INTER-AMERICAN TROPICAL TUNA COMMISSION

FOURTH MEETING OF THE SCIENTIFIC WORKING GROUP REVIEW OF STOCK ASSESSMENTS

La Jolla, California (USA)
May 19-21, 2003

CHAIRMAN'S REPORT

Chairman: Robin Allen

AGENDA

1. Welcome, introductions, consideration of agenda
2. The fishery in 2002
3. Sampling of catches for species composition
4. Review of stock assessments
   i. Yellowfin
   ii. Bigeye
   iii. Striped marlin
5. Bycatch species
   i. Silky sharks
6. The status of stocks of tuna and billfish in the EPO
7. Report and recommendations
8. Other business
9. Adjournment

DOCUMENTS

SWG-4-00	Draft: Tuna and billfish in the eastern Pacific Ocean
SWG-4-01	Draft: Report on sampling the eastern Pacific Ocean tuna catch for species composition and length-frequency distributions
SWG-4-02	First draft: Recommended diagnostics for large statistical stock assessment models
SWG-4-03	Draft: Status of yellowfin tuna in the eastern Pacific Ocean in 2002 and outlook for 2003
SWG-4-04	Draft: Status of bigeye tuna in the eastern Pacific Ocean in 2002 and outlook for 2003
SWG-4-05	Draft: Status of striped marlin in the eastern Pacific Ocean in 2001 and outlook for 2003/2004

APPENDICES

A. List of attendees
B. Longline data provided to or collected by IATTC for use in stock assessment and *ad hoc* research collaborations.
C. Categories and levels of data for reporting information from longline fisheries

The 4th Meeting of the IATTC Scientific Working Group was held in La Jolla, California (USA) on May 19-21, 2003. The attendees are listed in Appendix A.

1. Welcome, introductions, consideration of agenda

The meeting was called to order on May 19, 2003, by the Chairman, Dr. Robin Allen, Director of the IATTC, who thanked everyone for coming to the meeting, and then asked the attendees to introduce themselves. After a brief discussion, the provisional agenda was approved without change.

2. The fishery in 2002

Ms. Suter reviewed the information on the fishery for tunas in the eastern Pacific Ocean (EPO) in 2002 (Document SWG-4-00). Discussion centered on recent changes of the longline data, especially those from Korea and Taiwan, and on the numbers used in the assessment versus those reported in the document. It was pointed out that the most recent longline data from Korea and Taiwan were received too late to be included in the assessment. The staff was asked to verify whether the data which were received recently had been raised to total landings.

3. Sampling of catches for species composition

Mr. Tomlinson reviewed a system for sampling surface-caught tunas in the EPO, which was initiated in 2000 (Document SWG-4-01). Briefly, the fish in a well of a purse seiner or pole-and-line vessel are selected for sampling only if all the fish in the well were caught during the same month, in the same type of set (floating-object, unassociated school, or dolphin), and in the same sampling area. These data are then categorized by fishery.

The discussion focused on the overall use of catch estimates based on the species composition method versus the estimates based on the historical standard method. Dr. Allen pointed out that for skipjack and yellowfin the difference is relatively small, but the use of the species composition catch estimates makes a large difference in the assessment of bigeye. The group agreed that the species composition estimates for catch for the years 2000 to 2002 should now be considered the best estimates, and should be used as the base case in assessments,. It also agreed that an adjustment was also appropriate for previous years for which no species composition data are available. It was further suggested that both sets of catch figures could be made available for meetings of the Scientific Working Group.

4. Review of stock assessments

The assessments of yellowfin and bigeye were performed with A-SCALA (*Age-Structured Statistical Catch-at-Length Analysis*).

Dr. Harley reviewed the results of the meeting on diagnostics for large statistical stock assessment models held in La Jolla, October 2-4, 2002 (Document SWG-4-02). The meeting followed a recommendation of the 3rd meeting of the Scientific Working Group. These models are large and complex and there is a need to determine how to best summarize the results of such models so that the quality of the model fit can be investigated. The discussion was mainly about technical details and the group agreed that the meeting was useful to better understand and improve the assessments.

