE SHARK

3.1 Discussion of Steepness and Parameterization of the LFSR (Low Fecundity Stock Recruitment) Relationship

Stock Recruitment Relationships of the North Pacific Blue Shark; presented by Mikihiko Kai (ISC/17/SHARKWG-1/02)

This working paper provides stock-recruitment relationships of blue shark (*Prionace glauca*) in the North Pacific. We developed a pre-recruit survival model for the early life history of blue sharks and combined it with an existing model for the reproductive ecology of teleost species. We used biological data collected from wide areas of the western North Pacific between 2010 and 2016 to estimate key biological parameters. The model provides a point estimate for steepness, which is a fraction of unfished recruitment when spawning stock biomass is 20% of the species' unfished spawning stock biomass. We conducted numerical simulations to incorporate uncertainties in the biological parameters. The mean values and their standard deviations for steepness were 0.67 (standard deviation = 0.081) for the Beverton-Holt model. The curves showed a steep slope around the lower spawning biomass. These results suggest that the stock-recruitment relationship in North Pacific blue shark was highly density-dependent and that its productivity is higher than that of other pelagic sharks.

Discussion
The WG discussed the life history information and assumptions used to develop the "base case" estimate for steepness. **Based on recent biological studies (**see ISC/17/SHARKWG-1/03 for summary of the biological studies and discussion from November 2016 meeting**), the WG reiterated that T_{max} of 24 and 19 for males and females, respectively, a one-year reproductive cycle, and a natural mortality schedule estimated using the Walter et al. (2016) method II equation best describes blue shark life history; these assumptions should carry through to the assessment "reference case".** From these, steepness was estimated using simulations that account for variability about the life history parameters. For example, age specific M is modeled using a gamma distribution, etc. The WG accepted the estimate of *h* (steepness) and spent time discussing how to derive Beta and S_{frac} from these assumptions. In 2014, the WG used LFSR but there was no decision on a specific value for *h*. Carvalho et al. (ISC/17/SHARKWG-1/05 – see below) put forward a starting point of fixing Beta (at values of 1, 2 and 3) and calculating corresponding S_{frac} using the equation from Taylor et al. (2013) and

h=0.67. The WG suggested to derive S_{frac} from Taylor's equation and the LH parameters and estimate Beta in SS. Several models were run to explore the results when changing input values or estimating Beta and S_{frac} based on the suggestions. One issue is that with the data we have, we are not estimating the LFSR at low biomass levels, so the relationship shows a weaker density dependence. To examine the effects of combinations of Beta and S_{frac}, the LFSR was fit with low spawning biomass values as well.

The WG also discussed the uncertainty of the life history parameters, albeit greatly reduced due to new studies, and agreed that sensitivity runs with LFSR parameters and productivity parameters derived using a reproductive cycle of two years, and different T_{max} and natural mortality schedules, should be run (see below). The WG also explored using the Beverton-Holt SR relationship instead of LFSR and found the model runs to be consistent with runs using LFSR.

Ultimately, **the method proposed in ISC/17/SHARKWG-1/05 was used to parameterize LFSR. The fit with S_{frac} of 0.391 and Beta fixed at 2 was most consistent with the life history information and the WG put those forward for the reference run.**

3.2 Review of Proposed "Reference Case" Model

Stock Assessment of Blue Shark in the North Pacific Ocean Using Stock Synthesis; presented by Felipe Carvalho (ISC/17/SHARKWG-1/05)

This paper presents the preliminary SS stock assessment of blue sharks in the North Pacific Ocean (NPO). The assessment consisted of running a Stock Synthesis model with newly available catch, abundance index, and length and size composition data for 1971-2015. The results indicated that biomass (age 1 and older) for the blue shark North Pacific stock fluctuated around 316,896 mt from 1971 until 1981, thereafter exhibited a decline to the lowest level of 202,135 mt in 1993, and then increased to around 302,171 mt for the last three years (2013-2015). Estimated fishing mortality gradually increased from the early 1970s to the late-1980s, peaked at 0.84 $year^{-1}$ in 1989 in response to higher catches, and declined to 0.11 $year^{-1}$ in the most recent years (2013-2015). Compared to MSY-based reference points, the current spawning biomass (average for 2013-2015) was 68% above SSB_{MSY} and the current fishing mortality (average for 2013-2015) was 67% below F_{MSY}. The base case model indicated that the North Pacific blue shark stock was not overfished and was not subject to overfishing relative to MSY-based reference points. Further in-depth exploration of different alternative model scenarios will be presented in the 2017 SHARKWG stock assessment report.

