ANNEX 10

REPORT OF THE SIXTH MEETING OF THE INTERNATIONAL SCIENTIFIC COMMITTEE FOR TUNA AND TUNA-LIKE SPECIES IN THE NORTH PACIFIC OCEAN

Plenary Session, March 23-27, 2006
La Jolla, California U.S.A.

Report of the Marlin and Swordfish Working Group Joint Meeting (March 20-22, 2006, La Jolla, California, U.S.A.)

1.0 INTRODUCTION

The second joint intercessional meeting of the Marlin (MARWG) and Swordfish (SWOWG) Working Groups of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean was convened in La Jolla, California U.S.A. from March 20 – March 22, 2006. The goals of the meeting were to 1) review the assessment catch tables and provisional results of a recently completed stock assessment for North Pacific striped marlin based on three different biomass dynamics models, 2) initiate data preparations for the next stock assessment of North Pacific swordfish, 3) develop a work plan and timetable to support the completion of a North Pacific swordfish stock assessment in 2008, and 4) discuss a proposal for holding a 1st World Symposium on Swordfish. Gerard DiNardo, Chair of the MARWG, and Robert Humphreys, Chair of the SWOWG, welcomed participants (Attachment 1) and appointed Robert Skillman and Kevin Piner as rapporteurs. Working papers were distributed (Attachment 2) and the meeting agenda adopted (Attachment 3).

2.0 OVERVIEW OF NOVEMBER 2005 STRIPED MARLIN STOCK ASSESSMENT WORKSHOP

The MARWG Chair circulated and reviewed the report of the striped marlin stock assessment workshop convened in Honolulu, Hawaii from November 15-21, 2005 (ISC/06/MARWG&SWOWG/01). The goal of the workshop was to bring together scientists to review and compile submitted data, and assess the status of striped marlin in the North Pacific. The workshop was a recommendation from the first intercessional meeting of the MARWG & SWOWG in August 2005.

3.0 REVIEW OF ASSESSMENT CATCH TABLES FOR STRIPED MARLIN

At the November 2005 striped marlin workshop, participants developed a provisional catch table of category II data. The MARWG Chair outlined the frustration he experienced in getting ISC member data correspondents to respond to data requests and requests for clarification on data issues. Participants acknowledged these difficulties and recommended that the ISC Plenary be informed of this problem and solicit their support in resolving these problems.

It was noted that some issues remain with the catch data submitted by Chinese-Taipei and Korea in response to problems identified during a review of catch statistics at the last ALBWG and STATWG meetings. In the absence of Korea's participation, members discussed what they knew about the Korean catch data and data issues. The most serious issues involve the amount of fishing effort reported. Attempts to estimate Korean longline effort proved unsuccessful and the MARWG Chair voiced the preferred opinion of getting the data directly from Korea. Marlin species are apparently not recorded separately on the Korean catch log form, and the Secretariat of the Pacific Community Oceanic Fisheries Programme and other RFMOs split the total catch into species using their own procedures. Separate data logging of marlin species is certainly preferred.

4.0 REVIEW OF MARLIN FISHERIES

4.1 United States

Russell Ito presented a report on U.S. commercial fisheries for marlins in the North Pacific Ocean (ISC/06/MARWG&SWOWG/02). Marlins are targeted and also taken incidentally by U.S commercial fishers in the North Pacific Ocean. Blue marlin and striped marlin were the largest components of commercial marlin landings. U.S. fisheries for marlins were categorized into three gear types: longline, troll, and handline. The Hawaii-based longline fishery covered the broadest range and was the largest U.S. commercial fishery for marlins. Striped marlin typically was the largest component of the longline marlin landings. The troll and handline fisheries usually made one-day trips and operated mainly within 50 nmi from shore. The troll fishery was the second largest fishery for marlins with blue marlin as the dominant component of the landings. Landings of marlin by the handline fishery were relatively negligible. The longline CPUEs trends for striped and blue marlins are generally declining, although these decreasing CPUEs could be related to factors other than abundance. Data quality issues, such as raising factors for processed catch, and marlin misidentification, were also discussed.

During the discussion, it was clarified that since the logbook program did not start until late in 1990, earlier estimates are not as good. In addition, the data do not include purely recreational catches, though any catches sold by fishers who otherwise consider themselves recreational fishermen, are included. Participants pointed out that recreational data from California and some other eastern Pacific fisheries were used in the stock assessment that was conducted. However, some of this recreational data represents catch and release. It was also pointed out that the catch trend seems to be comparable to that shown in the Japanese data. However, it was noted that the California and Hawaii-based fleets had somewhat different trends in marlin CPUE. There is no clear explanation for this, though it was suggested that the California-based longline fleet tends to operate in more northern waters compared to the Hawaii-based longline fleet. Regarding targeting, it was pointed out that hooks between floats could be used as some indication of targeting but these data are not available for the entire time series. Also, at some time in the history of the logbooks, provision was made for vessel operators to indicate species targeted on each set. Otherwise, there is no clear means for allocating effort for this multi-species fishery to individual species. In waters fished by the Hawaii-based longline fishery, it was also clarified that blue marlin is taken in surface waters while striped marlin is taken at greater depths. Regarding the issue of spawning, it was noted larvae of shortbill spearfish appear to be present throughout the year in Hawaii whereas larvae of swordfish and blue marlin occur seasonally.

4.2 Japan

Koji Uosaki presented a report on the fisheries of Japan in the North Pacific Ocean (ISC/06/MARWG&SWOWG/03). The catch of striped marlin for Japanese longline vessels <20 GRT was 919 t in 2003 and has exhibited a slightly declining trend in the last 5 years. The catch of blue marlin from this fishery was 1,098 t in 2003 and shows no apparent trend with catches ranging from 900 t to 1,200 t over the last 5 years.

The catch of striped marlin for longline vessels >20 GRT in the Pacific was 803 t in 2004 and shows no apparent trend ranging from 800 t to 1,200 t over the last 5 years. The catch of blue marlin for this fishery was 2,082 t in 2004 and shows a slightly declining trend over the last 5 years. The trend in fishing effort for the smaller longline vessels is gradually increasing over the last 5 years, but shows a declining trend in effort for the larger longline vessels.

4.3 Mexico

Luis Fleischer indicated that Mexico sent a contributed paper to the November 2005 striped marlin stock assessment workshop covering recreational catch statistics from 1990 to 2003 (ISC/05/MARWG/07). The data are derived from sport fisheries operations, as striped marlin and other billfishes are reserved in Mexico for recreational fisheries, and not subject to any direct commercial catches since this designation. The report for the November 2005 Hawaii meeting also contains biological data (lengths), catch, and fishing effort for striped marlin caught off Mexico. Furthermore, catch data prior to 1990 is being assembled and reported in future meetings.

4.4 Category I Catch Table

Striped marlin catch statistics (Category I data) from the United States, Japan, Mexico, Chinese-Taipei, Costa Rica and Korea for fisheries in the North Pacific were updated by Al Coan and are presented in Table 1. The table does not reflect the total catch of striped marlin in the North Pacific, as data were unavailable from other fleets operating in the region; only statistics presented at the MARWG meeting are included. There is a need to complete the catch table by incorporating data from other countries whose vessels catch striped marlin in the North Pacific. The MARWG strongly recommends that all ISC data contributors ensure that their respective data correspondents submit available Category I, II, and III data to the ISC Database Administrator in accordance with established ISC protocols.

5.0 REVIEW AND DISCUSS RESEARCH AND STOCK ASSESSMENT WORK ON MARLIN AND SWORDFISH

5.1 Biological Research

Robert Humphreys presented recent results of biological research on marlins and swordfish conducted by staff of the Pacific Islands Fisheries Science Center (PIFSC) in Honolulu (ISC/06/MARWG&SWOWG/04). A draft manuscript on the age and growth of swordfish caught in the Hawaii-based pelagic longline fishery has recently been completed and currently undergoing review. Age and growth estimates were based on counts of annulus rings within cross-sections of the second anal fin ray. Results are similar to other studies showing that females grow faster than males after sexual maturity. Growth rates of swordfish from the Hawaii region are appreciably faster than those reported from a study of swordfish off Chinese-Taipei and similar to the faster growth rates recorded from swordfish caught off Chile. Tamaki Shimose, doctoral student at the University of Ryukyus, Okinawa, Japan, recently visited the PIFSC for a two-week period to learn aging techniques and protocols used by staff in their recently completed study of swordfish. Research continues on the horizontal and vertical movement of billfish species in Hawaiian waters through the application of popup satellite archival tags (PSATs). A collaborative research cruise in May 2005 by the SWFSC, Scripps Institute of Oceanography, and PIFSC to collect billfish eggs and larvae off the west coast of the Island of Hawaii has for the first time recorded the co-occurrence of eggs and larvae for swordfish, blue marlin, and shortbill spearfish. A recently published PIFSC paper reports evidence of significant shoaling of Hawaii-based pelagic longline gear based on field collected data recorded by time-depth recorders (TDRs) attached to the gear.