Dr. Maunder talked about improvements made to the assessment for 2003. He reviewed details of new catchability decisions, selectivity smoothness penalty decisions, considerations of the effective sample size and a new method to allow missing data in environmental indices. He also summarized new research on neural networks for standardization of CPUE and explained a new likelihood profile approximation to forward projections. A summary of the changes is:

- Retrospective analysis to determine years to average catchability
- Cross-validation to determine selectivity smoothness parameters
- Analytical formula to re-weight length-frequency sample size

- Method to allow missing data in environmental indices MSY_{ref} and SBR_{ref}
- Neural network CPUE standardization
- Likelihood profile approximation to forward projections

The discussion focused on the tradeoffs associated with oversmoothing and on the importance of replication of the results of CPUE standardization and neural networks.

4.1. Yellowfin

Dr. Maunder reviewed the yellowfin assessment presented in Document SWG-4-03. There were comments on the relative stability of the catchability coefficient estimates compared to those used in other oceans. It was suggested that the estimates for yellowfin did not show the same changes as those for bigeye because the FAD fishery does not take much yellowfin. The effects on the analysis of the full retention policy the Commission has had the past 2 years, the work on standardization of purse-seine effort to be carried out later this year, and the interpretation of AMSY under different recruitment regimes, alternative gear selectivity patterns and vulnerability of fish were discussed.

4.2. Bigeye

Dr. Harley reviewed the bigeye assessment presented in Document SWG-4-04. As a general point, it was noted that the time series under analysis covers a period during which a single set of environmental parameters, known as a regime, prevailed. Many oceanographers believe that a regime shift may have occurred around 1998, coinciding with the recent period of very low recruitment.

Some participants felt that it could be important to review the purse-seine data prior to 1993 to see if it may be possible to correct these data for potential species mis-identification, as was done for the post-1992 data. The group also discussed the possibility of extending the model back prior to 1975, but it was noted that there was little size composition data available for this period and the results of an extended analysis would likely not provide any additional information for stock status in recent years, thus it was not considered a high priority. It was also noted that interpreting changes over a long period would be difficult because of the extensive changes over the past fifty years.

The effects of the use of new maturity, fecundity and natural mortality schedules in the model were discussed, and in particular their relationship with the unusually low SBR at the stock size which would produce the AMSY. The reason for the pronounced drop in that reference point compared to last year's estimate was a combination of changes in the estimated natural mortality rate and the much greater age of maturity based on samples from purse-seine caught bigeye. It was noted that bigeye taken in purse-seine sets may not be representative of the population of mature fish. It was also noted that, when the model was fitted with a stock-recruit relationship, the SBR at AMSY was closer to previous estimates.

The issue of calculating the effective sample size for length-frequency samples was discussed, and some participants thought these samples should be used in the base case. However, these estimates were not used for the base case because the staff felt they should be investigated further before being used for purposes other than sensitivity analyses.

The issue of stock structure was also discussed. It was agreed that the alternative of a Pacific wide stock should be presented. The Working Group noted that work was underway with a Pacific wide assessment, but this had not yet produced results useful for management. It was also noted that tagging of bigeye with archival and conventional tags has not demonstrated long-distance movements.

The Working Group was concerned about uncertainty associated with estimates of catch data, and particularly that some important data only became available very recently and that there were no estimates of unrecorded catch. The group agreed that it was important to run the model with the recent catch data, and that the information should be reported to the Commission meeting.

4.3. Striped marlin

Dr. Hinton reviewed the striped marlin assessment in Document SWG-4-05. There was discussion of the potential impact on analyses of sexually dimorphic growth in striped marlin. It was noted that in the models used, either growth was not part of the model structure or parameterization (Pella-Tomlinson), or the model results were presented for a range of annual incremental growth rates (Deriso-Schnute model) that spanned the range of values obtained from observed male and female growth rates in the literature.

There was a discussion of the potential confounding of environmental effects in spatial and temporal strata from El Niño events. It was pointed out that a number of available indices of large-scale environmental variation used as indicators of El Niño had been considered in the modeling process, but none were significant in the final fitting process. It was also noted that the statistical habitat-based standardization may directly account for local effects by modeling the environment.

Participants noted that the presentation did not discuss alternative stock structure hypotheses and that such a presentation would have provided the group with additional information for discussion. The question of stock structure is outstanding, but the assessment presented in 2002 had indicated that the most plausible structure was that the striped marlin off Ecuador and Mexico were from a single population, and Dr. Hinton reported that this was supported by the preliminary results from genetic studies. A collaborative investigation of the stock structure and status of striped marlin in the Pacific using new genetic analyses and fisheries data from the entire basin was undertaken during 2002. However, the results of genetic analyses were not available in time to allow analyses of fisheries data and testing of stock structure hypotheses and status before this meeting. Thus, the report presented was an update to the report for 2002 using updated modeling techniques for standardization of catch rates and model selection.