Discussion

It was suggested that weighting of size composition data be achieved by first inputting number of trips sampled (by year) for each fishery with the maximum trip number of 100, then reweighting the size comps in a subsequent run to obtain the final effective sample sizes (see details in the working paper). In order to derive better fitting of the CPUE indices, the WG suggested that time-varying selectivities for several fisheries be used to account for apparent changes in the average size and variability. **Time-varying selectivities were used in the Hawaii longline fishery, the U.S. west coast drift gillnet fishery and the Taiwan distant-water longline**

fishery. In addition, the size composition data for the Japan Enyo deepset longline fishery in 2012 was anomalously low and removed from the model.

The WG agreed to use the input CVs on CPUEs for the reference case (both SS and BSSPM) and composition data weighting method after visual inspection and exploration of model output diagnostics (see details in the working paper). The WG decided to remove 2011 from the JL CPUE index in a sensitivity run to investigate the effect of the reduced fishing effort following the Great Japan Earthquake and tsunami.

The WG agreed that the selection of the reference case required that the model pass a series of proposed diagnostic tests for integrated models, including running the model as an Age-structured Production Model in SS, likelihood profiles, residual analysis, retrospective analysis, etc. (see details in the working paper). The WG reviewed these diagnostic outputs and was very satisfied with the results. The final reference run was based upon the most plausible life history and fishery information and good model diagnostics.

Acknowledging uncertainties in the model assumptions, **the WG agreed that a range of sensitivities should be run to explore different assumptions as shown below**.

- Mortality schedule: with different equations for M, reproductive cycle of 1 or 2 years, and different T_{max} values

Empirical equation (Peterson and Wroblewski 1984)		Walter-II methods (Walter et al. 2016) based on Campana et al. (2004)				
cycle=1	cycle=2	cycle=1 T_{max}=16	cycle=2 T_{max}=16	cycle=2 T_{max}=19	cycle=1 T_{max}=24	cycle=2 T_{max}=24

- Fix S_{frac} = 0.397 and estimate Beta within the model;
- Japanese early CPUE paired with each of the other late series;
- The same assumptions as in the SS model used in the 2014 stock assessment with only catch, CPUE, and size updated;

Stock assessment models using the Beverton-Holt stock recruitment relationship with h = 0.459 (2-year reproductive cycle and T_{max}=24), and 0.67 (1 year cycle and T_{max}=16).

4. BAYESIAN SURPLUS PRODUCTION (BSSPM) MODELING OF NORTH PACIFIC BLUE SHARK

Stock Assessment for the North Pacific Blue Shark (Prionace Glauca) Using Bayesian State-Space Surplus Production Model; presented by Mikihiko Kai (ISC/17/SHARKWG-1/04)

Stock assessment results for north Pacific blue shark were updated using newly available data, parameters, and model. The span was extended from 1971-2011 to 1971-2015. A new abundance index for Mexico longline during 2006 and 2015 was added to the five abundance indices used in the previous stock assessment in 2014. The stock assessment model "BSSPM" was used instead of "BSP2". New diagnostics such as WAIC and SDNR were used, and future projections were

conducted with 4 harvest scenarios for 10 years. Since Japanese offshore shallow-set longline indices (JPE and JPL) are the most representative abundance indices due to the large area coverage, the large amount of data, and the longest time series, the stock status of North Pacific blue shark was exhibited using a reference case based on the Japanese longline data. Our results (JPE-JPL) indicated that the median estimates of stock biomass fluctuated around 630,000 tons in 1970s, and then declined to the lowest level of 343,915 tons in 1989, thereafter increased to 688,429 tons in 2003, and has fluctuated around 560,000 tons in recent years. The estimated harvest rate sharply increased from the early 1970s to the 1980s, peaking at 0.184 $year^{-1}$ in 1989, in response to the high catch in 1970s, then sharply declined in the 1990s, falling to 0.067 $year^{-1}$ in the most recent years (2012-2014). Given the MSY is used as reference points, the current stock biomass (B) (2012-2014) was 20% above B_{MSY} and the current harvest rate (H) (2012-2014) was 48% below H_{MSY}. The results of the base-parameter model based on the Japanese longline fishery suggested that the north Pacific blue shark stock was not overfished and was not subject to overfishing relative to the MSY-based reference points. Future projections suggested that a scenario with H_{MSY} allowed B to increase to the MSY level. Inconsistent trends between a decrease of total catch and decrease of abundance indices for Mexico longline fisheries indicated a potential local depletion of the stock biomass in the eastern Pacific Ocean.