After the presentation, the following points came up in the discussion. The growth curve for striped marlin fit to Chinese-Taipei data by a graduate student differ considerably from other cited work; the reason for this difference is unclear. Sex-specific growth curves do appear in the literature for striped marlin; so, it is unclear whether there is differential growth by gender. It was noted that sex-specific length frequency data is available for striped marlin in the recreational fishery off the Pacific coast of Mexico (Ortega-Garcia et al. 2003) and will be considered in future analysis. Regarding validation of marlin species identifications reported in Hawaii logbooks, market data and observer data are routinely linked and compared to logbook data. In addition, observers are collecting fin-clip tissue samples to be subjected to DNA testing and species identification in instances where species identity in the field is uncertain.

5.2 Biomass Dynamic Model Assessments for Striped Marlin

Shelley Clarke presented a report on a Bayesian surplus production model that was applied to striped marlin (*Tetrapturus audax*) in the North Pacific and used to estimate current and future values of stock status (MARWG&SWOWG/05). This model's main strengths lie in the simplicity of its data requirements (catch data and at least one annual catch rate series) and its ability to incorporate existing information in the form of prior probability distributions for estimated parameters. This function facilitates fitting to times series that are less informative or have incomplete catch histories. The model incorporated a catch series in number (1952-2003), and was successfully fitted to an abundance index based on GLM standardized CPUE (in number) provided in the database that resulted from the November 2005 meeting. Alternative scenarios, including one based on catch in biomass, were tested to determine the sensitivity of the results to various assumptions. Results based on the available data suggest that the current stock is between 30-40% the stock at maximum sustainable yield (MSY stock) and the fishing mortality rate (F), estimated at 0.13 yr^{-1}, slightly exceeds F_{MSY}.

A discrepancy was noted in the trend at the end of the annual CPUE time series (see Fig. 1) compared to a time series based on the quarterly CPUE figures provided in the database. Participants concluded that this could be due to several factors, including that the GLM had quarter and year terms plus interaction terms, as well as area terms. Calculation of an annual CPUE value from quarterly values may have been affected by the omission of such interaction terms.

The priors that were applied to the intrinsic rate of increase (r) were derived from published biological parameters and presented in a working paper in the November 2005 workshop. Concern was raised about the basis for such prior estimates given the importance of the parameters in the model. It was suggested to show the implied priors on MSY, even though these are not explicitly input to the model, because these could be calculated from the priors that are specified. An effort to constrain r in the model resulted in the inability to achieve model convergence. A suggestion was then again made to do more sensitivity testing of r; priors on starting biomass were tested and presented in the paper. This further testing is a consequence of a correlation between r and K.

A long discussion ensued regarding drastic declines in CPUE, how realistic they were, their potential causes (changes in targeting, gear, or other factors), and whether breaking the data series at 1975 and fitting separate models to the two segments might provide some clarity. While the catchability of marlins has declined over the years, the catchability of tunas, particularly bigeye tuna, has increased. A suggestion was made to carefully document changes occurring over time for Japanese longline gear, but it was noted how difficult this was to do quantitatively. Questions were raised about whether the standardization of the CPUE statistics covered both old basket gear and more modern gear, and whether the targeting that has been incorporated into the standardization process adequately does the job. Current studies on this issue continue by various parties. Previously mentioned work in the Hawaii-based fishery using time-depth recorders has indicated that the monofilament mainline gear often fishes shallower than expected. Unfortunately, detailed oceanographic and current data could not be concurrently collected to investigate whether the shoaling was environmentally caused.

Kotaro Yokawa presented another application of a production model analysis to annual catch (t) and abundance index data of the North Pacific striped marlin stock (MARWG&SWOWG/06). Two data sets were applied; one was created at the striped marlin stock assessment workshop in November 2005; the other contains corrections to this database by Japan. Logistic and FOX models were fitted to these data sets using ASPIC software ver.5 (Prager 2004). This assessment indicates that North Pacific striped marlin is currently depleted (Figure 1). However, this result has a great deal of uncertainty because the abundance index underestimates current stock level, and the reliability of catch data is rather low. The relatively lower values (0.3-0.5) of B_1/K (ratio of biomass in starting year to the initial biomass) could mainly be attributed to the fact that the trend of annual abundance index did not reflect the historical change of the stock size of the North Pacific striped marlin. The GLM model currently used in the standardization of CPUE could not fully account for the effect of high CPUE values obtained by the directed sets in the northeast Pacific during the 1960's and the 1980's. As a consequence, the current level of the stock would be underestimated. Further study on the CPUE standardization of Japanese longline vessels and availability of catch data of countries that have not submitted Category I data is necessary to obtain more clear and reliable stock assessment results.

The discussion again turned to considerations about the completeness and quality of the CPUE data during 1952-1962. While the Bayesian Production model was run only using 1962 to current CPUE data and employed sensitivity analysis, the ASPIC model was run using CPUE from 1952 onward. There are issues in using the 1952-1962 CPUE data series. It was noted that the ASPIC assessment using "Data Set 2" (Japan's revised workshop dataset) indicates that the stock has been depleted since 1970 whereas using "Data Set 1" (workshop dataset), indicates that it has been fished since 1960s, with a very flat CPUE trend. Participants noted that whichever data set or model was used, it seems biologically unreasonable that the stock would have been so quickly overfished by 1960-1970. It was pointed out that the production model predicts a strong increase in biomass in the early years, which implies there was a lot of catch prior to 1950's. However, the historical record indicates that the early fishery was relatively small. It was noted that differences in starting biomass as a proportion of K between the Bayesian and ASPIC models may result from a suite of factors and will require additional testing. It was further noted that the ASPIC model used catch in biomass and catch rate based on catch number. Such modeling presumes that size has remained constant and requires verification for North Pacific striped marlin.

Kevin Piner presented an assessment of North Pacific striped marlin using an age-structured production model formulated within Stock Synthesis 2 (MARWG&SWOWG/07). A Beverton and Holt spawner recruit (S/R) relationship was assumed and recruitment was deterministic. Selectivity patterns for fisheries were estimated using proportion at length data, but the contribution of the length data to the total likelihood was down-weighted. The Japanese distant water longline fleet was the primary tuning CPUE series. The model estimates a population that declined to 10-40% of unfished spawning biomass by 2005 (Figure 2). In this approach, the estimates of S/R steepness, *h*, and unfished recruitment were highly correlated; thus more work is necessary to eliminate these correlations. Additional uncertainty remains about the assumption of constant catchability of the CPUE data series.

It was noted that similarities in CPUE and selectivity patterns occur between spatial regions, therefore maintaining 5 regions within the assessment model may not be necessary. In response to the comment about correlations between *h* and initial recruitment, it was recommended to fix *h* and estimate individual year recruitment deviations.

The Japanese longline size frequency data used in the analysis comes from two sources: commercial and training vessels. Smaller sized fish are recorded on the training vessels compared to the commercial fleet. Commercial vessels may be reporting only what is retained. The appearance of large fish in the purse seine size composition data relative to other fisheries in the North Pacific was noted and potential reasons noted, such as the use of different size metrics (EFL vs. LJFL) and whether very large fish move into the EPO. It was noted that some Mexican and southern California recreational fisheries have size data that could be compared to the purse seine data.

5.3 Stock Status

The results of all models indicated that stock biomass has been reduced. For models that provide estimates of current biomass relative to starting biomass, the results indicated the population has declined to 10-45% of initial biomass. In contrast, "splitting" the abundance series in the mid 1970s, and assuming this represents a change in targeting, indicated a more optimistic view (current biomass above biomass at MSY). While the results of the current assessments are provisional due to a suite of unresolved issues, the MARWG recommends that fishing mortality not exceed current levels.

The unresolved issues include the assumption that catchability in the distant water Japanese longline fishery has remained constant. An attempt was made to account for this in previous CPUE standardization analyses, however, hooks-per-basket data is available in the data series only after 1975. The observed decline in CPUE occurred prior to 1975, thus potential targeting changes may not be detected in the CPUE standardizations (Figure 3). The ability to account for targeting changes in the CPUE standardization could have major effects on the assessment. Further work on this is needed. However, the Hawaii longline CPUE series, which covers a shorter and more recent time period, and thus not as sensitive to assumptions about catch ability, indicates recent declines in catch rates and a cause for concern.

Unresolved issues in the catch data persist and remain to be addressed. For example, clarifications to the commercial catch data series of Korea and Chinese-Taipei. Also, the fact that Mexico's data are from a recreational fishery that practices catch-and-release, needs to be accounted for.

It was also noted that the basic biology of striped marlin needs additional research, with an emphasis on stock structure, life history parameters, and movement. The next assessment will include updated catch and effort data and is scheduled to be completed prior to the next ISC Plenary Meeting in 2007.

6.0 Future plans for Marlin WG

To facilitate future striped marlin stock assessments, the MARWG proposed five basic research areas. In addition, the MARWG also agreed to initiate actions towards completion of a Pacific-wide Blue Marlin assessment. This will require the establishment of collaborations between a variety of scientific organizations, including, but not limited to, the IATTC and SPC. The Chair of the MARWG will contact the scientific organizations and discuss ISC intentions regarding blue marlin. It is the view of the MARWG Chair that such an undertaking needs to be conducted collaboratively, and all efforts will be made to ensure this goal is maintained.

