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Report of ISC Billfish Working Group for 2010

WCPFC/NC6/IP-03
27 August 2010

ISC

Annex 8

REPORT OF THE BILLFISH WORKING GROUP WORKSHOP

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

12-13 July 2010
Victoria, British Columbia, Canada

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 Victoria, British Columbia, Canada from 12-13 July 2010. The goals of this workshop were to 1) finalize advice on potential billfish biological reference points, 2) review the spatial extent and disposition of fisheries catching North Pacific striped marlin within areas (Western Central Pacific Ocean (WCPO) and Eastern Pacific Ocean (EPO)) delineated at the April 2010 BILLWG Workshop, 3) review and modify (if necessary) current conservation advice, and 4) review and discuss the World Blue Marlin Symposium proposal.

Gerard DiNardo, Chairman of the BILLWG, welcomed participants from Japan, Korea, and the United States of America (USA) (Attachment 1). Gerard DiNardo, Chair of the ISC BILLWG, provided the welcoming remarks. Rapporteuring duties were assigned to Dean Courtney, John Hyde, Jae-Bong Lee, Kevin Piner, Darryl Tagami, Kotaro Yokawa, and Lyn Wagatsuma. Wagatsuma served as the lead rapporteur with overall responsibility of assembling the workshop report. Working papers were distributed and numbered (Attachment 2), and the meeting agenda adopted (Attachment 3). All authors who submitted a working paper agreed to have their papers posted on the ISC website where they will be available to the public.

2.0 APRIL 2010 ISC BILLWG WORKSHOP SUMMARY

Gerard DiNardo provided a summary of the intercessional workshop of the ISC BILLWG that was convened in Hakodate, Hokkaido, Japan 15-22 April 2010. The goals of this workshop were to 1) review the status of the North Pacific swordfish assessment using SS3 and Bayesian production models, 2) discuss progress of the blue marlin symposium, 3) delineate striped marlin stock boundaries, and 4) identify potential billfish biological reference points (BRP).

Conclusions from this meeting included:

- The North Pacific striped marlin stock assessment, scheduled to be completed in 2011, would be based on a two stock scenario hypothesis in the North Pacific Ocean. The two stocks are defined by the following boundaries (Figure 1):

- WCPO stock- West of 140°W and north of the equator
- EPO stock- East of 140°W and north of the equator

- The WG identified 17 potential BRPs for inclusion in the Biological Reference Point Attributes table; these BRPs are commonly used for stock assessment of highly migratory species as discussed during the meeting (Table 2). It was agreed that the each potential BRP should be characterized using the following attributes so that the Northern Committee can understand the implications of each BRP easily: the definition and management purpose, model structure, data needs, limit or target reference point, type of overfishing, pros/cons and special comments (Table 1). It was agreed that the table will be filled out, reviewed and finalized at the July 2010 BILLWG meeting.

- The North Pacific swordfish Bayesian Surplus Production (BSP) model and Stock Synthesis 3 (SS3) model were updated. Results from the BSP model were similar to the 2009 assessment. Conservation advice will remain unchanged unless clarification is required. The SS3 results in Region 2 do not provide reliable results due to limited data on size at catch.

Figure 1. Stock boundary delineated for the 2011 stock assessment of North Pacific striped marlin.

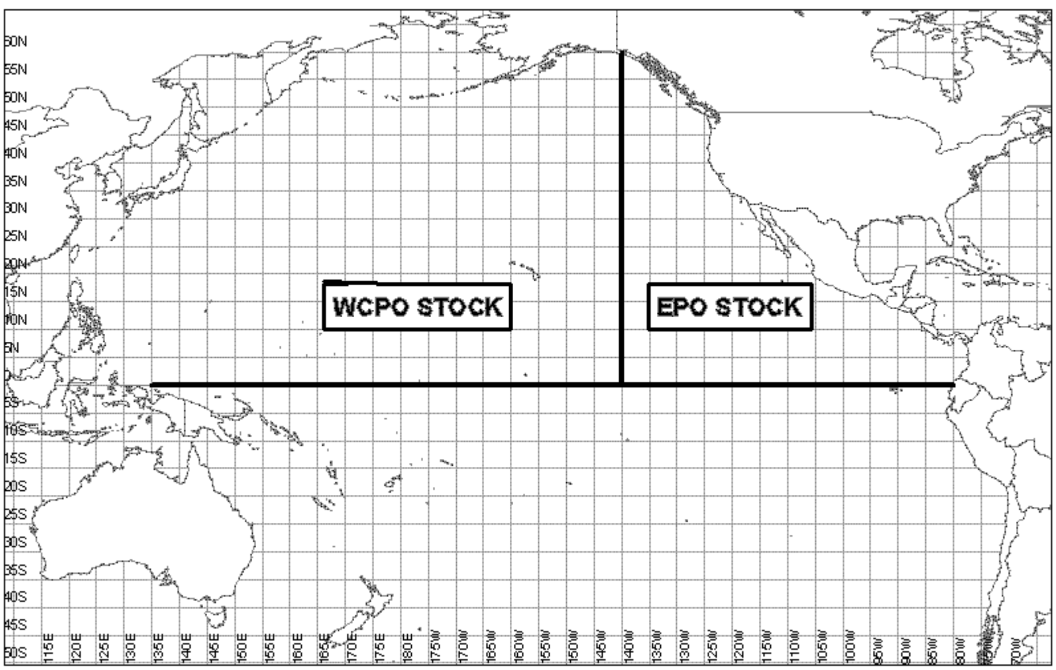

Table 1. Draft description of biological reference points including definition and management purpose, attributes, and special comments for two example BRPs for exploitation rates.

Biological Reference Point	Definition and Management Purpose	Model Structure	Data Needs	Limit or Target Reference Point	Model Includes Population Dynamics for Recruitment Overfishing	Pros/Cons and Special Comments
FMSY	Fishing mortality that maximizes yield under existing environmental conditions and fishery selectivity pattern	Age-structured or size-structured model for one or two sexes	Fishery catch, fishery catch per unit effort or other relative abundance indices, life history parameters (including natural mortality at age, size at age, weight-length relationships, fishery selectivity pattern, sex ratio in catch if two-sex model)	Has been used as limit and target reference point in various RFMOs	Yes	FMSY is difficult to estimate if stock-recruitment relationship is not known. This BRP may be easy to implement but also entails high risk of recruitment overfishing
FMAX	Fishing mortality that maximizes yield per recruit	Age-structured yield per recruit model	Life history parameters	Has been used as a limit and a target BRP	No	FMAX may be appropriate if recruitment is relatively constant over a range of fishing effort. This BRP may be very risky for some rapidly-growing species because it may cause recruitment overfishing

Table 2. Potential biological reference points for billfish.