Discussion

The WG agreed with the proposed reference run with the Japan early and Japan late indices is the best BSSPM model to represent the blue shark stock based on model diagnostics. The BSSPM reference run using Japan early and Japan late showed similar stock trajectories and current conditions as the SS reference run. It was suggested that we compare a few key management quantities from the SS reference run and the BSSPM reference run (i.e., B_{MSY}/B_0, MSY/B_{MSY}, and B_0). There was little difference between the estimated values for the BSSPM and SS reference runs. The BSSPM runs provide nice continuity with the 2014 assessment and showed similar results.

For the BSSPM MCMC runs, it is possible to fix the reference points across all runs or re-estimate them for each MCMC run, with the former resulting in wider credible intervals. The median stock trajectories did not differ depending upon the method used, and **the WG agreed that it will use the model with unfixed reference points for the BSSPM.**

The Group discussed the output that indicated overharvesting. In recent years the 95% credible interval for H was below H_{MSY} yet some of the 95% credible intervals for B fell below B_{MSY}. It was explained that the result may be due to process error. The WG also discussed use of WAIC rather than Bayes' factor as used in 2014. The Bayes' factor was not found to be very informative but the WAIC is useful for Bayesian model selection. The WG agreed that in some cases the model that did not have the lowest WAIC, given the choice of CPUE combinations examined, was nevertheless the best model, because the difference between WAIC values was very low and the outputs were very similar.

The WG discussed the results for the run using the Japan-early index with the Mexico longline CPUE index. The Mexico longline index has one of the more pessimistic trajectories in recent years, and the model run showed a decreasing biomass trajectory. The Mexico longline index, however, was not considered to be a good index to use to represent stock biomass because of the

low spatial coverage, high interannual variability, and inconsistent observer coverage for the data collection (see November 2016 WG Report). In addition, new information regarding the oceanographic conditions in the EPO due to the Warm Blob and El Niño showed that blue shark catch is likely affected by the warm conditions with the animals potentially moving to cooler regions or deeper waters (see *ISC/17/SHARKWG-1/INFO-01* below). **The WG was not able to conclude that local depletion near Mexico was the cause of the lower biomass estimates.**

5. SELECTION OF CONSENSUS MODEL TO PROVIDE THE BEST SCIENTIFIC INFORMATION ON NORTH PACIFIC BLUE SHARK

After reviewing both modeling approaches and all model diagnostics, **the WG decided that the SS reference run provides the best scientific information on the dynamics and current status of the north Pacific blue shark stock.** Careful examination of the relative contribution of the data (catch, CPUE, and size compositions) and model life history assumptions showed that the use of a fully integrated model greatly improves the assessment.

6. REVIEW AND FINALIZE ALL SUPPORTING BLUE SHARK WORKING PAPERS

Size and Sex of the Blue Sharks Caught By the Mexican Longline Industrial Fleets Recorded by On-Board Observers in the Pacific 2006-2015; presented by Leonora Mondragón-Sánchez (ISC/17/SHARKWG-1/01)

This aim of this working paper is to contribute to the knowledge of the spatial and temporal length and sex structure of blue shark in the North Pacific Ocean with recent information from the Mexican longlines fleets which operate along the west coast of the Mexican Pacific. Data on 71,803 blue sharks measured on board by observers from two principal fleets (Ensenada and Mazatlan) from 2006-2016 were used to describe the size composition of the blue shark catches in two regions: the west coast of the Peninsula of Baja California (BC) and the central Mexican Pacific. Results indicate significant differences in sizes and maturity condition of the blue sharks in terms of season (quarter) and zone. Immature or juvenile blue sharks of both sexes composed the majority (76.8%) of the observed catches along the west coast of the BC Peninsula. Mature blue sharks were predominant (59.8%) in the southern catches of the Mazatlan fleet. The present work detected a “hot spot” area with a significant aggregation of blue shark gravid females in oceanic waters just in front of the tip of the Peninsula of Baja California.

