ANNEX 7

REPORT OF THE BYCATCH WORKING GROUP MEETING

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

(May 2-5, 2007, Honolulu, Hawaii, U.S.A.)

1.0 REGISTRATION

The second meeting of the ISC Bycatch Working Group (the BCWG) was hosted by the United States (US) National Oceanic and Atmospheric Administration (NOAA) Pacific Islands Fisheries Science Center (PIFSC) and the US Western Pacific Regional Fisheries Management Council (WPRFMC) and convened at the WPRFMC Office at 0900 Wednesday April 2, 2007. Participation included four voting members of the ISC: Chinese Taipei, Japan, Mexico, and the US, as well as the Inter-American Tropical Tuna Commission (IATTC). There were 17 participants from a variety of institutions in addition to those already mentioned (above) including: the Fisheries Agency-Council of Agriculture and the Institute of Marine Resource Management-National Taiwan Ocean University (Chinese Taipei); the National Research Institute of Far Seas Fisheries (NRIFSF) and Japan Fisheries Agency (Japan); the National Fisheries Institute of Mexico (INP); and the NOAA Southwest Fisheries Science Center (SWFSC) and NOAA Pacific Islands Regional Office (US).

2.0 INTRODUCTIONS AND OPENING REMARKS

The Chairman thanked the members for their participation and the WPRFMC for providing the location, audiovisual and network support, parking, and refreshments for the meeting. The WPRFMC welcomed the participants to Honolulu and described some meeting logistics. Then the participants introduced themselves and commenced deliberations.

3.0 REVIEW AND REVISION OF DRAFT AGENDA AND ASSIGNMENT OF RAPPORTEURS

The agenda was revised to include several additional items and adopted by the BCWG (see Attachment 2 - Final Agenda). Rapporteurs were assigned for each section.

4.0 REVIEW OF THE BCWG TERMS OF REFERENCE AND MEETING OBJECTIVES

The current terms of reference were discussed and it was recognized that the goal of the BCWG should be to focus on highly migratory species (HMS) and their fisheries, specifically on fisheries interactions with sea turtles, sea birds and sharks. There was discussion about how efforts should be focused given the group's expertise and the number of species and fisheries to be considered. The following agreement was reached:

The BYWG approach on stock assessment will be to summarize critical information on stock assessment and status for those species assessed by other researchers and specialists in the field. The BCWG will highlight the species of greatest concern based on non-sustainable impacts on the population and will summarize the status of those species to the ISC Plenary as was done previously in the BCWG Meeting 1 Report.

One objective for this meeting of the Bycatch Working Group was to review North Pacific longline bycatch (Work Plan Objective 1) of sea turtles, seabirds, and sharks. The BCWG planned to review data provided by the members (Objective 2, 2006), available data on the total N. Pacific fishing effort of each country, and the best available bycatch rate data to estimate bycatch. Different bycatch rates exist for different fishery sectors (i.e. deep-set versus shallow-set, tropical versus temperate, etc) and need to be reviewed and summarized. The group planned to discuss the bycatch rates that may best represent each fishery sector, and relevant considerations for estimating bycatch.

As agreed at the previous meeting, another objective was to produce a more detailed work plan that includes specific projects and identifies the collaborators who will conduct the work. The objective was to produce a comprehensive plan in the format being used by the ISC Swordfish Working Group. Another objective was to discuss bycatch mitigation research (Work Plan Objective 8), its application to conservation measures, and to make recommendations regarding scientific results which the group thinks are most applicable to members' North Pacific fisheries.

5.0 REVIEW LONGLINE BYCATCH ESTIMATION METHODOLOGIES AND DATA TO ADDRESS WORK PLAN OBJECTIVE 1

5.1. Review of past bycatch estimation attempts

A description of the sampling scheme and the methodology for estimating bycatch in the Hawaiian Longline Deep Set Fishery was presented. The sampling scheme is based on two sampling schemes to select trips for observer deployment. The base sampling scheme is a systematic sample. Because representatives from a vessel are required to report their intended departure at least 72 hours prior to departure, this list of call-ins provides a sampling frame from which to draw a systematic sample. This systematic sample is typically drawn to be slightly under the targeted coverage level for practical reasons. The additional samples needed to obtain the targeted coverage are selected randomly from a pool of recent call-ins when an observer is available and all systematic samples have been covered. This secondary sample results in an unequal probability sample; therefore, the Horvitz-Thompson estimator is used to estimate bycatch with the sampling probabilities being approximated using sampling records. To estimate uncertainty when few, if any, bycatch is recorded, the Poisson distribution is assumed along with the sampling probabilities to approximate a 95% confidence interval.

After discussing observer sampling schemes, the Working Group noted the following:

- Observer programs are considered the most reliable method to estimate the bycatch rates in a fishery. Ideally, these programs should be based on random probability sampling schemes, and should have adequate coverage to account for the very low

bycatch rates of some species. In some cases, stratified schemes will result in more efficient sampling designs when it is known or suspected that different components of a fishery have different bycatch rates.

- In practice, random sampling is very difficult to implement, and there is a need to apply other designs, exercising caution to avoid biases that may be introduced by heterogeneities generated by variability in the vessels, gear, operations, etc.

- Using model-based estimates is one of the more frequent alternative choices. For this case, a detailed understanding of the factors affecting bycatch rates, and a database that provides their values are needed. To achieve that goal, samples should cover the whole spectrum of the variables of interest, and should be supplemented with additional information.