Biological Reference Point
FMSY
FMAX
$F_{0.1}$
F_{MED}
F_{τ}
F_{SPR}
$F_{SSB\text{-}ATHL}$
F_{lim}
F_{pa}
F_{loss}
B_{MSY}
B_{MAX}
$B_{0.1}$
$B_{X\%}$ (depletion)
B_{lim}
B_{pa}
B_{loss}

2.1 Status of Work Assignments

At the April 2010 workshop, the BILLWG was tasked with a number of assignments that included:

- At the July 2010 BILLWG workshop, Japan, Chinese Taipei, Korea, China, Mexico, USA, and IATTC will present data on the spatial extent and disposition of fisheries catching North Pacific striped marlin within the stock boundaries delineated at April 2010 BILLWG workshop.

- BRP table (Table 1) will be filled out, reviewed and finalized at the next BILLWG meeting in July.

- By the scheduled January 2011 BILLWG workshop, submit stock specific Category I, II, and III North Pacific striped marlin data for review and inclusion in the forthcoming striped marlin stock assessment.

At the April 2010 ISC BILLWG Workshop, the ISC BILLWG Chairman was also tasked with a number of assignments that include:

- Present results from the updated North Pacific swordfish assessment at the 10^{th} ISC Plenary.
- Construct draft outline of proposed objectives and scope for World Blue Marlin Symposium by July 2010 ISC BILLWG workshop.

The WG Chairman reported that not all assignments due at the July 2010 BILLWG workshop were completed. The spatial extent and disposition of fisheries catching striped marlin in the boundary areas was not submitted by all countries. This will impact the North Pacific striped marlin assessment schedule and we look forward to presentations on this topic at the next workshop. The WG Chairman also reminded BILLWG members that some assignments, specifically the submission of stock specific North Pacific striped marlin Category I, II, and II data, are on-going.

Discussion

It was clarified that the stock specific North Pacific striped marlin data should be submitted directly to the BILLWG Chair. The appropriate data will then be passed on to the ISC Database Administrator. It was also clarified that in addition to submitting the Category I, II, and III data, BILLWG members should also submit CPUE time series for use in the stock assessment.

3.0 BIOLOGICAL REFERENCE POINTS

3.1 Age-Based Analyses of Potential Biological Reference Points for the Western and Central North Pacific Swordfish (*Xiphias gladius*) Stock presented by Jon Brodziak (ISC/10/BILLWG-2/02)

Age-based demographic analyses were used to determine a suite of candidate biological reference points for the Western and Central North Pacific swordfish stock for consideration by the ISC Billfish Working Group. Life history data and results from the recent age-structured stock assessment modeling of this stock were used to compute the fishing mortality reference points F_{MSY}, F_{MAX}, $F_{0.1}$, F_{MED}, and F_{SPR}. The same information was used to compute the biomass reference points B_{MSY}, B_{MAX}, $B_{0.1}$, B_{MED}, and B_{SPR}. The percentage of maximum yield and spawning biomass per recruit were summarized to compare the relative yield and stock conservation benefits of the various fishing mortality reference points. Similarly, the ratios of reference biomass, recruitment, and yield to the values at MSY were also summarized to compare the relative stock conservation and yield benefits of the various biomass reference points.

Discussion

It was noted that several choices were made that may affect the resulting BRP estimates. For the example, the choice of years (1994-2006) included in the estimation of average selectivity and the method used to estimate catch weighted quarterly average selectivity. The rationale and/or methodology for these choices should be clarified. It was also noted that the age of the plus group may affect the resulting BRP estimates, especially if fishing mortality is high relative to natural mortality, and that the explicit relationship between the age plus group and BRPs estimated within Stock Synthesis are not well documented. It was noted that the NOAA Fisheries Toolbox (NFT) YPR program was chosen to estimate biological reference points for the working paper because explicit equations for each estimated reference point are available for the NFT YPR program (provided in the working paper).

It was noted that the BRP F_{crash} was in excess of F=3 because of the stock recruitment steepness assumption of h=0.9.

An observation was made, that based on the current swordfish assessment, the estimate of MSY from SS3 may be too low because fishing pressure is low.

3.2 Production model analyses of maximum sustainable yield-based reference points for the North Pacific swordfish stocks presented by Jon Brodziak (ISC/10/BILLWG-2/03)

Production model analyses of maximum sustainable yield-based reference points were conducted in 2009 and 2010 to assess the Western and Central (WCPO) and the Eastern Pacific (EPO) swordfish stocks in the North Pacific. Estimates of maximum sustainable yield-based reference point from the Bayesian surplus production models of the two swordfish stocks and their variability were summarized for consideration by the ISC BILLWG. The results for the WCPO stock were taken from the 2009 stock assessment. Results for the EPO stock were taken from the 2010 stock assessment update which included an updated time series of swordfish catches in the Eastern Pacific Ocean.

Discussion

It was noted that the estimate of B_{MSY} from the production model differed from the stock synthesis model, and that the difference in B_{MSY} resulted primarily from differences in model structure and the overall lack of contrast in the North Pacific swordfish fisheries CPUE data as discussed at the last working group meeting. In addition, differences in how the yield curve is estimated within age-structured YPR relative to the production model may also affect the resulting estimate of B_{MSY}.

It was noted that within the production model, the estimate of annual harvest rate to produce MSY (H_{MSY}) was higher in the WCPO (0.25) than in the EPO (0.15). There was a discussion about whether or not this difference was real given the uncertainty in H_{MSY} especially within the EPO. Some plausible differences in swordfish habitat between the WCPO and EPO were discussed based on oceanographic differences. It was also discussed that uncertainty about the exact location of the southern boundary for the EPO swordfish stock may also have contributed to the uncertainty of estimated BRPs in the EPO.

3.3 Biological Reference Point Table presented by Kevin Piner and Kotaro Yokawa (ISC/10/BILLWG-2/01)

The completed Biological Reference Point Table that was assigned to be completed at the April 2010 ISC BILLWG workshop was presented for review and finalization. The table includes 17 BRPs that are commonly used for stock assessment of highly migratory species, and were characterized using attributes including: the definition and management purpose, model structure, data needs, limit or target reference point, type of overfishing, pros/cons, and special comments.

Discussion

The BILLWG reviewed the BRP Table and made the following revisions:

- $F_{\square} = F_{crash}$
- $F_{SSB} = F_{SSB\text{-}ATHL}$
- $F_{X\%SPR} = F_{SPR}$

Merits of each BRP were discussed and included in the table (Table 3).