Specific activities for each of the striped marlin research areas follow.

6.1 CPUE data

There was consensus that drastic changes in CPUE need to be verified, and several ways forward were suggested as listed below. However, since a consensus was not reached on a particular future activity, the Working Group needs to continue exploring alternative ways of proceeding. Working with other ISC species working groups, as well as other RFOs, would be beneficial.

- For use in stock assessment, document the pros and cons of using data starting in 1952 or 1962.

- Investigate pros and cons of spitting the time series in the 1970's. There was a large drop in CPUE in the 1970's, though it was not the largest. The cause or causes for this decline need further work. It was pointed out that hooks-per-basket (HPB) has been incorporated into the standardization. If we are hypothesizing some other as yet un-described effect, it may be very hard to discern in the traditional data. This approach has been applied to each species separately. Since the single species CPUE standardization procedures have demonstrated that catchability of some species have declined while other have increased, a multi-species standardization process should be attempted. It was also suggest that comparing the species composition estimated using alternative sampling gears could help address this issue.

6.2 Size data

- Studies should be conducted to ensure that all measurements are being taken using the same metrics.

- To investigate the occurrence of unusually large fish in the EPO purse seine fishery, the unidentified year in which the Japanese longline fishery is said to have also caught similarly large fish should be examined. The study should be conducted over a fine spatial scale.

6.3 Annual Catch (Category I) Data

- Resolving issues with catch data from Korea and Chinese-Taipei has the highest priority.

- While annual catch data should be reported in weight, it is often collected in number of fish and converted to weight. In this case, members should submit catch in both weight and number and document the conversion formulas and process involved.

6.4 Stock assessment models

- The three modeling efforts (Bayesian surplus production, traditional surplus production (ASPIC), and stock synthesis) should continue.

- Additional sensitivity analyses should be conducted for all models.

- Start moving into more advanced models as a means of narrowing the estimates of impact on the stock.

- Continue with the development of alternative statistical CPUE standardization procedures (e.g., statHBS).

6.5 Data in general

- The Plenary should ask Chinese-Taipei, China, and Korea to submit Category I, II, and III fishing data.

- Use the stock assessment process to document the need for data and improvements in the coverage and quality of submitted data.

- Develop formulas and procedures for converting annual catch data currently reported in numbers to weight.

7.0 OPENING OF SWORDFISH WORKING GROUP (SWOWG) SESSION

The SWOWG Chair noted that the focus of this meeting was to begin preparation toward a North Pacific stock assessment. The WCPFC Northern Committee at its December 2005 meeting indicated that a stock assessment for swordfish would be conducted and mentioned the year 2006. The SWOWG Chair proposed that the process begin at this meeting and presented a detailed timeline within which a sequence of specific data tasks would need to be completed prior to the actual model assessment runs (see Attachment 4). The time period of these sequential data tasks require the scheduling of two intercessional SWOWG meetings to be held in-between each of the next two annual Plenary sessions in addition to SWOWG meetings held in association with the next two Plenary Sessions in 2007 and 2008. Given the need for other stock assessments to be conducted by the ISC and the overlapping membership with the MARWG, which is proceeding with an assessment of striped marlin, the members concluded that the projected 2008 completion date for the next swordfish stock assessment was appropriate, unless an age-structured modeling approach was found to be desirable and required more time.

During the discussion, it was emphasized that a dialog needed to be established with the Northern Committee to clarify their priorities and to communicate the SWOWG's perspective that given the status of the resource indicated by the 2004 assessment that it was desirable to follow a process to address uncertainties encountered in the previous assessment. However, it was recommended that some of the informal modeling be initiated early as a means of evaluating alternative CPUE data sets and other issues. Regarding data needed to conduct the assessment, participants recommended cross checking of ISC data sets with those maintained by the WCPFC and IATTC. Further, participants stressed that the SWOWG needed to work closely with the STATWG and member data correspondents to verify and improve data submitted to the ISC as well as to document the processes to compile the data.

8.0 REVIEW OF SWORDFISH FISHERIES

8.1 United States – ISC/06/MARWG&SWOWG/08

Russell Ito reported on the U.S. swordfish fisheries in the North Pacific Ocean. The swordfish fishery is made up of three distinct fleets, namely harpoon, gill net, and longline. The harpoon fishery is the oldest dating to the early 1900s, reached its highest levels in the 1970s, and continues now at a low level. The California drift net fishery began in 1980, expanded rapidly, and maintained high catches through the mid 1990s, and has since declined. The Hawaii-based longline fishery began in 1988, grew rapidly to a peak in 1993, and remained as the largest U.S. swordfish fishery through 2000. The California-based fishery dominated from 2001 to 2004. The Hawaii-based longline fishery for swordfish was reopened under a new management regime in April 2004. Concurrently, the California-based longline swordfish fishery was closed. The Hawaii-based longline fishery replaced the California-based longline fishery as the largest producer of swordfish in 2005, the first complete year under the new regime. The number of boats participating in each of these fisheries varied similarly to the catch trends. The harpoon and drift gill net fisheries take place in coastal eastern Pacific waters. Generally, the Hawaii- and California-based swordfish fisheries fished on the high seas in central Pacific waters north of Hawaii. CPUE for each of these fisheries was quite variable but generally showed little indication of trend.

In contrast to the apparent declines in the U.S. harpoon and drift-net fleets while CPUE remained relatively stable, declines in Japanese fisheries were associated with declines in CPUE. The declines in these U.S. fleets were thought to be related to economic factors rather than resource abundance, and continuation of the harpoon fishery was social-based. Regarding the U.S. longline fishery, the CPUE for the Hawaii-based fleet has remained fairly stable while that for the California-based fleet has increased. There is no clear reason for this trend, but there is some indication that the California fleet tended to fish in waters slightly north of the Hawaiian Islands fleet. In response to a question about the industry using satellite information to guide their fishing operations, it was noted that PIFSC staff have been distributing satellite sea surface temperature charts to fishermen.

8.2 Japan – ISC/06/MARWG&SWOWG/03

The swordfish catch by offshore and distant water longline vessels in 2004 (6,510 MT) in the North Pacific was 20% higher than that in 2003. The offshore longline fleet accounted for more than half of these catches using swordfish targeted sets. Limited information from port samplers suggests that relatively good catches of swordfish were observed in the winter fishing season of 2005 - 2006.

8.3 Mexico

Luis Fleischer described the swordfish fishery in Mexico based on the National Progress Report document to be submitted to the Plenary later this week. The development of the swordfish fishery in Mexico has two different historical periods. One was started in 1964 using longliners and the second began in 1986 with the introduction of gillnets. However, since 1990, Mexican law reserved all billfish landings (including the swordfish) to sport fisheries operations within a defined marine zone around the Mexican coast. This regulation designated a strip of fifty miles from the Mexican coast as a reserved zone for these activities. For those species reserved to the sport fisheries, the swordfish is the only billfish commercially captured outside the defined corridor. The swordfish fleet consisted of 24 active fishing boats in 1992 with 21 remaining active today. The main ports used by this fishery are Ensenada, San Carlos, La Paz on the peninsula of Baja California, and Mazatlan on the mainland coast of Mexico. The fleet operates mainly in the autumn and winter and between the latitudes 21°30´N and 32°20´N. The three highest catch years were 1981, 1990, and 1998 yielding 1,575, 2,650, and 3,603 mt, respectively. The highest historic record for this fishery occurred in 1998. The fishery is monitored using logbooks and previously by an observer program.

9.0 FISHERY STATISTICS

Swordfish catch statistics (Category I data) from the United States, Japan, Mexico, Chinese-Taipei, and Korea for fisheries in the North Pacific were updated by Al Coan and appear in Table 2. The table does not reflect the total catch of swordfish in the North Pacific, as data were unavailable from other fleets operating in the region; only statistics presented at the SWOWG meeting are included in Table 2. There is a need to complete the catch table (Table 2) by incorporating data from other countries whose vessels catch swordfish in the North Pacific. The SWOWG strongly recommends that all ISC data contributors ensure that their respective data correspondents submit available Category I, II, and III data to the ISC Database Administrator in accordance with established ISC protocols.

10.0 REVIEW OF DATA USED IN 2004 SWORDFISH STOCK ASSESSMENT

Robert Humphreys presented a review of the data used in the previous North Pacific swordfish stock assessment conducted in December 2003. Details of this previous stock assessment using MULTIFAN-CL are contained within the ISC4 SWOWG paper ISC/04/SWOWG/07. The assessment was limited to the area of the western and central North Pacific bound by 10° and 50° North Latitude and west of ~140° West longitude. Data was aggregated into 4 regions (NW, SW, NE, and SE) with north-south divided at 30° North latitude and east-west divided along 160° East longitude. Standardized CPUE (sCPUE) data series from 14 North Pacific fisheries were included in the assessment. Eight of these fisheries were from the Japan offshore and distant water longline fleet over the time series 1952 to first quarter 2003. Each of the four regions consisted of two types of sets; shallow “night” sets (swordfish-targeted) and “other” sets (non-targeted). Data for these 8 fisheries was aggregated by set type, region, year, and quarter.