- In some cases, observer programs are launched without a random probability sampling design, and begin with low coverage. The data collected may not be adequate for accurate estimates, but they may provide valuable information for improving the sampling design.

- Other valuable outcomes of observer programs are the identification of the factors that cause bycatch, and the recording of results of experiments in mitigation techniques. Therefore, they play a critical role in the search for mitigation measures and technologies. However, this alternative use may result in designs to optimize the probability of achieving the desired sample size, that deviate from the random one, and therefore cannot be used for estimation purposes, unless defined for a narrow stratum where extrapolation could be valid.

- It is important to be aware of the purpose for which observer data have been collected. For example, in the case of sea turtles, a substantial portion of the observations of bycatch made in many places in the last decade were focused on evaluating the performance of experimental mitigation measures. These observations were mostly focused on times, areas and fisheries with high bycatch rates, and avoided those with low bycatch rates. Estimation of bycatch rates using such data would have to take into account differences in availability between the observed strata and other parts of the fishery. Another example is when observers are not specifically directed to collect unbiased bycatch information.

Discussions on observer selection, training and placement showed the advantages of standardizing procedures across the member countries.

A review of two recently published papers (Lewison et al. 2004; Kaplan 2005) on turtle interactions in pelagic longline fisheries was made. The papers provide estimates of turtle bycatch. Although the complete databases and methods used by the authors were not available, the BCWG attempted to evaluate and compare the estimates, and questioned some of the assumptions and uses of the available data, (see table below). The use of consolidated fishing effort data from tuna, swordfish and other-target fisheries poses a problem. Both researchers used algorithms based on catch to assign fishing effort between fishery sectors that have tenfold different bycatch rates. Lewison et al.'s algorithm seems to have been more biased, as it produced bycatch totals more similar to

what would be expected from more swordfish-targeted effort than in Kaplan's model. Tuna-targetted fishing is by far the greatest longline activity in the areas represented by the effort data. The Kaplan paper used bycatch rates from very few sources compared with Lewison et al., and made questionable assumptions regarding turtle demographics. The BCWG, therefore, concluded that the results of both papers are unreliable and that such exercises require better data and a more vigorous estimation approach.

	Lewison et al. (2004)	Kaplan (2005)
Leatherbacks		
Catch (no.)	20,000-40,000	Not given
Mortality (no.)	1,000-3,200	626
Population estimates (no.)	160,000	3,530 nesters only
Loggerheads		
Catch (no.)	30,000-75,000	n/a
Mortality (no.)	2,600-6,000	n/a
Population estimates (no.)	335,000	n/a
BCWG Comments	-Lumping of data from tuna, swordfish and other-target fisheries may have caused significant bias in results. -Assumed post-hooking mortality @ 17-42% and 8-27% for loggerheads and leatherbacks, respectively. These values differ from the ratio of mortality/catch) -Our calculation of %mortality/abundance (e.g. 0.8 % - 1.8% for loggerheads and 0.6% - 2.0% for leatherbacks) is very low. -Used single year (2000) of effort data, while annual effort varies. -Bycatch estimates were obtained from various sources, including observer data, questionnaires, data summaries, etc., and these data are not documented. -Extrapolations to areas without data resulted in interaction totals that are inconsistent with other studies. It seems that this high number of interactions led to very high estimates of population size.	-Assumed post-release mortality @ 27%, then interactions would be 2,319 as compared with 20-40 thousand by Lewison) -Used single year (1998) of effort data. -Limited data from few fisheries. -Questionable assumptions regarding demographics such as sex ratio and remigration.

5.2. Review and tabulation of available fishing effort and bycatch to address Work Plan Objective 2

An ISC ftp site for developing a bycatch database for use by the Working Group has been established, but not yet activated. When that database is activated, it along with information in the ISC master database for Category I (total catch and number of vessels), Category II (logbook catch and effort) and Category III (biological) data will serve as the basis for estimating total bycatch by fishery.

The Working Group will concentrate on collecting and archiving data for the database especially those produced by observer programs that are designed to monitor the bycatch and to validate information recorded by fishermen in logbooks. The Working Group noted that the ideal database should be created with data from observer programs that are properly designed for estimating bycatch rates and total bycatch. Data archived should also include number of vessels, their characterization, and description of their fishing operations by types of vessels. For longline fisheries, fishing effort data needs to include factors as target species, depth of hooks fished, type and size of hooks, day versus night sets, depth of hooks fished, etc., that could influence bycatch rates and could be useful for stratification of the data. The Working Group also noted that the fishery data should be reported for area fished on as fine a scale as possible in order to prepare bycatch estimates for zones of the North Pacific Ocean, such zones 0 to 20 N and north of 20 N latititude.

Data from experiments on bycatch mitigation that occur in fishing operations should be identified in such a way as they would not be used as representing normal commercial fishing operations, unless that is considered appropriate by the submitting member.

Following the discussion of data needs, each participant described the data from their fisheries that could be available for use by the group.

5.2.1 United States

This year the US will submit Category I data to ISC for seabirds, sea turtles, and sharks that has been derived from or validated using observer data. The US will submit Category II data on Central Pacific longline operations, and Category III data on sea turtles. It will also provide data on the California/Oregon pelagic driftnet fishery (Category I and II, and some Category III data inside the US EEZ). The complete data set (longline and driftnet) is available from 2003 onwards.