Discussion
These analyses further demonstrate the non-uniform spatial and temporal distribution of blue sharks by size and sex. The results seem to be consistent with what is known of blue shark movements in the EPO from tagging studies. While there is apparent segregation by size and sex with larger and more male sharks in the south, it was clarified that the Mexico longline index used in the assessment uses two zones in the standardization which should account for any catch differences. Given the high incidence of gravid females in the south, the WG wondered if those specimens can be used for reproductive studies to learn more about maturity and the reproductive cycle. There are already two published studies on BSH reproductive biology from sharks caught in the same region, but in this fishery the fishermen discard the guts so quickly that biological studies are difficult. There was a question about the target species of the fishery. The fishery

targets both swordfish and shark using the same gear and methods, with relatively higher swordfish catch in the winter and higher shark catch in the summer, but the ratio of blue shark to swordfish catch is always high. There was a question about whether environmental factors are correlated with the spatial patterns observed. That analysis was not done for this study, but there is a publication by Vögler et al. (2012) showing the effect of environmental factors on BSH CPUE; environmental factors could be examined in the future and also for shortfin mako sharks.

Comments From the Mexican Delegation in Relation with the Decreasing Trend of the Blue Shark CPUE Abundance Index in Recent Years, 2014-2015; presented by Leonardo Castillo-Geniz (ISC/17/SHARKWG-1/INFO-01)

This information paper describes recent anomalous warm water conditions during 2014-2015 in the Northeast Pacific due to the Warm Blob and El Niño. Off Ensenada, seas surface temperature anomalies were as high as 3°C above average, the greatest effect likely driven by the Blob. Several species were observed outside their normal range during the warm water period. For example, surveys in the Gulf of Alaska reported catching *Mola mola* and common thresher sharks. In Vizcaino Bay, the catch of blue sharks declined during the warm period, whereas the catch of shortfin makos increased. The anomalous conditions may be responsible for the observed decline in CPUE of BSH in the Mexico longline fishery operating out of Ensenada (Fernández-Méndez et al. 2016).

Discussion
This paper nicely summarizes the warm water conditions in the northeast Pacific from 2014-2015 and provides a possible explanation for the decline in CPUE of BSH observed in the Ensenada longline fleet. **Future standardization analyses should try to include factors to account for the anomalous conditions. It is possible that shortfin mako CPUE is also affected and that should be considered when developing abundance indices for the upcoming mako assessment.**

Fishery Data and Catch Estimation of Blue Shark by Korean Tuna Longline Fishery in the North Pacific Ocean; overview presented by Suzy Kohin (ISC/17/SHARKWG-1/06).

This paper introduces the preliminary results of the Korean estimated catch of blue shark in the NPO. To estimate blue shark catch by the Korean tuna longline fishery in the NPO, we divided the area into two based on the main target species: A (north of 25°N) and B (0° - 25°N). The catch of blue shark in the NPO was estimated by the sum of retained and discarded/released catches, and it was calculated by multiplying nominal CPUE with total effort. It shows a similar annual trend between last (2013 stock assessment) and new catch estimations because both catch estimation methods similarly used effort and CPUE. However, it should be updated and could be changed by methods for estimation, data and so on.

Discussion
None.

7. SHORTFIN MAKO SHARK INFORMATION GATHERING AND ASSESSMENT WORK PLAN

A subset of members discussed the need to advance work on shortfin mako growth in order to provide better life history information for the upcoming mako assessment. Members were reminded of the work plan that age and growth specialists developed at their 2011 and 2014 meetings. Progress to date on corroborating band counts across readers (inter-reader) and across different enhancement methods (inter-method) was discussed. **The proposed meta-analysis presented at the November 2016 meeting (Takahashi et al. 2016) is considered valuable and should proceed once inter-reader and inter-method variability is addressed.**