5. Bycatch

5.1. Silky sharks

Dr. Lennert-Cody reviewed preliminary research on modeling trends in the bycatch per set of silky sharks using data from floating-object sets collected by observers aboard large purse-seine vessels. Her analysis demonstrated a substantial decline in catch per set over the period 1992-2002.

The discussion centered on the problems associated with correct identification of the species and the need for improved methods of counting large numbers of animals in the bycatch. The merits of analyzing trends in bycatch per set from sets on unassociated tuna schools for comparison to that of floating-object sets was also discussed. It was pointed out that FAD density and shark bycatch per set in floating-object sets may be negatively correlated, and thus estimates of FAD density may be needed to understand trends in bycatch per set in floating-object sets. To address the issue of changes FAD density over time, it was suggested that the effect of the fishery on silky shark populations could also be examined using a population dynamics model, with a gear-saturation effect. It was noted that data on bycatch taken with other gears, such as large and small longlines, must be included in the estimates of total silky shark bycatch for the eastern Pacific Ocean. It was also noted that there is a need to assess the potential impact of gears not sampled by observers, including smaller purse-seine vessels and directed hand-line effort by purse-seine vessel crews at night.

6. The status of stocks of tuna and billfish in the EPO

Dr. Allen introduced Document SWG-4-00, which is to be the primary source of data and scientific information presented to the Commission for its consideration of the effects of the fishery and of any conservation measures. The sections on yellowfin, bigeye and striped marlin are summaries of this year's assessments. The remaining sections are mostly updates of information and assessments previously reported.

Several suggestions were made for improvements in the document, including the addition of a summary of what was robust and what was uncertain in the assessments, as well as specific suggestions on maps,

tables, figures, simpler wording and the overall layout of the document.

7. Report and recommendations

7.1. Advice from the IATTC staff to the Commission for the management of the fisheries

Dr. Allen said that following the review of the assessments, additional work will be carried out, especially the analysis of the bigeye stock with the inclusion of recent longline data received from Korea, China, and Taiwan, and the results will be taken account of in the advice provided at the 70th Meeting of the IATTC in June 2003. However, subject to those changes, he said that the situation appeared to be similar to that anticipated last year, and accordingly it was likely that this year's recommendations would be similar to those of last year.

For yellowfin, the base case estimates indicate that the biomass is declining from the relatively high level, following strong recruitment during the late 1990s. The strong recruitments have allowed catches above the AMSY without depressing the stock size below the AMSY level. The spawning biomass is about the level at which the AMSY would be achieved.

There have apparently been two different productivity regimes, with different levels of AMSY, and the biomass required to produce the AMSY may differ between the regimes. The average weight of the yellowfin in the catch is much less than the critical weight, so increasing the average weight of the fish caught could substantially increase the AMSY.

An alternative assessment, using a stock-recruit relationship with a steepness of 0.75, produces a more pessimistic view. While this alternative was thought to be less likely than the base case, it is generally acknowledged that some relationship must exist between stock and recruitment, and thus the best estimates are likely to lie between the base case and the alternative.

The conclusion is that current fishing mortality should not be allowed to increase, with the aim of keeping it at or below than the level that would produce the AMSY. Given that there have been restrictions on fishing in each of the last four years, a similar restriction would be necessary to achieve that goal.

The stock status for bigeye tuna is less certain, because bigeye have been highly vulnerable to the purse-seine fishery only since 1994, and because the fishery has been in a state of rapid change since then. The biomass of bigeye declined in 2003, as predicted last year, after reaching a recent peak during 2000. The spawning biomass is now near the level that supports the AMSY and declining. Weak recruitment is a concern, with below-average recruitment occurring each quarter during the period mid-1998 to 2001. More recent recruitment is uncertain. The spawning biomass is expected to continue to decline. In the base case, and most sensitivity analyses, fishing effort needs to be reduced to allow the stock to recover to levels that can produce the AMSY in future years.