5.2.2 Japan

In the Japanese longline fishery in the north Pacific, shark catch are reported in logbook records along with target catch, fishing effort, and gear information. However, because shark logbook data include inaccuracy and uncertainty in species identification and reporting rates, careful interpretation of raw data is necessary to estimate total catch and to assess stock status based on the logbook records. Japanese Research and Training vessels collect accurate data on longline catch and bycatch in the central North Pacific, but the data may not be representative of the commercial longline fishery because of the difference in fishing area, season, and fishing operation. The Japanese observer program will start in 2007 with low coverage due to financial limitation and operational difficulties.

5.2.3 Mexico

Data of the Mexican longline fishery is available from logbooks and observer programs conducted by the National Fisheries Institute (INP) of Mexico. Exploratory analyses of these data reveal the presence of area, time, and fleet sector interactions and points out the need to stratify the data by those factors in order to produce better bycatch estimations. Sharks are the target of several important fisheries, but they are also bycatch species in other fisheries. A problem arises since the proportion of sharks in catches varies widely, making it difficult to assign them a role as target or bycatch in a straightforward manner and suggesting the possibility of treating longline catch with a probabilistic approach to clarify the target and bycatch species.

5.2.4 Chinese Taipei

There are two major Taiwanese tuna fisheries currently operating in the North Pacific Ocean: the distant water longline (DWLL>100 GRT) and the offshore longline (OSLL<100 GRT) fisheries. The following bycatch-related data are available:

Category I: Total bycatch of sharks without species specific data are available. Total bycatch of sea turtle and sea birds are not available.

Category II: The catch and effort data for sharks from DWLL in 5X5 degree areas are available. However, these data are not available for OSLL at present.

Category III: No data are available at this time.

There were 6 observed trips of Taiwanese DWLL from 2002 to 2005 in the North Pacific Ocean. The observer programs will be continuing.

5.3. Tabulation of each Member's observer programs to address Work Plan Objective 3

The BCWG polled the members present to ask about their observer coverage and tabulated the following information:

Observer coverages

Nation	Fleet	Coverage
US	Tuna longline	20%
	Swordfish longline	100%
	Drift Gillnet	20%
Japan	Longline	very low, starting in 2007
Mexico	Longline	low in the past, but recently it has been very greatly increased

Chinese Taipei	Longline	very low for DWLL, started in 2002

5.4. Prepare preliminary estimation of bycatch rate per unit of effort, for each species group

Conducting a new estimate of bycatch by extrapolating rates of bycatch provided by members could not be undertaken at the meeting. The main requirement for such an exercise is to acquire more estimates of bycatch rates from members. For sampling data to be valuable for extrapolation purposes, it is a basic requirement that they only be used to extrapolate over oceanographic and ecological conditions and fisheries operations (gear and so on) that are reasonably similar to the sampled situation. It is also important for the time frame of the sampled bycatch rate data and fisheries effort statistics to overlap.

6.0 CONSIDERATION OF OTHER FISHERIES FOR HMS AND THE HOLISTIC APPROACH:

The BCWG has focused much of its attention in the first, and now the second meeting, on bycatch interactions with longline fisheries. It was recognized that there are a number of other fisheries which either specifically target HMS or interact with species relevant to the BCWG. Below, fisheries targeting HMS in the North Pacific are listed.

Fisheries Targeting HMS Species in the North Pacific:

- High Seas Longline (targeting tuna or swordfish)
- Coastal Longline (targeting tuna, swordfish, mahi or sharks)
- Drift Gillnet (targeting swordfish or sharks)
- Purse Seine (targeting tuna)
- Troll (targeting tuna)
- Pole-and-Line (targeting tuna)
- Harpoon (targeting swordfish)
- Handline (targeting tuna)

Numerous fisheries not targeting HMS, but potentially interacting with seabirds, sea turtles and HMS sharks also exist (eg. trawls, set longlines, or coastal gillnets).

The BCWG discussed its role in the context of examining bycatch in the HMS fisheries only. The BCWG did not come to a consensus on this matter, and requests guidance from the ISC Plenary as to whether the BCWG should examine only those fisheries targeting HMS in the North Pacific or should it also examine other fisheries which may interact with the same bycatch species of concern to the BCWG. Most participants believed that the BCWG's role is to examine just those fisheries which target HMS only, and to review the best available information on the status of the relevant bycatch species in order to be able to inform the ISC Plenary on relative impacts of bycatch removals. With respect to the HMS targeting fisheries, the group also identified those which have the greatest bycatch concern in the North Pacific and should be the focus of the BCWG's efforts (longline and drift gillnet), versus those fisheries which have minor bycatch

interactions (troll, pole-and-line, harpoon and handline). With respect to assessing the impacts of removals and the status of bycatch species, it was recognized that examinations into the life histories of those species may be valuable.

BCWG members returned to the Terms of Reference and discussed the value of taking a holistic approach in assessing the status of various bycatch species which can be useful in determining the relevance and relative impact of fisheries for HMS.