Table 3. Billfish Biological Reference Point Table

Biological Reference Point	Definition and Management Purpose	Model Structure[1]	Data Needs[2]	Limit or Target Reference Point	Type of overfishing	Pros/Cons and Special Comments
F based Reference Points						
FMSY	Fishing mortality that maximizes yield under existing environmental conditions.	Age-structured or size-structured model for one or two sexes	Fishery catch, fishery catch per unit effort or other relative abundance indices, life history parameters	Has been used as limit and target reference point in various RFMOs	Recruitment and growth	FMSY is difficult to estimate if stock-recruitment relationship is not known. This BRP may be easy to implement but also entails high risk of recruitment overfishing. Can be estimated with biomass dynamics modeling.
F_{MAX}	Fishing mortality that maximizes yield per recruit under existing environmental conditions	Age-structured yield per recruit model	Life history parameters	Has been used as a limit and a target BRP	Growth	F_{MAX} may be appropriate if recruitment is relatively constant over a range of fishing effort. This BRP may be very risky for some rapidly-growing species because it may cause recruitment overfishing
$F_{0.1}$	The fishing mortality rate corresponding to 10% of the slope of the Y/R curve at the origin.	Age-structured yield per recruit model	Life history parameters	Has been used as a limit and a target BRP	Growth	A more precautionary exploitation level relative to F_{MAX}. Often thought to reduce potential recruitment overfishing without a substantial loss in yield.
F_{MED}	The fishing mortality rate to produce replacement recruitment often taken to the median of the R/S distribution. Fishing mortality to maintain recruitment at replacement level observed during specified period.	Estimates of Spawners and Recruits	Estimates of Spawners and Recruits. Typically drawn from an age structured assessment model.	Target or Limit	Recruitment	[3]Value dependent on the range of SSB used in the calculations. Not informative if estimates of recruitment taken from a narrow range of spawning biomass. No assumptions about recruitment process. Risky with the specification of BH h=1.0.
$F_{\square}$	Fishing mortality rate corresponding to the slope of the S/R function at the origin. Theoretical upper	A S/R curve and a relationship of SSB/R	Estimates of Spawner and Recruits. Typically drawn from an age	Limit	Recruitment	Fishing at $F_{\square}$ leads to extinction. Can only be interpreted as a Limit. Upper limit. Does not account for dispensatory effects.

	bound of sustainable rates.	and F	structured assessment model.			
$F_{X\%SPR}$	Fishing mortality rate that produces X% of the unfished spawning potential under equilibrium conditions. Sometimes used for a proxy for other BRP's.	Age-structured Spawner per recruit model	Life history parameters	Has been used as a limit and a target BRP	Recruitment	Although a recruitment based BRP, it is a per-recruit calculation and thus does not depend on estimating the S/R relation. The appropriate level (X%) can be difficult to determine.
F_{SSB}	Fishing mortality rate that produces no more than a specified probability of SSB falling below a defined level of SSB during a given projection period.	Age or length structured assessment	Fishery catch, fishery catch per unit effort or other relative abundance indices. May use additional data such as, life history parameters, biological samples etc.	Target or Limit	Recruitment	Assumes that specified level of spawning biomass is sufficient to insure recruitment success. Flexible which is both a pro and a con. Requires lots of specifications.
F_{lim}	Fishing mortality if maintained will drive the stock to the biomass limit (B_{lim}).	The same as typically associated with an age structured model.	Estimates of spawners and recruits.	Limit	Recruitment	Specified B_{lim}.
F_{pa}	Fishing mortality if maintained drives stock to precautionary biomass limit (B_{pa})	The same as typically associated with an age structured model.	Estimates of spawners and recruits. Need information on accuracy of assessment and risk to be accepted.	Limit	Recruitment	Specified B_{pa}. More precautionary version of F_{lim}.
F_{loss}	Fishing mortality if maintained drives a stock to the lowest observed	Age-structured or size-	Fishery catch, fishery catch per unit effort or other relative	Limit	Recruitment.	Usually used as a proxy of F_{lim} when data is limited.

	spawning stock.	structured model for one or two sexes.	abundance indices, life history parameters.			
Biomass based reference points						
B_{MSY}	The average biomass resulting from fishing at F_{MSY}	Age-structured or size-structured model for one or two sexes.	Fishery catch, fishery catch per unit effort or other relative abundance indices, life history parameters.	Has been used as limit and target reference point in various RFMOs	Recruitment	B_{MSY} is difficult to estimate if stock-recruitment relationship is not known. Can be estimated with biomass dynamics modeling. This BRP may be easy to implement but also entails high risk of recruitment overfishing
B_{MAX}	The average biomass resulting from a fishing mortality that maximizes yield per recruit	Age-structured yield per recruit model	Life history parameters	Has been used as a limit and a target BRP	[4]Associated value	B_{MAX} may be appropriate if recruitment is relatively constant over a range of fishing effort. Seldom used for management but included because F_{MAX} is defined.
$B_{0.1}$	The average biomass level associated with fishing at $F_{0.1}$	Age-structured or size-structured model for one or two sexes	Fishery catch, fishery catch per unit effort or other relative abundance indices, life history parameters	Has been used as limit and target reference	[4]Associated value	Seldom used for management but included because $F_{0.1}$ is defined.
$B_{X\%\ (depletion)}$	A biomass level that is some specified fraction of the estimated unfished biomass level	Biomass dynamic or age structured model.	Fishery catch, fishery catch per unit effort or other relative abundance indices.	Has been used as limit and target reference	Recruitment	Must use additional analysis to determine the appropriate depletion level. Usually a proxy for BMSY. Depletion is typically calculated relative to unfished level, however substantial uncertainty exists in the calculation of unfished state.
B_{lim}	Set on basis of historical data. Biomass below B_{lim} entails high risk that recruitment might be	The same as typically drawn from an age structured model.	Estimates of spawners and recruits.	Limit	Recruitment	Needs long time series of data (multiple generations). Easy to understand and based on observed values.

	reduced.					
B_{pa}	Precautionary buffer against natural variability and uncertainty associated with B_{lim}. (Note that $B_{pa}>B_{lim}$)	The same as typically drawn from an age structured model.	Estimates of spawners and recruits. Need information on accuracy of assessment and risk to be accepted.	Limit	Recruitment	Needs long time series of data (multiple generations). Easy to understand and based on observed values.
B_{loss}	The lowest observed spawning biomass.	Age structured model.	Fishery catch, fishery catch per unit effort or other relative abundance indices, life history parameters.	Limit	Recruitment.	Used as a proxy for B_{lim}. Needs long time series of data (multiple generations). Easy to understand and based on observed values.