Two other fisheries were from the Hawaii-based pelagic longline fleet operating in the NE region (targeted fishery) and the SE region (non-targeted fishery). The data series used for these fisheries included 1990-2002 and the data aggregated by region, year, and quarter. The remaining four fisheries were from the Japan high-seas driftnet fisheries (non-targeted) operating in each of the four regions. The data time series used included the 1970s to early 1990s and the data was aggregated by region, year, and quarter. Length frequency data from the Japan offshore and distant water longline fleet and from the Hawaii longline fleet was utilized in the assessment. Since no length-frequency data was available from the high-seas driftnet fleet, length data collected from the Japan coastal driftnet fishery operating in the NW region was utilized. Length frequency data from longline sets conducted by Japan training vessels were also available but not used in the assessment due to an inability to separate this data into set types and questions regarding how representative it was of the Japan commercial longline fleets. An analysis of the length frequency data among regions and fisheries indicated that young-of-the year fish were present as a distinct length mode (centered at ~70 cm EFL) in the SE region of the Hawaii longline fishery but absent from any of the Japan longline fisheries. The latter fisheries were thought to omit measurements on these smaller fishes and thereby truncate their associated length frequency distributions.

Results of the MULTIFAN-CL model analyses implied that swordfish in the surveyed North Pacific area were lightly exploited by the fisheries. These results were contingent on unusually high estimates of 0.6 yr^{-1} and higher for natural mortality. When natural mortality was fixed at 0.2 yr^{-1} exploitation increased but remained modest with then current levels of fishing mortality averaging about one-third of that at MSY. Sex differences in growth rate and movement of fish based on tagging data were not incorporated into the model. Furthermore, the indications of low exploitation from the model could also be a consequence of the lack of an informative signal in the fishery data. In the context of the limitations in the analysis, the optimistic results of the MULTIFAN-CL model need to be viewed with caution and represents a first attempt to assess the stock of North Pacific swordfish using a fully integrated model.

Regarding the Japanese longline fisheries, it was pointed out that 5-6 (HPB) gear was used to target swordfish in the early years, but this has changed in more recent years. This gear change would cause the results to be somewhat more optimistic in recent years. It was also suggested that dividing the fisheries into target and non-targeting components as done in this study could result in a more optimistic outcome. In addition, the Japanese fleet fishing for swordfish has started setting shallower in more recent years; consequently, swordfish catches may have increased. It was also noted that dividing the fishery into areas requires information on movement for the model to work effectively; however, there is limited swordfish tagging information. This brought up a broader discussion of stock structure and genetic evidence as well as the areas of authority of the IATTC and the WCPFC.

11.0 SWORDFISH SPECIFIC DATA NEEDS

Robert Humphreys discussed specific needs in the fishery data to include procedures to identify swordfish-targeted versus non-targeted effort, particularly in identifying changes in fishery targeted data series which switch to mixed-targeted fisheries, or when the target species is unknown. In previous studies, researchers have divided the North Pacific into a number of different regions for their analyses. The SWOWG will need to come to a consensus on how these regions will be defined and incorporate both biological and fisheries considerations in the determination of how many regions are to be identified and their geographic boundaries. As noted previously for marlins, the Japanese CPUE standardizations previously done on an annual basis need to be redone and updated on a quarterly basis.

The pronounced sexual dimorphism in this species will require biological parameters to incorporate sex-specific data on growth rates, size and age at 50% maturity, and length and weight frequency. Size-specific sex ratios and size and sex-specific latitudinal distributions will also be important. Currently, this information is available for the central North Pacific but may be incomplete for the western and eastern portions of the North Pacific. Other life history information to consider is the distinct separation between the higher latitude (north of 35°N latitude) fishing grounds inhabited by a greater percentage of larger sized female fish, the relatively greater occurrence of males south of 27° C, the prevalence of smaller sized fish of both sexes below 22° N, and the restricted distribution of egg and larval stages to subtropical and tropical waters with minimum sea surface temperatures of 24° C.

12.0 POTENTIAL DATA SOURCES BY FISHERY FOR EACH COUNTRY/ORGANIZATION

A table of potential data sources (see Table 3) was developed for North Pacific swordfish following the table format used to compile similar data sources for North Pacific striped marlin during the Joint Intercessional Meeting of the Marlin & Swordfish Working Groups held in Shimizu from August 29 to September 2, 2005. During the current meeting, data sources were updated for Japan, U.S.A. California, U.S.A. Hawaii, Mexico, and IATTC. Updates for Chinese-Taipei were provided prior to the meeting via email. Due to the non-participation of China and Korea in the working group meeting, potential data sources for these countries were not identified. Two new fishery data sources were added to Table 3; one for the “harpoon” fishery and an additional row for “longline” to distinguish longline fisheries from countries other than Japan and Chinese-Taipei. This is necessary since “distant longline”, offshore longline”, and coastal longline” refer more to the gross tonnage size of the vessels in the fishery rather than the distance they fish from their home ports. The term “coastal gillnet” also refers to vessel tonnage in the Japan fishery rather the proximity of the fishing grounds to the home port. For countries with gillnet fisheries other than Japan, the offshore extent of the fishery was noted in the appropriate data cell. Cells with the notation “N/A” indicate situations where a particular fishery is not conducted by an ISC member country. Data source cells left blank indicate that further investigation is needed to determine what data is available.

The names of data contacts for country/organization were updated in Table 3 and will be contacted periodically during the interim period between now and the next Intercessional meeting (October 2006) regarding there progress in assembling Category I, II, and III data from their fisheries and other data sources. During this interim period, the SWOWG chair will develop several alternate schemes to subdivide the North Pacific into sub-regions for which the Category II and III data can be initially aggregated into. The SWOWG chair will communicate with members of the SWOWG to reach a consensus on which sub-region divisions are most appropriate. Establishment of these sub-regions will facilitate the assembly of catch data by each country/organization prior to the next (October 2006) Intercessional meeting.

13.0 RESEARCH PLAN

The most recent updates of the SWOWG Research Plans occurred during the Joint Intercessional MARWG & SWOWG meeting held in Shimizu, Japan, during August 29 to September 2, 2005 (see Attachment 6). The research plan was not modified during the current SWOWG session.

14.0 TIME AND PLACE OF NEXT INTERCESSIONAL MEETING

Discussions on the timing of the next 5-day joint intercessional meeting of the MARWG & SWOWGs were conducted in relation to possible conflicts with other meetings associated with WCPFC, IATTC, and ICCAT. Consensus was reached that the best available time period was the week of October 23-27, 2006. Three possible ISC host member sites are under consideration and will be further evaluated.

15.0 PROPOSAL FOR WORLD SWORDFISH MEETING

At the August 2005 Intercessional meeting of the MARWG & SWOWGs, a proposal to convene a World Symposium on Swordfish was presented. One of the responsibilities of the SWOWG is to periodically convene a swordfish symposium. The last symposium was convened in Hawaii in January 1997 and primarily focused on the Pacific region. The next proposed symposium would mark the first world-wide gathering of scientists to discuss developments in ecological, biological and resource assessment research on swordfish. Late 2007 was initially suggested as a possible date for the symposium, and a European venue was suggested. The proposal has been informally discussed earlier with ICCAT representatives and there was support for the proposal.

The SWOWG again discussed the proposal, and recommended that the ISC take the lead on organizing the symposium and to first form a multi-agency/organization steering committee to ensure world-wide participation. While a venue has not been finalized, it was recommended that the symposium convene in late 2008 after the SWOWG has completed the North Pacific swordfish stock assessment.

16.0 CLOSING REMARKS

The MARWG & SWOWGs adopted the report and forwarded it to the Plenary. The Chairman's expressed their appreciation to the rapporteurs and to all participants for their contributions and cooperation in completing a successful meeting. The MARWG & SWOWG Chairs recognized the efforts and contributions of the SWFSC, and passed on a big mahalo.

Table 1. 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 ().