WG members developed and agreed to a work plan to advance the shortfin mako ageing work. All members will work on corroborating reading with x-rays from the OTC validation study, then with x-rays from the processed reference collection vertebrae, and finally, once readings are corroborated among labs, all will provide readings of the reference collection vertebrae using their own lab's enhancement/reading methods. It is anticipated that a webinar will be needed to finalize band reading corroboration, probably in May or June. **The WG recommended an ageing workshop about one month in advance of the mako data prep meeting in order to try to come to a consensus on the best growth model(s) to put forward for the assessment.**

The WG also discussed compiling metadata on shortfin mako fisheries and time series before the one day SHARKWG meeting in July so that a final work plan can be proposed to the ISC Plenary. **The SHARKWG Chair will solicit input from WG members on shortfin mako data within one month**. A 1-2 day webinar may be needed before the Plenary in order to have enough information to decide on how to proceed with the mako assessment.

8. ROUTINE ASSIGNMENTS FOR THE ISC PLENARY

The SHARKWG Chair reminded WG members that an election for a new WG Chair will occur in July. Each nation in attendance at the July meeting may nominate an individual and vote. Only members present can be nominated and elected Chair.

9. FUTURE SHARKWG MEETINGS

A tentative schedule for upcoming WG meetings was adopted:

June, 2017 1-2 day webinar	Review progress and assignments on shortfin mako data prep and biological inputs; develop draft shortfin mako assessment work plan
July 8-9, 2017 Vancouver, Canada	Finalize blue shark stock assessment information for the Plenary; conduct work for the Plenary; finalize shortfin mako assessment work plan
October, 2017 (tentative) Shimizu, Japan	Shortfin mako shark ageing workshop
November, 2017 (tentative) Shimizu, Japan	Shortfin mako data prep meeting
Spring 2018 La Jolla, USA	Shortfin mako assessment meeting

10. OTHER MATTERS

The WCPFC representative informed the WG of the recent shark post-release mortality workshop. One outcome was a plan to study post-release mortality of shortfin mako sharks in the New Zealand longline fishery.

The WG discussed other north Pacific shark species taken in high seas fisheries and whether they should be prioritized for quantitative work. Two species were discussed: bigeye thresher (*Alopias superciliosus*), which is caught in high seas tuna longline fisheries in relatively high numbers, and salmon shark (*Lamna ditropis*), which is caught in more coastal fisheries of Japan. While salmon sharks are found along the west coast of North America, they are rarely taken in U.S. fisheries. **The WG considers salmon shark stock status and conservation to be more of a Japanese domestic issue than one to be addressed by the ISC.**

The WCPFC representative mentioned that the ABNJ Tuna project funded a Pacific bigeye thresher stock analysis in 2016. The analysis used indicators to represent the status of the stock, and conclusions relative to reference points were not available. The report has been completed and will be discussed at the upcoming SC13 meeting in August. ABNJ plans to conduct stock assessments on three other shark stocks over the next year including Pacific silky sharks (*Carcharhinus falciformis*), southern hemisphere porbeagle sharks (*Lamna nasus*), and one stock still to be determined.

The WG did not agree to move forward with quantitative analyses of other species at this time, however, that will certainly be considered after finishing the shortfin mako shark assessment.

11. 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 a revised version to all WG members before finalization.

12. ADJOURNMENT

The Chair thanked all participants for attending and for their hard work resulting in a carefully conducted, collaborative assessment. She indicated that she will be in touch regularly over the coming months to finalize the assessment report and looks forward to seeing many of the participants in July at the SHARKWG and Plenary meetings in Vancouver, Canada.
The meeting was adjourned at 11:51 on March 24, 2017.

13. REFERENCES

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ATTACHMENT 1: LIST OF PARTICIPANTS

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ATTACHMENT 2. LIST OF DOCUMENTS