[1]Model structure applies to calculation of reference point only. Additional model complexity may be needed to calculated observed metric (F, SSB etc) for comparison.

[2]Data needs applies to calculation of reference point only. Additional data may be needed to calculated observed metric (F, SSB etc) for comparison.

[3] There was no consensus that F_{MED} was risky when steepness was specified as 1.0.

[4] Associated values are often reported along with their F complement, but may not be used for management.

4.0 BILLFISH CONSERVATION ADVICE

The BILLWG reviewed its previous conservation advice with the objectives of clarifying the statements where necessary. Current conservation advice for the two species follows:

North Pacific striped marlin: “While further guidance from the management authority is necessary, including guidance of reference points and the desirable degree of reduction, the fishing mortality rate of striped marlin (which can be converted into effort or catch in management) should be reduced from the current level (2003 or before), taking into consideration various factors associated with this species and its fishery. Until appropriate measures in this regard are taken, the fishing mortality rate should not be increased”

North Pacific swordfish: “the WCPO and EPO stocks of swordfish are healthy and well above the level required to sustain recent catches”

Discussion

Regarding North Pacific striped marlin, the WG members noted that parts of the statement were ambiguous; however no consensus on clarification of the statement was reached.

Regarding North Pacific swordfish, clarification was sought to define the terms WCPO and EPO, but no consensus was reached. It was noted that these terms were defined in the text describing North Pacific swordfish conservation advice in the previous ISC Plenary report (ISC/09/Plenary/Rep).

5.0 NORTH PACIFIC STRIPED MARLIN REGIONALIZED FISHERIES

5.1 Preliminary analysis of area boundary to standardize CPUE of striped marlin in the North Pacific Ocean presented by Kotaro Yokawa (ISC/10/BILLWG-2/04)

Potential area boundaries in the area west of 140°W of the North Pacific Ocean to standardize CPUE of striped marlin was provided. Spatial patterns were clarified using the delta type, two-step method describing abundance index. Results from the two models used in delta type, two-step method helped to identify optimal area boundaries for latitude and longitude. Summing of AIC for both steps led to the selection of the model in the second step to determine optimal boundaries. It was concluded that choosing the appropriate time series of CPUE is important when using GLM to standardize CPUE or when applying another model like the statHBS. Due to the large effect of gear configuration on CPUE, the method for CPUE standardization of striped marlin should be revisited in the next stock assessment.

Discussion

Since the primary author, Minoru Kanaiwa, was not present to answer questions and to fully explain the model and methodology, it was agreed that full review and discussion on this paper would be postponed until the next ISC BILLWG meeting. Co-author, Kotaro Yokawa, pointed out the difficulties in the estimation of gear configuration within the statistical approach due to the skewed distribution pattern of data for Japanese offshore and distant-water longliners. This problem should be revisited during the next BILLWG workshop.

5.2 The U.S. Longline Fishery for Striped Marlin in the North Pacific Ocean presented by Gerard DiNardo (ISC/10/BILLWG-2/05)

This report summarizes catch trends for striped marlin caught by the U.S. Hawaii-based longline fishery in the North Pacific Ocean (NPO). Although striped marlin are targeted and taken incidentally by a suite of commercial and recreational fisheries in the North Pacific Ocean, only the U.S. longline fishery is discussed here. To facilitate completion of the upcoming striped marlin stock assessment, which assumes two NPO stocks, the U.S. longline time series for catch has been separated into WCPO and EPO stocks. Trends of catch, number of sets, and number of hooks were presented from 1991-2009. Striped marlin catch was also plotted by area for 2009.

Discussion

It was pointed out that there has been an increasing trend for number of sets and number of hooks since 2001, and that 95% of the effort was in the WCPO. It was also noted that catch varied substantially but was relatively stable from 1991-2009 and nearly all of the catch in 2009 was in the WCPO.

It was suggested that the following summaries be added to the next catch and effort update for striped marlin in the U.S. longline fishery in the NPO:

- Number of vessels by year
- Number of sets and hooks for both shallow and deep sets by year
- Market value by year
- Number of hooks per basket by year

5.3 Available data of striped marlin and swordfish by the Japanese fishery in the North Pacific presented by Kotaro Yokawa (ISC/10/BILLWG-2/06)

This report provides an update of available data for striped marlin by Japanese fisheries, including catch (mt), total hooks, and size data within two-stock structure zones. Catch was estimated separately by gear from Japanese year books and log books, in the WCPO and EPO between 1951 and 2008. Total number of hooks by Japanese offshore longline was estimated in each zone during the same period, as was the number of size samples. Additionally, this study provided the updated catch amount of swordfish in the north Pacific by gear and stock zone. The estimated catch and the total number of hooks of striped marlin in recent years decreased significantly in the two zones, compared to those before 1990. Due to the recent decreasing trend of catch and effort data in the Japanese offshore and distant-water longline fisheries, care should be exercised when using these striped marlin data for stock assessment, especially in the northeastern Pacific Ocean.

Discussion

It was pointed out that the only Japanese fishery in the EPO area, as defined by the BILLWG for the upcoming striped marlin stock assessment, is the distant-water longline fishery. Swordfish catches were also presented by gear from 1951-2008 for both the one stock and two stock scenarios. It was also noted that the number of available size data in the north Pacific decreased substantially since 2004. This may be due to new sampling methods implemented at that time and problems with the choice of fork length measured. Efforts are being made to correct some of these errors which will increase the number of available size data from 2004-2008. The number of sets conducted in the EPO area substantially decreased in recent years. Most of the observed reduction occurred off Mexico, which is the main fishing ground for striped marlin in the EPO. This could have an effect on the representativeness of CPUE obtained from Japanese longline data.

6.0 WORLD BLUE MARLIN SYMPOSIUM

Gerard DiNardo reviewed the rationale, objectives, possible themes, possible sponsors, steering committee members, and timeline of the World Blue Marlin Symposium tentatively scheduled for May 2011.

Discussion

There was discussion on whether holding a World Blue Marlin Symposium (WBMS) is a necessary condition for the completion of a blue marlin stock assessment and it was noted that the assessment would still proceed whether a WBMS was held or not. The BILLWG agreed that although a WBMS would be beneficial, it would not go forward with a WBMS in 2011. It was suggested that input (data) and support from other organizations (i.e. SPC) could be attained by conducting smaller workshops, and not a formal symposium. It was also suggested that the WBMS could be held at a later date, following the completion of a blue marlin stock assessment, possibly affiliated with the International Billfish Symposium.