For example, a report on the increase in numbers of albatrosses at a nesting colony in Japan in recent years despite no decrease in fishing effort was presented. A long-term nest census conducted by H. Hasegawa (http://www.mnc.toho-u.ac.jp/v-lab/ahoudori/) has indicated exponential growth of breeding populations of short-tailed and black-footed albatrosses on Torishima Island, Japan since 1976. During that period, the terrestrial environment was modified to improve reproductive success of the breeding colony, while Japanese fishing effort remained at a similar level and no bycatch mitigation measures were introduced into the longline fishery until 2000. Model analysis of potential factors affecting the short-tailed albatross population revealed that nest site improvement had the greatest impact on the population dynamics and increase in the short-tailed albatross population.

Another report highlighted results of a cooperative Indonesia-Japan survey of nesting leatherback turtles in Irian-Jaya which identified several terrestrial factors such as harvesting, egg poaching, predation by feral animals, low hatching rates and beach erosion having negative impacts on the population, rather than fishery. It was these factors rather than fishery interactions that were identified as the primary cause of population declines.

A report demonstrating uncertainty in sea turtle population numbers and the causes for observed trends in population numbers was also presented. Sea turtle nesting counts have been recorded in the most important nesting beaches for the loggerhead and leatherback turtles of the Pacific basin. Nesting counts are not directly correlated to population abundance, because the demographic changes show considerable time lags, given the age at maturity of the population (e.g. the impacts of an improvement in juvenile survival will not be measurable until those individuals reach their nesting age).

The leatherback sea turtle populations that nest in the American continent (mainly Mexico and Costa Rica) have been declining steadily for many years. Both populations show similar patterns, only differing by some interannual variability.

The loggerhead populations that visit the eastern Pacific, nest on the western side (Japan and Australia), and they have also shown pronounced declines in the period leading up to around the year 2000. At that time, the nesting counts in several Japanese beaches commence to increase, and in just a few years the change has been quite significant (http://www4.osk.3web.ne.jp/~umigame/J/katsudousyoukai/kaigi/umigamekaigi_17matome.htm). The Australian nesting count available only reaches the year 2000, but data for Wreck Rock (one of the beaches, but not the major one) seems to indicate that some of the Australian populations may have been increasing since 2000, and information from other nesting populations (Milani Chaloupka, Sea turtle Association of Japan 2006

Symposium) also seems to indicate that those populations have been increasing since 2000.

It is important to interpret these population trends in light of the different factors that may affect the populations. If the populations from the Southern and Northern hemispheres show the same pattern, then we should ask ourselves: are the fisheries impacts following similar trajectories in both regions? Are the impacts of past actions (e.g. driftnet ban) significant in both places? Are there oceanographic changes affecting the ecosystems where they grow (e.g. productivity in eastern boundary currents off South and North America)? Loggerhead turtles are most closely linked to fisheries because their diet includes bait species, while leatherbacks feed on jellyfishes, and other gelatinous species. Why should loggerheads seem to experience some rebounds, while leatherbacks continue to decline, yet there is no evidence that fishing effort has changed as dramatically as would be required to effect such population changes? These questions address the condition of the populations based on a holistic approach rather than only focusing on fishery effects.

7.0 DEVELOPMENT OF A WORKPLAN

At the first meeting of the Bycatch Working Group in 2006, eight general work plan objectives were identified in order to help focus research priorities. An additional general objective was added this year (Objective 9) and these objectives are as follows:

1. Bycatch Estimation: Members are encouraged to initiate or continue the estimation of bycatch (turtles, sea birds, sharks, and other bycatch species) in all major fisheries for pelagic species in the North Pacific based on logbook data, observer data, or any other available information.

2. Priority Data for Bycatch Assessment: Members are encouraged to provide any available bycatch information in three categories of descending urgency. These are: 1) the most urgently needed estimates of removals (see objective 1. above); (2) Catch and effort data and other logbook-type data; and 3) Biological data (size, age, gender, etc.).

3. Observer Programs: Provide scientific and technical guidance towards the development and standardization of observer programs and the training of observers in all relevant fisheries in collaboration with other commissions.

4. Identify Fishery Information Necessary to Monitor Bycatch: Such details might include additional species of interest (e.g. mahimahi) the recording of discards in logbooks, and observation of the condition of bait (frozen or thawed), the condition of discards (alive or dead) and other such details.

5. Assess Data Poor Species: Develop and apply stock assessment models for data poor bycatch species.

6. Inter-fishery Comparisons of CPUE: Comparisons between different operational characteristics within fishing styles (i.e. monofilament versus multifilament longlines,

etc.) can help for many assessment and estimation models where data are incomplete for one style or the other. Calibration research is encouraged.

7. Collaboration with Other Commissions: Encourage ongoing cooperation to assess bycatch in other areas by fisheries capturing tuna and tuna like species. The BCWG will rely on those efforts to provide bycatch of species that contribute to total bycatch of populations also impacted by temperate fisheries of more direct concern to the BCWG.

8. Gear Research: Continue development and testing of alternative fishing gear to reduce bycatch.

9. Compare trends in fishery effort and bycatch populations to look for evidence that removals by fishing had lagged impacts on population status (i.e. analyzing jointly the trends in sea turtle populations in relation to trends in fisheries effort in the regions of interest (eg. Loggerheads in the N. Pacific) and in other regions (eg. Loggerheads in the S. Pacific and Atlantic) that could provide comparative or contrasting views.