It is likely that the staff will recommend that fishing effort be reduced to facilitate a recovery of the stock from the levels it is expected to reach in the next few years. In addition to any general restrictions on fishing that the Commission might agree, a reduction in fishing effort on FADs in offshore waters (west of 95°W) is likely to be proposed.

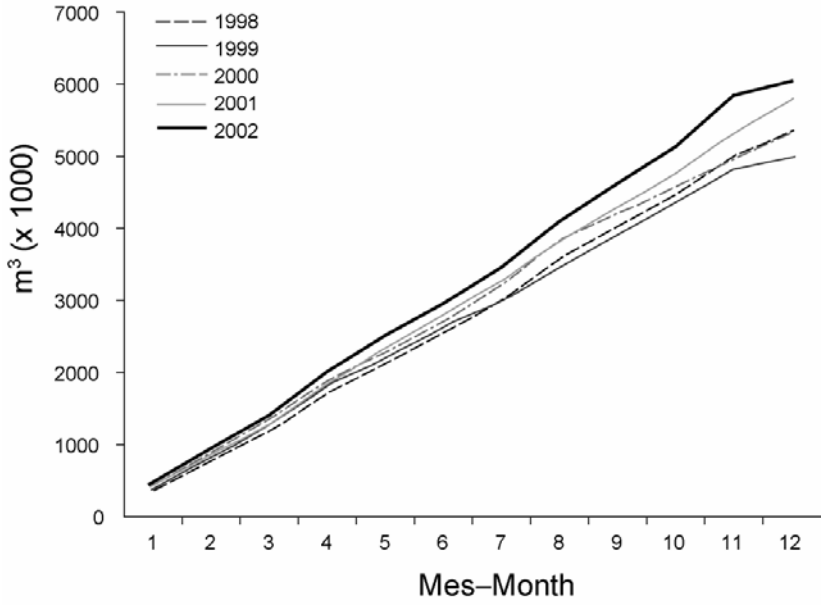
The staff does not intend to make recommendations concerning striped marlin and silky sharks. The latter will probably be considered by a meeting of the Bycatch Working Group.

Dr. Allen said the staff would be proposing that the Commission adopt standards for data reporting for vessels for which logbook and unloading data were not available. Dr. Hinton described the data currently provided to the Commission (Appendix B) and suggested reporting specifications (Appendix C).

7.2. Working group recommendations

7.2.1. Yellowfin

The Working Group noted the importance of evaluating the effect of management measures to date. It was noted there had been various measures addressing yellowfin since 1999 and the Commission should be advised of the effects of those, particularly as the total capacity of the purse-seine fleet had been increasing over that period. Various difficulties in measuring the effects of particular conservation measures in the face of environmental changes were discussed. While noting it was difficult to say what would have happened in the absence of any of those measures, two possible measures of effort were suggested, the total number of sets per year and the cumulative capacity at sea in each year. The Working Group noted that the total number of sets in recent years had been less than in 1998, but that there had been a large increase in sets on tunas associated with dolphins in 2002 compared to 2001 and earlier years. The figure showing the cumulative capacity of the purse-seine fleet at sea during 1998-2002, shown below, was not available at the meeting.



Cumulative capacity of the surface fleet at sea, by month, 1998-2002

The Working Group also recommended that the simulations of effects of proposed measures be provided to the Commission. The staff noted that for purse-seine catches these could be interpolated from the forward projections with fishing mortality being varied by plus or minus 25%.

7.2.2. Bigeye

The Working Group discussed criteria for time and area closures that might be appropriated for bigeye management, focusing on the situations where most of the purse-seine catches of small bigeye are taken. This tends to be near the equator, west of 95°W, in August to November.

There were mixed views on whether any restrictions should apply to both longline and purse-seine gears. It was pointed out that purse-seine closures would have little immediate effect on spawning biomass, but would have long-term effects because of the time needed for the fish to reach sexual maturity. The effects of restricting longline fishing would be immediate. Reducing purse-seine catches eventually has a greater impact on the spawning biomass than reducing longline catches. It was also noted that the intended effects of any restrictions would be undermined if only part of the fleet complied. Finally it was

noted that distant water longline fleets operations are planned over long time periods and any unpredictable changes would be difficult to accommodate. The Working Group suggested that this problem could be addressed by considering management measures that could be applied over a longer time period than the remaining months of this year.