	Japan							Chinese-Taipei [1,2]				Costa Rica [1]	Korea			Mexico			United States					Grand Total
Year	Distant-water and Offshore Longline	Coastal Longline	Other Longline	Small Mesh Gillnet	Large Mesh Gillnet	Other	Total	Distant-water Longline	High-seas Drift Gillnet	Other	Total	Sport	Longline	High-seas Drift Gillnet	Total	Longline	Sport [1]	Total	Longline	Troll	Handline	Sport [1]	Total	
1952	2,901		722	0	0	1,564	5,187				0		-		0			0				23	23	5,210
1953	2,138		47	0	0	954	3,139				0		-		0			0				5	5	3,144
1954	3,068		52	0	0	1,088	4,208				0		-		0			0				16	16	4,224
1955	3,082		28	0	0	1,038	4,149				0		-		0			0				5	5	4,154
1956	3,729		59	0	0	1,996	5,785				0		-		0			0				34	34	5,819
1957	3,189		119	0	0	2,459	5,766				0		-		0			0				42	42	5,808
1958	4,106		277	0	3	2,914	7,301				0		-		0			0				59	59	7,360
1959	4,152		156	0	2	3,191	7,501				0		-		0			0				65	65	7,566
1960	3,862		101	0	4	1,937	5,905				0		-		0			0				30	30	5,935
1961	4,420		169	0	2	1,797	6,388				0		-		0			0				24	24	6,412
1962	5,739		110	0	8	1,912	7,770				0		-		0			0				5	5	7,775
1963	6,135		62	0	17	1,910	8,124				0		-		0			0				68	68	8,193
1964	14,304		42	0	2	2,344	16,691				0		-		0			0				58	58	16,749
1965	11,602		19	0	1	2,796	14,418			608	608		-		0			0				23	23	15,049
1966	8,419		112	0	2	1,573	10,106			677	677		-		0			0				36	36	10,819
1967	11,698		127	0	3	1,551	13,379	2		643	646		-		0			0				49	49	14,073
1968	15,913		230	0	3	1,040	17,186	1		591	592		-		0			0				51	51	17,829
1969	8,544	600	3	0	3	2,630	11,780	2		814	816		-		0			0				30	30	12,626
1970	12,996	690	181	0	3	1,029	14,899	0		722	722		-		0			0				18	18	15,639

[1] Estimated from catch in number of fish

[2] Data from assessment table

Table 1. Continued.

	Japan							Chinese-Taipei[1,2]				Costa Rica[1]	Korea			Mexico			United States					Grand Total
Year	Distant-water and Offshore Longline	Coastal Longline	Other Longline	Small Mesh Gillnet	Large mesh gillnet	Other	Total	Distant-water Longline	High-seas Drift Gillnet	Other	Total	Sport	Longline	High-seas Drift Gillnet	Total	Longline	Sport[1]	Total	Longline	Troll	Handline	Sport[1]	Total	
1971	10,965	667	259	0	10	2,016	13,917	0		701	701		-		0			0				17	17	14,635
1972	7,006	837	145	0	243	990	9,221	9		480	489		-		0			0				21	21	9,731
1973	6,299	632	118	0	3,265	630	10,944	1		821	822		-		0			0				9	9	11,774
1974	6,625	327	49	0	3,112	775	10,888	24		835	859		-		0			0				55	55	11,802
1975	5,193	286	38	0	6,534	685	12,736	64		571	635		-		0			0				27	27	13,398
1976	4,996	244	34	0	3,561	571	9,406	32		497	530		-		0			0				31	31	9,967
1977	2,722	256	15	0	4,424	547	7,964	17		1,030	1,046		-		0			0				41	41	9,052
1978	2,464	243	27	0	5,593	418	8,745	0		0	0		-		0			0				37	37	8,782
1979	4,898	366	21	0	2,532	526	8,343	26		464	490		-		0			0				36	36	8,870
1980	5,871	607	5	0	3,467	537	10,488	61		1,442	1,503		-		0			0				33	33	12,024
1981	3,957	259	12	0	3,866	538	8,632	17		669	687		-		0			0				60	60	9,379
1982	5,211	270	13	0	2,351	655	8,500	7		660	667		-		0			0				41	41	9,208
1983	3,575	320	10	22	1,845	792	6,564	0		0	0		-		0			0				39	39	6,604
1984	3,335	386	9	76	2,257	719	6,782	0		0	0		-		0			0				36	36	6,818
1985	3,698	711	24	40	2,323	732	7,528	0		972	972		-		0			0				42	42	8,541

[1] Estimated from catch in number of fish

[2] Data from assessment table

Table 1. Continued.

Year	Japan							Chinese-Taipei[1,2]				Costa Rica[1]	Korea			Mexico			United States					Grand Total
	Distant-water and Offshore Longline	Coastal Longline	Other Longline	Small Mesh Gillnet	Large Mesh Gillnet	Other	Total	Distant-water Longline	High-seas Drift Gillnet	Other	Total	Sport	Longline	High-seas Drift Gillnet	Total	Longline	Sport[1]	Total	Longline	Troll	Handline	Sport[1]	Total	
1986	5,178	901	33	48	3,536	571	10,267	0		601	601		-		0	-		0				19	19	10,888
1987	5,439	1,187	6	32	1,856	513	9,033	31		1,035	1,066		-		0	-		0	272	30	1	28	331	10,429
1988	5,768	752	7	54	2,157	668	9,406	7		1,167	1,174		-		0	-		0	504	54	1	30	589	11,169
1989	4,582	1,081	13	102	1,562	537	7,877	8		1,337	1,345		-		0	-		0	612	24	0	52	688	9,910
1990	2,298	1,125	3	19	1,926	545	5,916	2		1,284	1,287		-		0	-	181	181	538	27	0	23	588	7,971
1991	2,677	1,197	3	27	1,302	506	5,712	36		1,149	1,185	106	-		0	-	75	75	663	40	0	12	715	7,793
1992	2,757	1,247	10	35	1,169	302	5,520	1		646	647	281	-		0	-	142	142	459	38	1	25	523	7,114
1993	3,286	1,723	1	0	828	443	6,281	5		365	370	438	-		0	-	159	159	471	68	1	11	551	7,798
1994	5,522	1,284	1	0	1,443	383	8,633	1		318	319	521	-		0	-	179	179	326	34	0	17	377	10,029
1995	5,596	1,840	3	0	970	278	8,686	27		151	178	153	-		0	-	190	190	543	52	0	14	609	9,817
1996	4,248	1,836	4	0	703	152	6,943	26		169	195	122	348		348	-	237	237	418	54	1	20	493	8,337
1997	4,697	1,400	3	0	813	163	7,076	59		361	420	138	828		828	-	193	193	352	38	1	21	412	9,068
1998	4,377	1,975	2	0	1,092	304	7,750	90		263	354	144	519		519	-	345	345	378	26	0	23	427	9,538
1999	2,600	1,551	4	0	1,126	183	5,464	66		0	66	166	352		352	-	266	266	364	28	1	12	405	6,719
2000	1,766	1,109	8	0	1,062	297	4,242	153		236	389	97	436		436	-	312	312	200	14	1	10	225	5,702
2001	2,077	1,326	11	0	1,077	237	4,728	121		160	281	151	206		206	-	237	237	351	42	2		395	5,998
2002	1,730	957	5	0	1,264	291	4,247	251		321	572	76	153		153	-	305	305	226	29	0		255	5,608
2003	1,907	870	3	0	1,064	203	4,047	-		172	172	79	172		172	-	322	322	538	28	0		566	5,358
2004	(1,555)	-			-	-	(1,555)	-		(134)	(134)	(19)	(75)		(75)	-	-	0	(384)	(56)	(2)		(442)	(2,225)
2005	-	-			-	-	0	-		-	0	-	(115)		(115)	-	-	0	(377)	-	-		(377)	(492)

[1] Estimated from catch in number of fish
[2] Data from assessment table

Table 2. 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 ( ).

Year	Japan								Chinese-Taipei[4]			Korea	Mexico	United States[5]						Grand Total
														Hawaii	California					
	Distant-water and Offshore Longline[2]	Coastal Longline	Driftnet	Harpoon	Other Bait Fishing	Trap Net	Other[3]	Total	Distant-water Longline	Offshore Longline	Total	Longline	All Gears	Longline	Longline	Gill Net	Harpoon	Unknown	Total	
1952	9,138	941	0	2,558	-	-	79	12,716	-	-	-	-	-	-	-	-	-	-	-	12,716
1953	11,180	439	0	1,399	-	-	124	13,142	-	-	-	-	-	-	-	-	-	-	-	13,142
1954	12,957	394	0	810	-	-	124	14,285	-	-	-	-	-	-	-	-	-	-	-	14,285
1955	13,784	326	0	818	-	-	176	15,104	-	-	-	-	-	-	-	-	-	-	-	15,104
1956	15,407	308	0	772	-	-	86	16,573	-	-	-	-	-	-	-	-	-	-	-	16,573
1957	14,956	334	0	855	-	-	71	16,216	-	-	-	-	-	-	-	-	-	-	-	16,216
1958	19,336	341	0	1,063	-	-	96	20,836	-	-	-	-	-	-	-	-	-	-	-	20,836
1959	18,034	365	0	890	-	-	69	19,358	-	-	-	-	-	-	-	-	-	-	-	19,358
1960	21,091	351	1	1,191	-	-	93	22,727	-	-	-	-	-	-	-	-	-	-	-	22,727
1961	20,721	350	1	1,333	-	-	40	22,445	-	-	-	-	-	-	-	-	-	-	-	22,445
1962	10,559	377	0	1,369	-	-	55	12,360	-	-	-	-	-	-	-	-	-	-	-	12,360
1963	10,162	398	0	743	-	-	74	11,377	-	-	-	-	-	-	-	-	-	-	-	11,377
1964	5,974	391	4	1,006	-	-	82	7,457	-	-	-	-	-	-	-	-	-	-	-	7,457
1965	7,786	419	0	1,908	-	-	222	10,335	-	-	-	-	-	-	-	-	-	-	-	10,335
1966	8,970	413	0	1,725	-	-	59	11,167	-	-	-	-	-	-	-	-	-	-	-	11,167
1967	10,196	484	0	891	-	-	52	11,623	-	261	261	-	-	-	-	-	-	-	-	11,884
1968	8,295	536	0	1,539	-	-	1,167	11,537	-	281	281	-	-	-	-	-	-	-	-	11,818
1969	7,792	296	0	1,557	-	-	1,246	10,891	0	292	292	-	-	-	-	-	-	-	-	11,183
1970	5,659	427	0	1,748	-	-	1,049	8,883	-	182	182	-	-	5	-	-	612	10	627	9,692

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

[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] For 1952-1970 "Other" refers to catches by other bait fishing methods, trap nets, and various unspecified gears.