The following table was developed by the working group to specify research projects that have a high priority for addressing the work plan objectives:

Objective	**Research Project**	**Collaborators**
1. Bycatch Estimation	a) Continue to estimate bycatch in 3 US fisheries: tuna longline (California/Hawaii); swordfish longline (Hawaii); and drift gillnet (California/Oregon).	SWFSC, PIFSC
	a) Estimate bycatch for all HMS Fisheries.	All members
	b) Hold a workshop on statistical methods to interpret data from bycatch experiments.	IATTC, PIFSC
	c) Hold workshops on statistical methods for estimating bycatch from observer data.	
	d) Further explore the extrapolation method used by Lewison et al., 2004 to try and understand how and what data were applied to areas without measurements, and to advance towards improving such estimates.	PIFSC
	e) Propose to MexUS-Pacifico a cooperative project with the US and Mexico on estimating bycatch in both countries' longline fisheries.	SWFSC, INP

Objective	Research Project	Collaborators
2. Priority Data	a) Prioritize relevant and urgent bycatch data needs (progress made at this meeting)	BCWG
	b) Initiate submission of fisheries and bycatch statistics needed to initiate estimation of bycatch by fishery sectors.	BCWG and its chair, working with the ISC database administrator
	c) Compile information on life history parameters necessary for stock assessments of sharks	US, Taiwan, Japan (NRIFSF), INP
	d) Continue or initiate shark genetics studies (especially sharks of high interest, eg, blue, mako, bigeye thresher)	Japan, SWFSC, Taiwan
3. Observer Program	a) Develop a website to maintain information critical to the success of observer programs—eg., manuals, forms, data sheets, and species identification and handling guidelines translated into languages of member countries and others	PIFSC, IATTC
4. Identify fishery information necessary to monitor bycatch	a) Refer to item 2.	PIFSC
	b) Compile data on TDR and fish captures by hook depth (fish captures by hook #) in the Hawaii-based longline fishery	NOAA, PIFSC, IATTC, University of Hawaii
	c) Summarize results of post-capture mortality studies	PIFSC, SWFSC, IATTC
5. Assess data poor species	a) Summarize results of stock assessments by other organizations and institutions periodically	BCWG
	b) Identify species that should be assessed (and identify outside individuals best able to provide that information)	BCWG

Objective	Research Project	Collaborators
6. Inter-fishery comparisons of CPUE	a) Compare rates of bycatch in the overlapping fishing grounds between US and Japanese longline fisheries (taking into account differences in gear type, hook depths, etc. between fisheries)	NRIFSF, PIFSC
	b) Plan for a project to compare seabird bycatch data in overlapping longline areas and seasons	US, Taiwan
	c) Propose to MexUS-Pacifico a project to examine bycatch in US and Mexico longline fisheries	SWFSC, INP
7. Collaboration with other Commissions	a) Summarize purse seine bycatch and bycatch from other relevant fisheries (e.g. drift net fisheries).	PIFSC, SWFSC
8. Gear research	a) Continue experiments on sea turtle, seabird and shark bycatch reduction being conducted by all members, and disseminate results.	BCWG
	b) Compile a summary document on all known ongoing and completed turtle bycatch reduction work.	NOAA Fisheries
9. Compare trends in fishery effort and bycatch populations	a) Analyze the trends in sea turtle abundance trends (with appropriate lags) and trends in fisheries effort in the regions of interest (eg. Loggerheads in the N. Pacific) to look for possible relationships between the two (or lack thereof)	

8.0 BYCATCH REDUCTION RESEARCH

The resolutions from the WCPFC and IATTC that address bycatch issues were briefly reviewed. It was noted that the most detailed and specific bycatch measures to date are those from the WCPFC regarding seabirds. The WCPFC plans to address specific measures for sea turtles at the August SC2 meeting and December Plenary, and has requested advice on technical specifications from its advisory bodies.

Participants discussed research underway in various Pacific HMS fisheries.

Bycatch in the IATTC area purse seine fishery was discussed, noting the important species of finfish bycatch, such as undersized bigeye and yellowfin tunas. Work is underway to redesign FADs used by purse seiners, so that the entanglement of turtles in FADs is reduced. There are also projects to address shark bycatch, and studies on trends in shark abundance. Regarding longlining, IATTC in collaboration with many NGO's, NOAA (USA) and the Overseas Fishery Cooperation Foundation (OFCF) of Japan, industry and fishers groups, and government fisheries agencies has started a program to reduce sea turtle bycatch. The program consists of voluntary exchanges of hooks to test circle hooks in the fishing boats, distribution of dehooking tools, an observer program to document the results, and fishers workshops throughout Latin America to improve species handling protocols. The tests of circle hooks versus the predominant J or tuna hooks are carried on in the artisanal fleets of the coastal nations of the eastern Pacific, from Mexico to Peru, in experimental designs which alternate hook types along the line. In tuna, billfish, and shark-targeted (TBS) fisheries, tests are mostly with size 16/0 circle hooks, and to date, results suggest that the circle hooks maintain target catch and reduce sea turtle bycatch. In mahimahi-targeted (MM) fisheries in Peru and Ecuador they are testing size 13/0 and 14/0 circle hooks vs. J or tuna hooks. In these fisheries the circle hooks do not yet match the performance of the old hooks in catching the target species, and a better solution is needed.