7.0 OTHER BUSINESS

7.1 RFMO Plans and Upcoming Meetings

7.1.1 IATTC North Pacific striped marlin stock assessment

Gerard DiNardo notified the BILLWG on the IATTC's plan to complete a North Pacific striped marlin stock assessment by the end of July 2010. Further detail is yet unknown. The BILLWG Chair is assigned to look into this, and report back to the BILLWG.

Discussion

Concern was expressed about having two separate North Pacific striped marlin stock assessments. The BILLWG agreed to review the results of the IATTC North Pacific striped marlin stock assessment and decide how to proceed with its stock assessment from there.

7.1.2 International Symposium on Tuna and Billfish Tagging

Gerard DiNardo discussed the upcoming International Symposium on Tuna and Billfish Tagging – Challenges for Tuna and Billfish Tagging Technology and Data Utilization. This symposium is scheduled for 7-12 November 2010 in Taitung, Taiwan. While this is not an "official" ISC symposium, it was noted that some BILLWG members are involved in the planning of this symposium.

Discussion

The BILLWG endorsed the symposium and encourages members to attend. The BILLWG would also like to have a presentation of the results of the symposium at a future BILLWG workshop. Since many billfish stock structure questions still exist, the BILLWG Chairman should consider making a presentation at this symposium on the need for a coordinated billfish tagging program in the Pacific Ocean.

7.2 Work Assignments

The BILLWG were given a number of assignments:

- Submit finalized working papers presented at this meeting by Friday, 13 August 2010.
- All member countries will submit stock specific Category I, II, and III North Pacific striped marlin data as well as CPUE time series for use in the stock assessment by 1 January 2011. All data should be separated into fisheries within the stock boundaries delineated by the BILLWG.
- All member countries will submit Category I data for all billfish (blue marlin, swordfish, etc.) species by 1 January 2011.

The BILLWG Chairman was tasked with a number of assignments:

- Contact WCPFC to request billfish data from non-ISC member countries.
- Determine status of the ISC Biological Sampling proposal and report to BILLWG at January 2011 BILLWG workshop. The Chairman should also seek clarification on status of the Biological Sampling proposal at the 10th ISC Plenary.
- Request information from IATTC regarding North Pacific striped marlin stock assessment and report to BILLWG.

7.3 Future Meetings

The next intercessional BILLWG workshop is scheduled for 19-27 January 2011 in Hawaii, USA. The goals of this workshop will be to review and adopt stock specific Category I, II, and III North Pacific striped marlin data as well as CPUE time series for use in the stock assessment.

All data should be separated into fisheries within the stock boundaries delineated by the BILLWG.

The following intercessional BILLWG workshop is scheduled for 19-27 May 2011. The location is not yet determined, but Japan provisionally offered to host this meeting. The goal of this meeting will be to finalize the North Pacific striped marlin stock assessment for presentation at the 11th ISC Plenary meeting.

8.0 ADJOURNMENT

The ISC BILLWG intercessional workshop was adjourned at 3:37pm on 13 July 2010. The Chairman expressed his appreciation to all participants for their contributions and cooperation in completing a successful meeting.

Table 4. Striped marlin catches (in metric tons) by fisheries, 1952-2005. Blank indicates no effort. - indicates data not available. 0 indicates less than 1 metric ton. Provisional estimates in ( ).