For 1971-2002 "Other" excludes estimated catches by other bait fishing methods and trap nets.

[4] Offshore longline category includes some catches from harpoon and other fisheries but does not include catches unloaded in foreign ports. Estimates of catches for 2002 are preliminary.

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

Table 2. Continued - Swordfish

	Japan								Chinese-Taipei[4]			Korea	Mexico	United States[5]						Grand Total
														Hawaii	California					
Year	Distant-water and Offshore Longline[2]	Coastal Longline	Driftnet	Harpoon	Other Bait Fishing	Trap Net	Other[3]	Total	Distant-water Longline	Offshore Longline	Total	Longline	All Gears	Longline	Longline	Gill Net	Harpoon	Unknown	Total	
1971	5,095	332	1	473	12	37	54	6,004	-	257	257	-	-	1	-	-	99	3	103	6,364
1972	4,453	520	55	282	8	1	25	5,344	-	352	352	-	2	0	-	-	171	4	175	5,873
1973	4,421	404	720	121	2	23	37	5,728	-	460	460	-	4	0	-	-	399	4	403	6,595
1974	4,388	508	1,304	190	11	16	164	6,581	1	460	461	-	6	0	-	-	406	22	428	7,476
1975	5,603	602	2,672	205	33	18	45	9,178	29	470	499	-	-	0	-	-	557	13	570	10,247
1976	6,087	691	3,488	313	165	14	76	10,834	23	487	510	-	-	0	-	-	42	13	55	11,399
1977	7,180	834	2,344	201	62	7	57	10,685	36	527	563	-	-	17	-	-	318	19	354	11,602
1978	7,273	984	2,475	130	96	22	62	11,042	-	436	436	-	-	9	-	-	1,699	13	1,721	13,199
1979	7,769	973	983	161	38	15	76	10,015	7	608	615	-	7	7	-	-	329	57	393	11,030
1980	6,005	824	1,746	398	22	15	33	9,043	10	679	689	-	380	5	-	160	566	62	793	10,905
1981	7,039	675	1,848	129	40	9	73	9,813	2	567	569	-	1,575	3	1	461	267	20	752	12,709
1982	6,064	839	1,257	195	51	7	43	8,456	1	758	759	-	1,365	5	2	911	156	43	1,117	11,697
1983	7,692	955	962	166	27	9	120	9,931	0	789	789	-	120	5	1	1,321	58	378	1,763	12,603
1984	7,177	1,141	971	117	91	13	125	9,635	-	954	954	-	47	3	14	2,101	96	678	2,892	13,528
1985	9,335	980	1,026	191	59	10	136	11,737	-	742	742	-	18	2	46	2,368	211	792	3,419	15,916

Table 2. Continued - Swordfish

Year	Japan								Chinese-Taipei[4]			Korea	Mexico	United States[5]						Grand Total
														Hawaii	California					
	Distant-water and Offshore Longline[2]	Coastal Longline	Driftnet	Harpoon	Other Bait Fishing	Trap Net	Other[3]	Total	Distant-water Longline	Offshore Longline	Total	Longline	All Gears	Longline	Longline	Gill Net	Harpoon	Unknown	Total	
1986	8,721	960	1,170	123	32	9	186	11,201	-	652	652	-	422	2	4	1,594	236	696	2,532	14,807
1987	9,495	819	910	87	29	11	198	11,549	3	1,515	1,518	-	550	24	4	1,287	211	300	1,826	15,443
1988	8,574	665	1,048	173	12	8	206	10,686	-	1,041	1,041	-	613	24	19	1,092	180	344	1,659	13,999
1989	6,690	742	1,397	362	15	10	215	9,431	50	1,491	1,541	-	690	218	29	1,050	54	224	1,575	13,237
1990	5,833	687	1,026	128	11	4	53	7,742	143	1,309	1,452	-	2,650	2,436	18	1,028	50	137	3,669	15,513
1991	4,809	799	424	153	18	5	84	6,292	40	1,390	1,430	-	861	4,508	39	836	16	137	5,536	14,119
1992	7,234	1,173	840	381	15	6	56	9,705	21	1,473	1,494	-	1,160	5,700	95	1,332	74	44	7,245	19,604
1993	8,298	1,394	292	309	41	4	3	10,341	54	1,174	1,228	-	812	5,909	165	1,400	169	36	7,679	20,060
1994	7,366	1,357	421	308	30	4	7	9,493	-	1,155	1,155	-	581	3,176	740	799	153	8	4,876	16,105
1995	6,422	1,386	561	423	33	7	2	8,834	50	1,135	1,185	-	437	2,713	279	755	96	31	3,874	14,330
1996	6,916	1,063	428	597	44	4	5	9,057	9	1,130	1,139	12	439	2,502	347	752	81	10	3,692	14,339
1997	7,002	1,400	365	346	57	5	6	9,181	15	2,190	2,205	246	2,365	2,881	664	707	84	3	4,339	18,336
1998	6,233	1,975	470	476	66	2	6	9,228	20	1,900	1,920	123	3,603	3,263	422	924	48	13	4,670	19,544
1999	5,557	1,551	724	416	46	5	3	8,302	70	2,234	2,304	104	1,136	3,100	1,333	606	81	2	5,122	16,968
2000	6,180	1,109	808	497	45	5	13	8,657	325	2,470	2,795	161	2,216	2,949	1,908	646	90	9	5,602	19,431
2001	6,932	1,326	732	230	28	15	11	9,274	1,039	2,727	3,766	349	780	220	1,763	375	52	5	2,415	16,584
2002	6,227	-	1,164	201	24	11	15	7,642	1,633	2,511	4,144	350	465	204	1,320	302	90	3	1,919	14,520
2003	5,339	-	1,198	149	23	4	10	6,723	1,084	3,196	4,280	311	671	147	1,812	216	107	0	2,282	14,267
2004	(6,510)	-	-	-	-	-	-	(6,510)	(1,301)	(3,167)	(4,468)	(350)	-	(213)	(898)	(169)	(62)	(37)	(1,379)	(12,707)
2005	-	-	-	-	-	-	-	0	-	-	0	(407)	-	(1,360)	-	(148)	(50)	(0)	(1,558)	(1,965)

Table 3. List of potential data sources under consideration for swordfish stock assessment.

Fishery/Source	Data Cat.	Spatial Scale	Japan	USA California	USA Hawaii	IATTC	Chinese Taipei	Mexico	Korea	SPC	China
Country/Organ. (Data Contact)			Yokawa	Coan	Coan, (Skillman)	Hinton	Chang	Fleischer	Moon	Lawson	?
Distant Longline	**I**		Yes	N/A	N/A	No	NPALBWG	N/A	NPALBWG	Ask?	Ask?
	II	1° x 1°	1960s?	N/A	N/A	Various by flag.	5° x 5°	N/A	5° x 5°	Ask?	Ask?
	III		1970s- EFL, proc-Wt (few)	N/A	N/A	Yes	No	N/A	No	Ask?	Ask?
Offshore Longline	**I**		Yes	N/A	N/A	Partial	Yes	N/A		Ask?	Ask?
	II	1° x 1°	1960s?	N/A	N/A	Various time	No	N/A		Ask?	Ask?
	III		1970s- EFL, proc. Wt	N/A	N/A	No	No	N/A		Ask?	Ask?
Coastal Longline	**I**		Yes	N/A	N/A	Partial	Partial	N/A			
	II	1° x 1°	1994??	N/A	N/A	1° x 1° lit	No	N/A			
	III		EFL, proc. Wt	N/A	N/A	Little	No	N/A			
Longline	**I**		N/A	Yes	Yes	Partial	N/A	Yes, 50-75 nmi offshore			
	II		N/A	1990?	1991?	Various by flag	N/A	Maybe			
	III		N/A	EFL, 1994-	No	Spotty	N/A	Maybe			
High-Seas Drift Net/Large Mesh	**I**		Yes	N/A	N/A	N/A		N/A			
	II	1° x 1°	1960-92	N/A	N/A	N/A		N/A			
	III		EFL (Observer)	N/A	N/A	N/A		N/A			
Coastal Gill-Net	**I**		Yes	Yes	N/A	N/A		Yes, 50-75 nmi offshore			
	II		No	1980-	N/A	N/A		Maybe			
	III		Yes, 2002-	Yes	N/A	N/A		Maybe			
Harpoon	**I**		Yes	Yes	N/A	N/A		N/A			
	II		No	1974-	N/A	N/A		N/A			
	III		Yes, 2002-	Partial, 1974-1999	N/A	N/A		N/A			
Purse Seine	**I**		Yes	See IATTC data	See FAA/SPC Databases	Very low		N/A		?	
	II					1° x 1°		N/A		?	
	III					EFL		N/A		?	
State Records	**I**		Yes	Yes	1948?	N/A		Yes			
Fishing Clubs	**I**		Yes		No	N/A		N/A			
	III		No	RW Wt. only 1950? ?	No	N/A		N/A			
Research/ Training Cruises	**III**		EFL, Wt, Sex	No	EFL, Wt, by Sex 1950s?	N/A		N/A			
Market Samples	**III**		1970s for wt. 1998 for EFL	Yes, F&G, Pre 2000	1960? Auction Limited FL, proc Wt.	Partial	LJFL, Wt., Sex	No			
Observers	**III**		No	EFL, Wt., sex	EFL, sex	EFL		N/A			

Figure 1 . ASPIC model output showing trends in B/B_{MSY} , F/F_{MSY} and CPUE assuming Data Set 1 (top left and right panels) and Data Set 2 (bottom left and right panels).