One approach that is being tested as an alternative to circle hooks in the MM fisheries of Ecuador and Peru is the use of hooks with an added wire appendage opposite from the hook point. The design comes from a successful study in the New Zealand snapper fishery where these hooks were found to substantially reduce gut hooking and the catch of smaller fish without affecting target fish catch. The tests in Ecuador and Peru had very good results—significant reduction in interaction rates with appendage hooks (53% and 80% reduction in Peru and Ecuador, respectively). Hook swallowing was also greatly reduced among the turtles that were caught. Subsequently more testing was conducted with hooks modified by the addition of a ring (at the request of the fishers), and, (lacking the original type) also using a weaker wire appendage. The results were still a very significant reduction in sea turtle hooking rates, but quite higher than in the same hooks without rings. So, the study was not a good replicate of the first study. Rings on hooks increased target catch by 35% helping to explain why hooks with rings are so popular.

Other tests were conducted in Ecuador by OFCF of Japan, and in Peru with support from NOAA, to find ways to reduce turtle entanglements. Olive Ridley turtles are attracted to the floats, and they tend to entangle near them. One study replaced the very flexible polypropylene multifilament (PP) float lines and mainline on either side of each float line with monofilament (MF) at every other float. The reduction in entanglements on the modified (monofilament) section was very significant. Another experiment replaced the entire line with monofilament, with good reduction of entanglement, but this method is not practical for the fishers, since they can carry and set only half as much gear with this method. Studies are under way by OFCF of Japan to solve this problem. Another study supported by NOAA has been started in Peru, replacing the floats by others less visible or less attractive to the turtles.

Other tests were conducted in Ecuador by OFCF to find ways to reduce turtle entanglements. One study replaced the very flexible polypropylene multifilament float lines and mainline on either side of each

float line with monofilament at every other float. The reduction in entanglements on the modified (monofilament) section was reduced to one turtle compared with 17 in the unaltered sections. Olive Ridley turtles are attracted to the modified sections, but they are not entangled or hooked, and when the boats approach, the turtles leave. Another experiment replaced the entire line with monofilament, with good reduction of entanglement, but this method is not practical for the fishers, since they can carry and set only half as much gear with this method.

An update was provided on research underway in US fisheries to reduce longline turtle bycatch. Results from two major studies are nearly complete. A study of gear designed to reduce the catch of shallow-swimming species such as marlins, mahimahi, and sea turtles was conducted on 6 Hawaii-based commercial longline fishing trips. The basic longline gear used was the typical monofilament reel style of gear most common in the United States. It was deployed in the normal style for deep, day-set tuna fishing and on alternate days it was set so that hooks normally deployed at depths less than 100 meters were absent. The modified operation designed by Steve Beverly (http://www.smartgear.org/smartgear_winners/smartgear_winner_2005/smartgear_winner_2005grand/index.cfm) requires setting a longer interval of main line after the float and attaching a weight before attaching branch lines. Then, after the last branch line between floats is attached, another weight and another long interval of main line is deployed before the float. A second float is attached to put more space between the near-vertical drops of main line. The modified operation requires a little more time each day to deploy the same number of hooks as in normal operations, and so it has an operational cost. The result is that all hooks fish deeper than 100 m, and there is an increased catch of bigeye tuna. The catch of shallower-swimming species such as yellowfin tuna, istiophorid billfishes, and mahimahi was quite successfully reduced. As these species are all currently retained and sold there would be an economic loss from using the new method that might not be compensated for by increased bigeye tuna catches.

A similar economic concern applies to the very successful testing of large (size 18) circle hooks on about 1,000 sets conducted using ½ circle hooks and ½ tuna hooks (size 3.6 sun) in the Hawaii tuna longline fishery. The results definitely indicate no decrease in bigeye tuna catch using the large circle hooks. There was actually a nominal increase in bigeye catch, and the fishermen were pleased with the increased bigeye landings using the gear. However the catch of most other species did decline, including yellowfin tuna. So the gear definitely increases fishing selectivity for the main target species, but may reduce net revenue.

Most turtle bycatch reduction measures for longline fisheries that are in place in the US, or which have been considered by RFMOs are designed to be specific to shallow fishing. However, it can be difficult to specify, regulate, or even know the depth of fishing gear. Many aspects of gear configuration that may be specified in regulations may not in fact control fishing depth. If a fisherman wants to set hooks at shallower depths it can usually be accomplished despite any gear specifications that may be part of the regulations.

NRIFSF in Japan is continuing sea turtle bycatch mitigation studies including hook and bait modification and their impacts on catch rates of sea turtles, tuna, billfish and shark. Development of de-hooking devices, and programs to train fishermen in their use are also ongoing. Japan also conducts studies on tori-lines and side-setting to evaluate their efficacy and feasibility in reducing seabird bycatch.

Chinese Taipei is conducting research on reducing turtle bycatch using circle hooks and on reducing predation by dolphins on longline target catch using acoustic pingers.

Mexico's research on circle hooks is continuing. This work was well described in the report from last year.

It was noted that it is very important to be practical and to consider the realities of fishing economy when developing bycatch mitigation measures. It is problematic when mitigation measures are prescribed for fisheries sectors that have never tested such measures, and where there may be physical or economic impediments to their use. Examples include the high cost of pre-packaged blue dyed bait that was tried in Japan, and the impracticality of side setting on certain longline vessels due to their design and structure. It was also noted that the first response of fishers to new procedures or gears is very likely to be negative. However, this response can often be overcome if conservation technology specialists can work with the fishermen to overcome initial difficulties. Examples include initial refusal to use circle hooks in some artisanal fisheries because they couldn't easily be stored on existing hook racks, or baited in the usual manner. These difficulties were easily overcome with a little tinkering and experience.