Year	Japan: Distant-water and Offshore Longline	Japan: Coastal Longline	Japan: Other Longline	Japan: Small Mesh Gillnet	Japan: Large Mesh Gillnet	Japan: Other[2]	Japan: Total	Chinese Taipei[1]: Distant-water Longline	Chinese Taipei[1]: High-seas Drift Gillnet	Chinese Taipei[1]: Offshore Longline	Chinese Taipei[1]: Offshore Gillnet	Chinese Taipei[1]: Offshore Others	Chinese Taipei[1]: Coastal Harpoon	Chinese Taipei[1]: Coastal Setnet	Chinese Taipei[1]: Coastal Gillnet & Other net	Chinese Taipei[1]: Coastal Longline	Chinese Taipei[1]: Coastal others	Chinese Taipei[1]: Other	Chinese Taipei[1]: Total	Costa Rica[1]: Sport	Korea: Longline	Korea: High-seas Drift Gillnet	Korea: Total	Mexico: Longline	Mexico: Sport[1]	Mexico: Total	United States: Longline	United States: Troll	United States: Handline	United States: Sport[1]	United States: Total	Grand Total
1951	2,494	-	673	-	0	1,281	4,447																									4,447
1952	2,901	-	722	-	0	1,564	5,187												-		-		0			0				23	23	5,210
1953	2,138	-	47	-	0	954	3,139												-		-		0			0				5	5	3,144
1954	3,068	-	52	-	0	1,088	4,207												-		-		0			0				16	16	4,223
1955	3,082	-	28	-	0	1,038	4,148												-		-		0			0				5	5	4,153
1956	3,729	-	59	-	0	1,996	5,785												-		-		0			0				34	34	5,819
1957	3,189	-	119	-	0	2,459	5,767												-		-		0			0				42	42	5,809
1958	4,106	-	277	-	3	2,914	7,300			543								387	930		-		0			0				59	59	8,289
1959	4,152	-	156	-	2	3,191	7,501			391								354	745		-		0			0				65	65	8,311
1960	3,862	-	101	-	4	1,937	5,904			398								350	748		-		0			0				30	30	6,682
1961	4,420	-	169	-	2	1,797	6,388			306								342	648		-		0			0				24	24	7,060
1962	5,739	-	110	-	8	1,912	7,769			332								211	543		-		0			0				5	5	8,317
1963	6,135	-	62	-	17	1,910	8,124			560								199	759		-		0			0				68	68	8,951
1964	14,304	-	42	-	2	2,344	16,692			392								175	567		-		0			0				58	58	17,317
1965	11,602	-	19	0	1	2,794	14,416			355								157	512		-		0			0				23	23	14,951
1966	8,419	-	112	0	2	1,570	10,103			370								180	550		-		0			0				36	36	10,689
1967	11,698	-	127	0	3	1,551	13,379	2		385								204	591		-		0			0				49	49	14,019
1968	15,913	-	230	0	0	1,043	17,186	1		332								208	541		-		0			0				51	51	17,778
1969	8,544	600	3	0	3	2,668	11,818	2		571								192	765		-		0			0				30	30	12,613
1970	12,996	690	181	0	3	1,032	14,902	0		495								189	684		-		0			0				18	18	15,604
1971	10,965	667	259	0	10	2,042	13,943	0		449								135	584		0		0			0				17	17	14,544
1972	7,006	837	145	0	243	993	9,224	9		380								126	515		0		0			0				21	21	9,760
1973	6,357	632	118	0	3,265	702	11,074	1		568								139	708		0		0			0				9	9	11,791
1974	6,700	327	49	0	3,112	775	10,963	24		650								118	792		0		0			0				55	55	11,810
1975	5,281	286	38	0	6,534	686	12,825	64		732								96	892		0		0			0				27	27	13,744
1976	5,136	244	34	0	3,561	585	9,560	32		347								140	519		0		0			0				31	31	10,110
1977	3,019	256	15	0	4,424	547	8,261	17		524								219	760		43		43			0				41	41	9,105
1978	3,957	243	27	0	5,593	546	10,366	0		618								78	696		28		28			0				37	37	11,127
1979	5,561	366	21	0	2,532	526	9,006	26		432								122	580		-		0			0				36	36	9,622
1980	6,378	607	5	0	3,467	536	10,993	61		223								132	416		37		37			0				33	33	11,479
1981	4,106	259	12	0	3,866	542	8,785	17		491								95	603		-		0			0				60	60	9,448
1982	5,383	270	13	0	2,351	656	8,673	7		397								138	542		39		39			0				41	41	9,295
1983	3,722	320	10	22	1,845	827	6,746	0		555								214	769		19		19			0				39	39	7,573
1984	3,506	386	9	76	2,257	719	6,953	0		965								330	1,295		23		23			0				36	36	8,307
1985	3,897	711	24	40	2,323	733	7,728	0		513								181	694		16		16			0		18		42	60	8,498
1986	6,402	901	33	48	3,536	577	11,497	0		179								148	327		61		61	-		0		19		19	38	11,923
1987	7,538	1,187	6	32	1,856	513	11,132	31		383								151	565		1		1	-		0	272	30	1	28	331	12,029
1988	6,271	752	7	54	2,157	668	9,909	7		457								169	633		11		11	-		0	504	54		30	588	11,141
1989	4,740	1,081	13	102	1,562	537	8,035	8		184								157	349		26		26	-		0	612	24	0	52	688	9,098
1990	2,368	1,125	3	19	1,926	545	5,986	2		137								256	395		315		315	-	181	181	538	27	0	23	588	7,465
1991	2,845	1,197	3	27	1,302	507	5,881	36		254								286	576	106	141		141	-	75	75	663	41	0	12	716	7,495
1992	2,955	1,247	10	35	1,169	303	5,719	1		219								197	417	281	318		318	-	142	142	459	38	1	25	523	7,400
1993	3,476	1,723	1	-	828	708	6,736	5		221								142	368	438	388		388	-	159	159	471	68	1	11	551	8,640
1994	2,911	1,284	1	-	1,443	383	6,022	1		137								196	334	521	1,045		1,045	-	179	179	326	35	0	17	378	8,479
1995	3,494	1,840	3	-	970	283	6,590	27		83								82	192	153	307		307	-	190	190	543	52	0	14	609	8,041
1996	1,951	1,836	4	-	703	152	4,646	26		162	8	6	30	3	-	-	-		235	122	429		429	-	237	237	418	54	1	20	493	6,162
1997	2,120	1,400	3	-	813	163	4,499	59		290	9	-	33	3	-	2	-		396	138	1,017		1,017	-	193	193	352	38	1	21	412	6,655
1998	1,784	1,975	2	-	1,092	304	5,157	90		205	15	-	19	6	1	9	-		345	144	635		635	-	345	345	378	26	0	23	427	7,053
1999	1,608	1,551	4	-	1,126	184	4,473	66		128	7	-	26	5	1	3	-		236	166	433		433	-	266	266	364	28	1	12	405	5,979
2000	1,152	1,109	8	-	1,062	297	3,628	153		161	17	1	29	6	1	1	-		369	97	537		537	-	312	312	200	14	1	10	225	5,168
2001	985	1,326	11	-	1,077	237	3,636	121		129	16	-	30	5	-	-	-		301	151	254		254	-	237	237	351	42	2		395	4,974
2002	764	796	5	-	1,264	290	3,119	251		226	14	-	6	8	1	-	-		506	76	188		188	-	305	305	226	30	0		256	4,450
2003	1.013	842	3	-	1,064	203	3,124	241		91	26	-	11	5	1	-	-		375	79	206		206	-	322	322	552	29	0		581	4,687
2004	699	1,000	2	-	1,339	92	3,132	261		95	8	1	7	5	2	-	1		380	(19)	75		75	-	-	0	376	34	1		411	3,998
2005	562	668	1	-	1,214	98	2,543	176		76	1	-	5	9	9	-	8		284	-	141		141	-	-	0	493	20	0		513	3,481
2006	623	539	1	-	1,190	95	2,448														56		56				609	21	0		630	3,134
2007	(306)	(860)	(5)	(-)	(970)	(79)	(2,220)														28		28				265	13	0		278	(2,526)
2008	(394)	(606)	(10)	(-)	(1,302)	(97)	(2,408)																									-2,408

[1] Estimated from catch in number of fish

[2] Contrains bait fishing, net fishing, trapnet, trolling, harpoon, etc.

updated 7/13/10

ISC/10/BILLWG-2/06, Table 1

Table 5. Swordfish catches (in metric tons) by fisheries, 1952-2005. Blank indicates no effort. - indicates data not available. 0 indicates less than 1 metric ton. Provisional estimates in ( ).