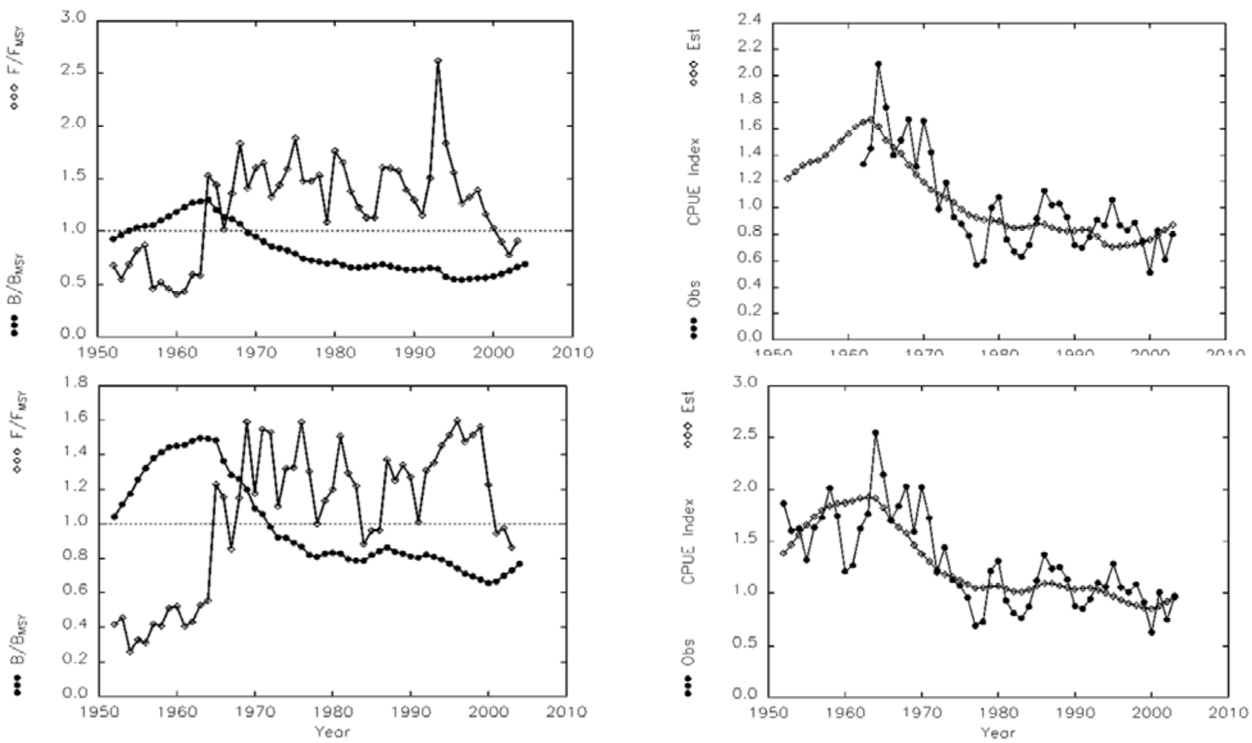
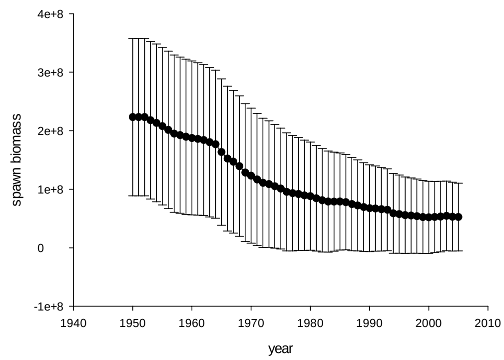


Figure 2. Spawning biomass trajectories when *h* is estimated (= 0.36) and *h* is fixed (= 0.7).



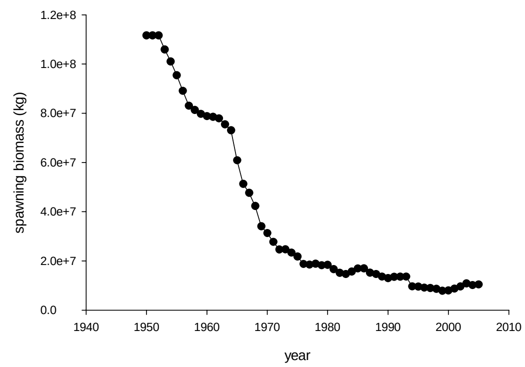
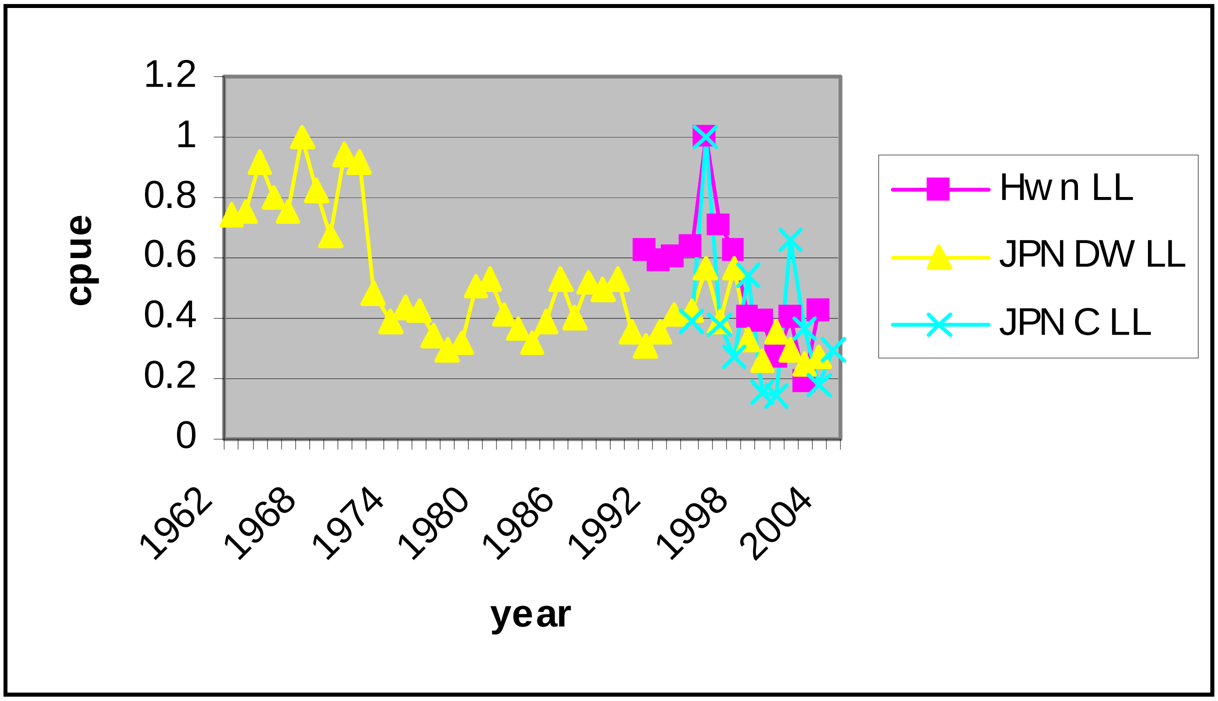


Figure 3. Standardized CPUE for the Japanese distant water longline (JPN DW LL), Japanese coastal longline (JPN C LL) and Hawaiian longline (Hwn LL) fisheries.



Attachment 1. List of Participants

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Attachment 2. Working Papers and Information Papers

ISC/06/MARWG&SWOWG/01 Marlin Working Group. 2005. Report of the Marlin Working Group Meeting (November 15-21, 2005, Honolulu HI, U.S.A.). 23 p.