9.0 REVIEW OF WORK PLAN AND REVIEW OF RECOMMENDATIONS

The work plan was agreed to by all the members present.

The BCWG requests guidance from the ISC Plenary as to whether the BCWG should examine only those fisheries targeting HMS in the North Pacific or should it also examine other fisheries which may interact with the same bycatch species of concern to the BCWG. Discussion centered around whether or not a "holistic approach" (Section 6, above) requires examining all fishery impacts, or only HMS fisheries. The BCWG did not reach a consensus on this issue. Most participants believed that the BCWG's role is to examine just those fisheries which target HMS as well as to review the best available information on the status of the relevant bycatch species in order to be able to inform the ISC Plenary on relative impacts of bycatch removals.

10.0 OTHER BUSINESS (TIME, PLACE, THEME, AND AGENDA FOR NEXT WORKING GROUP MEETING).

The next meeting is tentatively scheduled for the week of May 12-16, 2008 in Honolulu.

11.0 CLEARING AND ADOPTION OF REPORT

The report was cleared and adopted (subject to typographical and grammatical and formatting changes by the chair) at 1400 Saturday May 5, 2007.

12.0 ADJOURNMENT

The Meeting was adjourned at 1400 Saturday May 5, 2007**.**

Attachment 1: Participants in the Second Meeting of the ISC Bycatch Working Group

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Attachment 2: AGENDA
Bycatch Working Group of the ISC
Second Meeting, May 2-5 (Wed-Sat), 2007

1. Registration (0900 Wednesday May 2)

2. Introductions and Opening Remarks

3. Review and Revision of Draft Agenda and Assignment of Rapporteurs

4. Review of the BCWG Terms of Reference and Objectives

5. Review longline bycatch estimation, seeing what data are available, what are needed, and how to proceed with bycatch estimation to address Work Plan Objective 1.

    5.1. Review of past bycatch estimation attempts.

    5.2. Review and tabulate information on fishing effort and bycatch of turtles, seabirds and sharks submitted by members to address Work Plan Objective 2.

    5.3. Tabulating the extent and adequacy (% coverage) of each member's observer data collection to address Work Plan Objective 3.

    5.4. Create a spreadsheet for calculating a simple, preliminary estimate of longline bycatch projected on the basis of reported fishing effort and an assumed or measured bycatch rate per unit of effort, for each species group.

6. Consideration of other relevant fisheries, such as gillnet fisheries for HMS, etc.

7. Elaboration of Work Plan on Objectives 1-8): Identify Specific Research Projects and Collaborators. We will complete a work plan table in a format similar to that used by the Swordfish Working Group

8. Discuss bycatch reduction research (Work Plan Objective 8), its application to conservation measures, and recommendations regarding scientific results which the group thinks are most applicable to members' North Pacific fisheries for HMS. This should include some discussion of which types of fisheries and fishing gears need to be covered. Conservation measures adopted to date by RFMO's will be reviewed.

9. Review of Work Plan and Review of Recommendations

10. Other business (time, place, theme, and agenda for next working group meeting).

11. Clearing and Adoption of Report

12. Adjournment (afternoon on Saturday May 5)

Attachment 3: List of Information Documents and References for the Bycatch Working Group of ISC-7

WCPFC Decisions

Conservation and Management Measure-2006-02.pdf
Conservation and Management Measure to Mitigate the Impact of Fishing for Highly Migratory Fish Stocks on Seabirds.

Conservation and Management Measure-2006-05.pdf
Conservation and Management Measure for Sharks in the Western and Central Pacific Ocean.

Conservation and Management Measure-2006-07.pdf
Conservation and Management Measure for the Regional Observer Programme.

Resolution-2005-03.pdf
Resolution on Non-Target Fish Species.

Resolution-2005-04.pdf
Resolution to Mitigate the Impact of Fishing for Highly Migratory Fish Species on Sea Turtles.

IATTC Resolutions

C-04-05.pdf
IATTC Resolution C-04-05 (Revised), Consolidated Resolution on bycatch.

C-04-07.pdf
IATTC Resolution C-04-07, Resolution on a three-year program to mitigate the impact of tuna fishing on sea turtles.

C-05-01.pdf
IATTC Resolution C-05-01, Resolution on incidental mortality of seabirds.

C-05-03.pdf
IATTC Resolution C-05-03, Resolution on the conservation of sharks caught in association with fisheries in the Eastern Pacific Ocean.

References

ISC06_Report.pdf
Report of the Bycatch Working Group Meeting, March 20-22, 2006, La Jolla, California, USA.

Kaplan.pdf

A risk assessment for Pacific leatherback turtles (*Dermochelys coriacea).* By Isaac C. Kaplan, Can. J. Fish. Aquat. Sci. 62: 1710-1719 (2005).

Lewison.pdf
Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on loggerhead and leatherback sea turtles. By Rebecca L. Lewison, Sloan A. Freeman, and Larry B. Crowder, Ecology Letters, (2004) 7: 221-231.

llreport0307.pdf
Best Practices for the Collection of Longline Data to Facilitate Research and Anaylsis to Reduce Bycatch of Protected Species. Report of a workshop held at the International Fisheries Observer Conference, Sydney, Australia, November 8, 2004. By Kimberly S. Dietrich, Victoria R. Cornish, Kim S. Rivera, and Therese A. Conant. NMFS-OPR-35, March 2007.