WORKING PAPERS

ISC/17/SHARKWG-1/01	Size And Sex of the Blue Sharks Caught by the Mexican Longline Industrial Fleets Recorded by on board Observers in the Pacific 2006-2015. Jose Leonardo Castillo-Geniz, Carlos Javier Godinez-Padilla, Luis Vicente González-Ania, Horacio Haro-Avalos, Leonora Fernanda Mondragón-Sánchez and Javier Tovar-Ávila. (leonardo.castillo@inapesca.gob.mx)
ISC/17/SHARKWG-1/02	Stock recruitment relationships of the North Pacific blue shark. Mikihiko Kai and Yuki Fujinami (kaim@affrc.go.jp)
ISC/17/SHARKWG-1/03	Brief summary of biological parameters for the stock assessment of blue shark (*Prionace glauca*) in the North Pacific. Hiroki Yokoi, Yuki Fujinami, and Yasuko Semba (yokoih@affrc.go.jp)
ISC/17/SHARKWG-1/04	Stock assessment for the north Pacific Blue shark (*Prionace glauca*) using Bayesian State-space Surplus Production Model. Mikihiko Kai, Felipe Carvalho, Hiroki Yokoi, Minoru Kanaiwa, Norio Takahashi, Jon Brodziak, Tim Sippel and Suzanne Kohin (kaim@affrc.go.jp)
ISC/17/SHARKWG-1/05	Stock Assessment of Blue Shark in the North Pacific Ocean Using Stock Synthesis. Felipe Carvalho, Mikihiko Kai, Tim Sippel, Kevin Piner (felipe.carvalho@noaa.gov)
ISC/17/SHARKWG-1/06	Fishery data and catch estimation of blue shark by Korean tuna longline fishery in the North Pacific Ocean. Youjung Kwon, Doo Nam Kim, Sung Il Lee, Hun Ju Cho, Jeong Eun Ku and Mi Kyung Lee (kwonuj@korea.kr)

INFORMATION PAPER

ISC/17/SHARKWG-1/ INFO-01	Comments from the Mexican delegation in relation with the decreasing trend of the blue shark CPUE abundance index in recent years 2014-2015. Jose Leonardo Castillo-Géniz, Benigno Hernández de la Torre, Luis Vicente González-Ania, Carlos Javier Godínez-Padilla, Javier Tovar-Ávila, Leonora Fernanda Mondragón-Sánchez and Luz Martínez-Fuentes (leonardo.castillo@inapesca.gob.mx)

ATTACHMENT 3. AGENDA

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

SHARK WORKING GROUP (SHARKWG)
BLUE SHARK STOCK ASSESSMENT WORKSHOP AGENDA
March 17-24, 2017

Meeting Hours: 10:00-18:00 (Friday, 17 March)
09:00-18:00 (Saturday, 18 March through Friday, 24 March)
We will work Sunday, 19 March as needed.

1. Opening of SHARKWG Workshop
    a. Welcoming remarks
    b. Introductions
    c. Meeting arrangements
2. Distribution of documents and numbering of Working Papers
3. Review and approval of agenda
4. Appointment of rapporteurs
5. Summary of current meeting objectives
6. Stock Synthesis (SS) modeling of north Pacific blue shark
    a. Discussion of steepness and parameterization of the LFSR
    b. Review current "base case" model and alternate runs
    c. Examine model diagnostics and conduct further analyses if needed
    d. Compare models and select consensus run(s) for best scientific information on north Pacific blue shark based on SS assessment
7. Bayesian Surplus Production (BSSPM) modeling of north Pacific blue shark (Tim Sippel, Megan Slack)
    a. Review current "base case" model and alternate runs
    b. Examine model diagnostics and conduct further analyses if needed
    c. Compare models and select consensus run(s) for best scientific information on north Pacific blue shark
8. Select consensus modeling approach (SS/BSSPM) and run(s) for best scientific information on north Pacific blue shark (Tim Sippel, Megan Slack, Suzy Kohin)
    a. Finalize model results, sensitivities and projections
    b. Formulate conservation information considering model uncertainty
    c. Develop/finalize assessment report (Report deadline June 1?)
9. Review and finalize all supporting BSH WG papers (Tim Sippel, Megan Slack, Hiroki Yokoi)
10. Shortfin mako shark information gathering and assessment work plan (Suzy Kohin)
    a. Life history information gaps
    b. Fishery metadata table
    c. Fishery and size data availability
    d. Preliminary model choices
    e. Develop assessment work plan and deadlines

11. Routine assignments for the ISC Plenary
    a. Chair election in July
12. Future SHARKWG meetings
13. Other matters
    a. Update on ABNJ shark post release mortality workshop
    b. Other species for SHARKWG prioritization
14. Clearing of report
15. Adjournment