ISC/06/MARWG&SWOWG/02 U.S. Commercial Fisheries for Marlins in the North Pacific Ocean. 14 p. (Russell Y. Ito and William W. Walsh 2006)

ISC/06/MARWG&SWOWG/03 National report of Japan. 12 p. (Koji Uosaki 2006)

ISC/06/MARWG&SWOWG/04 Biological Research Conducted by PIFSC During 2005-2006 in Support of Marlin and Swordfish Stock Assessments. 8 p. (Robert L. Humphreys, Michael Musyl, and Edward E. DeMartini 2006)

ISC/06/MARWG&SWOWG/05 Preliminary Application of a Bayesian Surplus Production Model to Striped Marlin (*Tetrapturus audax*) in the North Pacific. 16 p. (Shelley Clarke and Murdoch McAllister 2006)
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SC/06/MARWG&SWOWG/06 Production Model Analysis of the North Pacific Striped Marlin Using Currently Available Data Set in the ISC Marlin Working Group. 10 p. (Kotaro Yokawa 2005)

ISC/06/MARWG&SWOWG/07 Stock Status of Striped Marlin in the North Pacific Ocean in 2005. no pagination. (Kevin Piner, Ray Conser, and Gerard DiNardo 2006)

ISC/06/MARWG&SWOWG/08 U.S. Swordfish Fisheries in the North Pacific Ocean. 24 p. (Russell Ito and Atilio Coan 2006)

Attachment 3. Agenda

Joint Marlin & Swordfish Working Groups Meeting

Sixth Meeting of the Interim Scientific Committee
For Tuna and Tuna-like Species in the North Pacific Ocean (ISC)

March 20-22, 2006
Large Conference Room
Southwest Fisheries Science Center
La Jolla, California U.S.A.

MARWG Chair: Gerard DiNardo and SWOWG Chair: Robert Humphreys

March 20 (Monday), 0900-1700

1. Opening of Marlin Working Group
   Welcoming remarks and introductions of participants
   Review of Agenda
   Selection of Rapporteurs

2. Overview of Striped Marlin Stock Assessment Workshop (held 15-21 November 2005 in Honolulu)

3. Review of Assessment Catch Tables for Striped Marlin

4. Review and Discuss Status of Biomass Dynamic Model Assessments for Striped Marlin

5. Future Plans for Marlin WG

6. Opening of Swordfish Working Group
   Welcoming remarks and introductions of participants
   Remarks by Chair concerning future Swordfish stock assessment
   Review of Agenda

7. Review of Swordfish Fisheries
   United States
   Japan
   Mexico

8. Compilation of Swordfish Fishery Statistics Table
   Appointment of committee to update annual swordfish catch (metric tons) table by country/organization and fishery for the North Pacific (Category I data)

9. Status of Swordfish Data Tables (Category II and III data)
   Review of data series used in 2004 assessment
   Swordfish-specific data needs

March 21 (Tuesday), 0900-1300

10. Construct Matrix of Potential Data Series of Category I, II, III Data by Fishery and Country/Organization for the North Pacific

11. Assignment of ISC Country/Organization Data Tasks for Completion by Next Intercessional Meeting

12. Time and Place of Next Intercessional Meeting

13. Discuss Proposal for World Swordfish Meeting with ICCAT

March 22 (Wednesday), 1100-1500

14. Review and Adoption of Joint MARWG & SWOWGs Report

15. Close of Meeting

Attachment 4. Proposed Timetable for 2008 North Pacific Swordfish Stock Assessment

<u>March 2006 ISC6 Working Group Meeting</u>

1. Assemble potential data sources of Category I, II, III data for swordfish by fishery and country/organization.

2. Assignment of lead individual for each country/organization to take lead in assembling Category I, II, III data by fishery, year, and quarter.

    <u>Work During Interim Period</u>

    1. Lead individuals to assemble Category I, II, III data by fishery, year, and quarter.

<u>October 2006 Intercessional Working Group Meeting</u>

1. Review assembled Category I, II, III data for each country/organization.

2. Discuss and reach agreement on areas to be used in the assessment.

2. Review and reach agreement on biological parameters and conversion factors to be used.

3. Discuss criteria for identifying swordfish targeted vs. non-targeted effort

    <u>Work During Interim Period</u>

    1. Lead individuals to continue assembling Category I, II, III data by fishery, year, and quarter.

    2. Lead individuals to continue work to separate swordfish targeted vs. non-targeted effort.

<u>February 2007 Intercessional Working Group Meeting</u>

1. Review and reach agreement on actual data series, catch tables, and biological data to be used.

2. Review and reach agreement on protocols for differentiating targeted versus non-targeted effort.

3. Discuss optimal methods to standardize dataset time series

Work During Interim Period

1. Lead individuals to begin standardization of dataset time series

July 2007 ISC7 Working Group Meeting

1. Review progress on standardization of dataset time series

2. Review and discuss stock structure

3. Discuss model structure

Work During Interim Period

1. Lead individuals to continue work on standardization of dataset time series.

October 2007 Intercessional Working Group Meeting

1. Agree on which standardization methods are to be used.

2. Agree on which standardized CPUE time series to use.

3. Agree on stock structure to be employed and how this will be applied to the standardized CPUE time series.

4. Discuss model structure and agree on which types of assessment models are to be used.

Work During Interim Period

1. Assigned researchers to begin model assessments.

February 2008 Intercessional Working Group Meeting

1. Review progress of model assessments and whether model results converge or diverge.

2. Discuss ways to improve/solve problems encountered.

Work During Interim Period

1. Continue work on model assessments.

July 2008 ISC8 Working Group Meeting & Plenary Meeting

1. Review and discuss results of swordfish stock assessments.

2. Reach consensus on status of North Pacific swordfish stocks.

3. Report results to ISC Plenary.

Attachment 5. Current Work Plan of the ISC Marlin Working Group

Objective	**Research Project**	**Collaborators**
1. Conduct biological and Oceanographic research in support of improved stock assessment	MOVEMENT: a) Estimate patterns of movement using conventional tags	Kohin, Holts, Saito
	b) Determine patterns of movement, behavior and post release mortality using PSAT tags	Musyl, Saito, PIFSC
	STOCK STRUCTURE: a) Assess stock structure of striped marlin using genetic techniques	Hinton, Purcell (USC)., PIFSC, NRIFSF
	b) Assess stock structure using fisheries data and oceanography	Hinton, PIFSC, NRIFSF
	AGE AND GROWTH: a) Continue to evaluate regional differences in size and sex Ratio, and potential biases	Saito, PIFSC, NTU
	b) Proceed with hard parts based age and growth study	PIFSC, NRIFSF, NTU
	c) Assemble conversion relationships among various length And/or weight measurements	PIFSC, NRIFSF, NTU
2. Develop and apply stock assessment models	Develop and apply spatially-explicit models of stock And fishery dynamics incorporating effects of environment, gear, fishing practices, fleet dynamics, and other factors	Kleiber, NRIFSF, IATTC, DiNardo, Conser, Clarke
3. Develop comprehensive marlin fishery database	a) Construct abundance indices for fisheries	Among all scientists
	b) Collect and incorporate marlin fishery statistics from North Pacific countries not yet included in the database	All ISC member nations, MARLIN-WG, ISC Database Administrator

Attachment 6. Current Work Plan of the ISC Swordfish Working Group

Objective	Research Project	Collaborators
1. Conduct biological and oceanographic research in support of improved stock assessment	AGE AND GROWTH a) Continue to validate regional differences in age and growth, and aging of larger animals b) Continue studies on regional sex ratio differences by size c) Expand collection of data on size- and sex-composition of catch	 Humphreys, Sun PIFSC, Sun, Yokawa PIFSC, Yokawa, Sun
	MOVEMENT a) Estimate patterns of movement and growth rates using conventional tags b) Determine patterns of movement and behavior using archival and PSAT tags	 Kohin, Saito, Holts Musyl, Saito, PIFSC
	STOCK STRUCTURE a) Collect samples of young swordfish from specific areas b) Assess the use of otolith elemental composition to uniquely identify geographically separate nursery areas in juvenile swordfish FISHERIES OCEANOGRAPHY a) Assess stock structure using fisheries data and oceanography	 IATTC, Yokawa, Humphreys Humphreys, Yokawa, IATTC Hinton, PIFSC, NRIFSF

Attachment 6. Current Work Plan of the Swordfish Working Group (continued).

Objective	Research Project	Collaborators
2. Develop and apply stock assessment models	a) Develop and apply spatially-explicit models of stock and fishery dynamics incorporating effects of environment, gear, fishing practices, fleet dynamics, and other factors. b) Develop sex-specific age-structured model	Kleiber, Bigelow, NRIFSF, IATTC, NTU NRIFSF, Conser, Kleiber, Sun
3. Develop, test, and apply basin-scale swordfish simulation model (low priority)	Use simulator to help develop and evaluate stock assessment models	Kleiber, Bigelow, Hinton, NRIFSF, Sun
4. Develop comprehensive swordfish fishery database	a) Construct abundance indices for major fisheries in the North Pacific b) Incorporate swordfish statistics for all fisheries catching swordfish in the North Pacific but not yet included in the database.	Among all scientists ISC Database Administrator