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Best Practices for the Collection of Longline Data to Facilitate Research and Analysis to Reduce Bycatch of Protected Species. Report of a workshop held at the International Fisheries Observer Conference, Sydney, Australia, November 8, 2004. Executive Summary. By Kimberly S. Dietrich, Victoria R. Cornish, Kim S. Rivera, and Therese A. Conant. NMFS-OPR-35, March 2007.

Read.pdf
Do circle hooks reduce the mortality of sea turtles in pelagic longlines? A review of recent experiments. By Andrew J. Read, Biological Conservation 135: 155-169 (2007).

SC2_EB_Birdlife_Tracking.pdf
Distribution of albatrosses and petrels in the WCPFC Convention Area and overlap with WCPFC longline fishing effort. By Birdlife International.

SC2_EB_Birdlife_Tracking_Appendix.pdf
Distribution of Albatross and petrels in the WCPFC Convention Area and overlap with WCPFC longline fishing effort. Appendix: Maps of albatross and petrel distribution in the WCPFC area. By Birdlife International.

SC2_EB_IP1.pdf
Analyses of observer data for the Hawaii-based longline swordfish fishery. By Eric Gilman et al., WCPFC-SC2-2006-EB IP-1.

SC2_EB_IP2.pdf
Measurement-points examination of circle hooks for pelagic longline fishery to evaluate effects of hook design. By Kosuke Yokota, Hiroshi Minami, and Masashi Kiyota, WCPFC-SC2-2006/EB IP-2.

SC2_EB_IP3.pdf
A summary of the Korean tuna fishery observer programme for the Pacific Ocean in 2005. By Doo Hae An, Soon-Song Kim, Dae-Yeon Moon, and Seon-Jae Hwang, WCPFC-SC2-2006/EB IP-3.

SC2_EB_IP5.pdf
Seamount research planning workshop report, 20-21 March 2006. By Valerie Allain, David Kirby, and J. Kerandel, WCPFC-SC2-2006/EB IP-5.

SC2_EB_IP7.pdf

Review of seabird status and incidental catch in Eastern Pacific Ocean fisheries. Document BWG-5-05.a.i.

SC2_EB_IP8.pdf
The sea turtle bycatch mitigation program for the coastal longline fleets and preliminary results of circle hook experiments. Document BWG-5-04.

SC2_EB_IP10.pdf
Interactions of fisheries in the Eastern Pacific Ocean and marine turtles. By the IATTC, WCPFC-SC2-2006/EB IP-10.

SC2_EB_WP4.pdf
Towards a seabird mortality risk assessment: Distribution of seabirds in the WCPFC convention area and potential overlap with fisheries. By Susan Waugh, WCPFC-SC2-2006/EB WP-4.

SC2_EB_WP5.pdf
A review of methodologies aimed at avoiding and/or mitigating incidental catch of seabirds in longline fisheries. By Leigh Bull, WCPFC-SC2-2006/EB WP-5.

SC2_EB_WP9.pdf
Effect of circle hooks and feasibility of de-hooking devices to reduce incidental mortality of sea turtles in the Japanese longline fishery. By Hiroshi Minami, Kosuke Yokota, and Masashi Kiyota, WCPFC-SC2-2006/EB WP-9.

SC2_EB_WP12.pdf
Comparison of circle hooks and J hooks in the catch rate of target and bycatch species taken in the Korean tuna longline fishery. By Soon-Song Kim, Dae-Yeon Moon, Doo-Hae An, and Jeong-Rack Koh, WCPFC-SC2-2006/EB WP-12.

SC2_EB_WP13.pdf
Turtle bycatch mitigation in the Hawaii longline fishery. By P. Dalzell & E. Gilman, WCPFC-SC2-2006/EB WP-13.

SC2_EB_WP16.pdf
Shark catch in the pelagic longline fishery: Comparison of circle and tuna hooks. By Kosuke Yokota, Masashi Kiyota, and Hiroshi Minami, Fisheries Research 81: 337-341 (2006).

SC2_NGO_Seabirdbycatchrates.pdf
Summary of seabird bycatch rates recorded in the Western and Central Pacific. By Birdlife International.

Chaloupka.ppt.pdf
Long-term temporal and spatial trends in loggerhead nesting in Japan and other rookeries in the Pacific, Atlantic and Indian Oceans. By Sea Turtle Association of Japan and Milani Chaloupka, powerpoint slides from Nov 2006 annual symposium.

PFRP Chaloupka.pdf
Robust statistical re-evaluation of the effect of pelagic longline fisheries on loggerhead sea turtle stocks in the Pacific. By Milani Chaluopka, web page project description.

Marine Turtle Newsletter No51.pdf

Incidental capture of sea turtles by Japanese research and training vessels: results of a questionnaire. By Waichiro Nishimura and Satoru Nakahigashi, Marine Turtle Newsletter No. 51 (1990). 4 p.

Kaplan-Cox-Kitchell.pdf
Circle hooks for Pacific Longliners: not a panacea for marlin and shark bycatch, but part of the solution. By Isaac Kaplan, Sean Cox, and James Kitchell, Transactions of the American Fisheries Society 136:392-401.