	Japan							
Year	Distant-water and Offshore Longline[2]	Coastal Longline	Driftnet	Harpoon[3]	Other Bait Fishing	Trapnet	Other[4]	Total
1951	7,246	115	10	4,131	88	78	10	11,678
1952	8,890	152	0	2,569	6	68	6	11,691
1953	10,796	77	0	1,407	20	21	87	12,408
1954	12,563	96	0	813	104	18	17	13,610
1955	13,064	29	0	821	119	37	41	14,111
1956	14,596	10	0	775	66	31	7	15,486
1957	14,268	37	0	858	59	18	11	15,251
1958	18,525	42	0	1,069	46	31	21	19,734
1959	17,236	66	0	891	34	31	10	18,267
1960	20,058	51	1	1,191	23	67	7	21,400
1961	19,715	51	2	1,335	19	15	11	21,147
1962	10,607	78	0	1,371	26	15	18	12,115
1963	10,322	98	0	747	43	17	16	11,244
1964	7,669	91	4	1,006	40	16	26	8,852
1965	8,742	119	0	1,908	26	14	182	10,991
1966	9,866	113	0	1,728	41	11	4	11,763
1967	10,883	184	0	891	33	12	5	12,008
1968	9,810	236	0	1,539	41	14	9	11,649
1969	9,416	296	0	1,557	42	11	14	11,336
1970	7,324	427	0	1,748	36	9	3	9,547
1971	7,037	350	1	473	17	37	31	7,946
1972	6,796	531	55	282	20	1	2	7,687
1973	7,123	414	720	121	27	23	2	8,430
1974	5,983	654	1,304	190	27	16	2	8,176
1975	7,031	620	2,672	205	58	18	2	10,606
1976	8,054	750	3,488	313	170	14	12	12,801
1977	8,383	880	2,344	201	71	7	2	11,888
1978	8,001	1,031	2,475	130	110	22	1	11,770
1979	8,602	1,038	983	161	45	15	4	10,848
1980	6,005	849	1,746	398	29	15	1	9,043
1981	7,039	727	1,848	129	58	9	3	9,813
1982	6,064	874	1,257	195	58	7	1	8,456
1983	7,692	999	1,033	166	30	9	2	9,931
1984	7,177	1,177	1,053	117	98	13	0	9,635
1985	9,335	999	1,133	191	69	10	0	11,737
1986	8,721	1,037	1,264	123	47	9	0	11,201
1987	9,495	860	1,051	87	45	11	0	11,549
1988	8,574	678	1,234	173	19	8	0	10,686
1989	6,690	752	1,596	362	21	10	0	9,431
1990	5,833	690	1,074	128	13	4	0	7,742
1991	4,809	807	498	153	20	5	0	6,292
1992	7,234	1,181	887	381	16	6	0	9,705
1993	8,298	1,394	292	309	43	4	1	10,341
1994	7,366	1,357	421	308	37	4	0	9,493
1995	6,422	1,387	561	423	34	7	0	8,834
1996	6,916	1,067	428	597	45	4	0	9,057
1997	7,002	1,214	365	346	62	5	0	8,994
1998	6,233	1,190	471	476	68	2	0	8,440
1999	5,557	1,049	724	416	47	5	0	7,798
2000	6,180	1,121	808	497	49	5	0	8,660
2001	6,932	908	732	230	30	15	0	8,847
2002	6,230	965	1,164	201	29	11	0	8,600
2003	5,376	1,063	1,198	149	28	4	0	7,818
2004	5,395	1,509	1,062	229	30	4	0	8,229
2005	5,359	1,295	956	187	337	3	0	8,137
2006	6,181	1,508	796	244	342	5	1	9,077
2007	(6,109)	(2,017)	(829)	(122)	(367)	(2)	(1)	(9,446)
2008	(4,426)	(1,758)	(648)	(173)	(349)	(3)	(0)	(7,357)

	Chinese Taipei[5]										
Year	Distant-water Longline	Offshore Longline	Offshore Gillnet	Offshore Others	Coastal Harpoon	Coastal Setnet	Coastal Gillnet & other net	Coastal Longline	Coastal Others	Other	Total
1951											
1952	-	-									-
1953	-	-									-
1954	-	-									-
1955	-	-									-
1956	-	-									-
1957	-	-									-
1958	-	-									-
1959	-	427								91	518
1960	-	520								127	647
1961	-	318								73	391
1962	-	494								62	556
1963	-	343								18	361
1964	-	358								10	368
1965	-	331								27	358
1966	-	489								31	520
1967	-	646								35	681
1968	-	763								12	775
1969	0	843								7	850
1970	-	904								5	909
1971	-	992								3	995
1972	-	862								11	873
1973	-	860								119	979
1974	1	880								136	1,017
1975	29	899								153	1,081
1976	23	613								194	830
1977	36	542								141	719
1978	-	546								12	558
1979	7	661								33	701
1980	10	603								76	689
1981	2	656								25	683
1982	1	855								49	905
1983	0	783								166	949
1984	-	733								264	997
1985	-	566								259	825
1986	-	456								211	667
1987	3	1,328								190	1,521
1988	-	777								263	1,040
1989	50	1,491								38	1,579
1990	143	1,309								154	1,606
1991	40	1,390								180	1,610
1992	21	1,473								243	1,737
1993	54	1,174								310	1,538
1994	-	1,155								219	1,374
1995	50	1,135								225	1,410
1996	9	701	2	-	19	10	-	-	-		741
1997	15	1,358	1	1	27	8	-	24	-		1,434
1998	20	1,178	8	-	17	15	1	-	-		1,239
1999	70	1,385	4	-	51	5	1	-	-		1,516
2000	325	1,531	5	-	74	5	1	1	-		1,942
2001	1,039	1,691	17	-	64	8	1	1	-		2,821
2002	1,633	1,557	7	1	1	16	1	1	-		3,217
2003	1,084	2,196	3	-	-	8	-	-	-		3,291
2004	884	1,828	5	-	-	7	1	-	3		2,728
2005	437	1,813	1	-	-	5	2	-	18		2,276
2006											
2007											
2008											

	Korea			Mexico	United States[6]						Grand Total
					Hawaii	California					
Year	Longline	High-seas Drift Gillnet	Total	All Gears	Longline	Longline	Gill Net	Harpoon	Unknown[7]	Total	
1951											11,678
1952	-			-	-	-	-	-	-	-	11,691
1953	-			-	-	-	-	-	-	-	12,408
1954	-			-	-	-	-	-	-	-	13,610
1955	-			-	-	-	-	-	-	-	14,111
1956	-			-	-	-	-	-	-	-	15,486
1957	-			-	-	-	-	-	-	-	15,251
1958	-			-	-	-	-	-	-	-	19,734
1959	-			-	-	-	-	-	-	-	18,785
1960	-			-	-	-	-	-	-	-	22,047
1961	-			-	-	-	-	-	-	-	21,538
1962	-			-	-	-	-	-	-	-	12,671
1963	-			-	-	-	-	-	-	-	11,605
1964	-			-	-	-	-	-	-	-	9,220
1965	-			-	-	-	-	-	-	-	11,349
1966	-			-	-	-	-	-	-	-	12,283
1967	-			-	-	-	-	-	-	-	12,689
1968	-			-	-	-	-	-	-	-	12,424
1969	-			-	-	-	-	-	-	-	12,186
1970	-			-	5	-	-	612	10	627	11,083
1971	0			-	1	-	-	99	3	103	9,044
1972	0			2	0	-	-	171	4	175	8,737
1973	0			4	0	-	-	399	4	403	9,816
1974	0			6	0	-	-	406	22	428	9,627
1975	0			-	0	-	-	557	13	570	12,257
1976	0			-	0	-	-	42	13	55	13,686
1977	219			-	17	-	-	318	19	354	12,961
1978	68			-	9	-	-	1,699	13	1,721	14,049
1979	-			7	7	-	-	329	57	393	11,949
1980	64			380	5	-	160	566	62	793	10,905
1981	-			1,575	3	0	473	271	2	749	12,820
1982	48			1,365	5	0	945	156	10	1,116	11,842
1983	11			120	5	0	1,693	58	7	1,763	12,763
1984	48			47	3	12	2,647	104	75	2,841	13,520
1985	24			18	2	0	2,990	305	104	3,401	15,981
1986	9			422	2	0	2,069	291	109	2,471	14,761
1987	44			550	24	0	1,529	235	31	1,819	15,439
1988	27			613	24	0	1,376	198	64	1,662	14,001
1989	40			690	218	0	1,243	62	56	1,579	13,279
1990	61			2,650	2,436	0	1,131	64	43	3,674	15,672
1991	5			861	4,508	27	944	20	44	5,543	14,306
1992	8			1,160	5,700	62	1,356	75	47	7,240	19,842
1993	15			812	5,909	27	1,412	168	161	7,677	20,368
1994	66			581	3,176	631	792	157	24	4,780	16,228
1995	10			437	2,713	268	771	97	29	3,878	14,559
1996	15		15	439	2,502	346	761	81	15	3,705	13,957
1997	100		100	2,365	2,881	512	708	84	11	4,196	17,089
1998	153		153	3,603	3,263	418	931	48	19	4,679	18,114
1999	132		132	1,136	3,100	1,229	606	81	27	5,043	15,625
2000	202		202	2,216	2,949	1,885	646	90	9	5,579	18,599
2001	438		438	780	220	1,749	375	52	5	2,401	15,287
2002	439		439	465	204	1,320	302	90	3	1,919	14,640
2003	381		381	671	147	1,812	216	107	0	2,282	14,443
2004	410		410	270	213	898	169	62	37	1,379	13,016
2005	434		434	235	1,475		220	76	0	1,771	12,853
2006	477		477	347	1,175		444	71	2	1,692	11,593
2007	452		452	383	1,444		484	58	0	1,986	(12,267)
2008				(84)							(7,441)

[1] Catch data are currently unavailable for Republic of Korea, Philippines, and some other countries catching swordfish in the North Pacific.

(shaded) only one vessel fished so combined with Hawaii longline

[2] Catches by gear for 1952-1970 were estimated roughly using FAO statistics and other data. Catches for 1971-2002 are more reliably estimated.

[3] Contrains trolling and harpoon but majority of catch obtained by harpoon.

[4] For 1952-1970 "Other" refers to catches by net fishing and various unspecified gears.

[5] Offshore longline category includes some catches from harpoon and other fisheries but does not include catches unloaded in foreign ports.

[6] Estimated round weight of retained catch. Does not include discards.

[7] Unknown includes pole and line, purse seine, troll and troll/handline, half ring, and unspecified gears.

updated 7/13/2010

ISC/10/BILLWG-2/06, Table 2

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Attachment 2. Working Papers and Background Papers

WORKING PAPERS

ISC/10/BILLWG-2/01	Biological Reference Point Table. Kevin Piner and Kotaro Yokawa. (Kevin.Piner@noaa.gov)
ISC/10/BILLWG-2/02	Age-Based Analyses of Potential Biological Reference Points for the Western and Central North Pacific Swordfish *(Xiphias gladius)* Stock. Jon Brodziak and Dean Courtney. (Jon.Brodziak@noaa.gov)
ISC/10/BILLWG-2/03	Production model analyses of maximum sustainable yield-based reference points for the North Pacific swordfish stocks. Jon Brodziak and Gakushi Ishimura. (Jon.Brodziak@noaa.gov)
ISC/10/BILLWG-2/04	Preliminary analysis of area boundary to standardize CPUE of striped marlin in North Pacific Ocean. Minoru Kanaiwa and Kotaro Yokawa. (m3kanaiw@bioindustry.nodai.ac.jp)
ISC/10/BILLWG-2/05	The U.S. Longline Fishery for Striped Marlin in the North Pacific Ocean. Russell Ito and Karen Sender. (Russell.Ito@noaa.gov)
ISC/10/BILLWG-2/06	Available data of striped marlin and swordfish by the Japanese fishery in the North Pacific. Ai Kimoto and Kotaro Yokawa. (aikimoto@affrc.go.jp)

BACKGROUND PAPERS

ISC/10/BILLWG-1/REPORT	Report from the April 2010 ISC Billfish Working Group Workshop. 15-22 April 2010. BILLWG. (Gerard.DiNardo@noaa.gov)

Attachment 3. Agenda

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

BILLFISH WORKING GROUP (BILLWG)

INTERCESSIONAL WORKSHOP AGENDA

Meeting Site: Hotel Grand Pacific
Galiano Room #233
463 Belleville Street
Victoria BC Canada, V8V 1X3
250-386-0450, 250-380-4475 (fax)

Meeting Dates: 12-13 July 2010

Goals: Finalize advice on potential billfish biological reference points, delineate spatial structure of North Pacific striped marlin within areas (WCPO and EPO) delineated at the April 2010 BILLWG Workshop, review and modify (if necessary) current conservation advice, and review World Blue Marlin Symposium proposal.

July 12 (Monday), 0830-0900 – Registration

July 12 (Monday), 0900-1200

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

2. Adoption of Agenda and Assignment of Rapporteurs

3. Computing Facilities
   a. Access
   b. Security Issues

4. Numbering Working Papers and Distribution Potential

5. Status of Work Assignments and Meeting Summaries

6. Biological Reference Points
   a. Potential BRP for swordfish
   b. Finalize BRP table

July 12 (Monday), 1200-1300 – Lunch

July 12 (Monday), 1300-1400

7. Review of Current Billfish Conservation Advice

July 12 (Monday), 1400-1700

8. Description of Regionalized Fisheries
   a. Country reports

July 13 (Tuesday), 1000-1100

9. World Blue Marlin Symposium Planning

10. Other Matters
    a. RFMO Plans
    b. Work Assignments
    c. Future Meetings

July 13 (Tuesday), 1100-1400

11. Rapporteurs complete sections & report finalized

July 13 (Tuesday), 1400-1600

12. Clearing of Report

13. Adjournment