7.2.3. Striped marlin

The Working Group did not have specific recommendations concerning the management of striped marlin, but it was suggested that the new standardization method presented for this species be included in the updated Document SWG-4-00.

7.2.4. Silky sharks

With respect to silky sharks, it was noted that any restrictions on sets on FADs to conserve bigeye would also have an effect on catches of silky sharks. It was also recommended that the issue of direct effort directed to this species by handlining at night from purse seiners be examined.

7.2.5. Data

The Working Group endorsed, for large-scale vessels, the proposal for Commission standards for reporting for vessels that do not provide logbooks. The group also recommended that coastal countries be asked to provide data on artisanal fleets. The group considered the issue of the best means to raise data for individual analyses, and suggested that the best data to obtain is the most detailed data possible along with the information on how it was raised. Thus, for catch and effort sample data it is indispensable to obtain total catch and effort along with a description of the method used to obtain the sample data.

7.3. General recommendations

The Working Group noted that it would be desirable that in future meetings assessments of the three major species, yellowfin, bigeye and skipjack could be reviewed.

The Working Group was told of plans for a World Bigeye Meeting to be held in Madrid in March 2004. It was recommended that the Commission be asked to formally support active participation in this meeting.

Some participants noted that a more extensive review of the staff's research could be provided if there were more time to study the assessment and other documents. In particular, it would be helpful for detailed information from sensitivity analyses to be posted on the Commission's web site. There were mixed views about extending the duration of the meeting, but suggestions that the process might be made more of a continuous cycle with mid year meetings on particular topics such as last year's diagnostic meeting were favored. It was agreed that it would be useful to hold a meeting later this year to consider reference points.

The Working Group recommended that a single set of catch statistics incorporating the staff's best estimate of species composition be reported in official catch statistics, rather than the current practice of reporting catches based primarily on unloading reports.

8. Other business

Dr. Hall presented information concerning the interaction of sea turtles in tuna fisheries, the decline of numbers of nesting leatherback turtles in Costa Rica and Mexico, sightings and mortality of turtles reported by observers on purse-seine vessels, and migration patterns recorded by electronic tags.

9. Adjournment

The meeting was adjourned at 4:30 pm on 21 May.

Appendix A.

INTER-AMERICAN TROPICAL TUNA COMMISSION
COMISION INTERAMERICANA DEL ATUN TROPICAL

SCIENTIFIC WORKING GROUP -- GRUPO DE TRABAJO CIENTÍFICO

4th MEETING- 4ª REUNION

May 19-21, 2003 – 19-21 de mayo de 2003
La Jolla, California, USA

ATTENDEES - ASISTENTES

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Subsecretaría de Recursos Pesqueros

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Appendix B.

Longline data provided to or collected by IATTC for use in stock assessment and *ad hoc* research collaborations.

	Type	Resolution	Species
Chile	Landings	EPO, statistical yearbook reports	Various species
People's Republic of China	Catch and effort	EPO, 2001, 5x5 – month, raised	Tunas and billfishes, with major category groupings
Costa Rica	Landings and export	EPO, 1991 – 2002	Tunas and billfishes
Ecuador	Landings and export	EPO, 1998 – 2001	Tunas, billfishes, shark (pooled) and other miscellaneous by species, swordfish for years prior to 1998.
Spain	Catch and effort	EPO, 1997 – 2000, 5x5 – month, raised	Swordfish in numbers and weight
	Length frequency	EPO, 1997 – 2000, 5x5 – month	Swordfish
Guatemala	Landings	EPO, 1999 – 2002	Tunas and billfishes, with major category groupings
Honduras		no information	
Indonesia		no information	
Japan	Catch and Effort	Pacific, 1954 – 2001, 5x5 – month, raised EPO, 1971 – 2001, 1x1 – month, sample data EPO, 1975 – 2002, 5x5 – month, sample data with gear configuration detail EPO, 1998 – 2002, 1x1 – month, sample data with gear configuration detail Various other for ongoing collaborations on billfish analyses	Tunas and billfishes in numbers
	Total catch	Pacific and EPO	Tunas and billfishes in numbers and weight
	Length frequency	1x1, 5x5, 5x10 & 10x20 by time, 1971-2001 Various other for ongoing collaborations	YFT, BET, (by month) PBF, SWO (by quarter) Billfish (by month)
Korea	Catch and effort	Pacific, 1975 – 1986, 5x5 – month, presumably raised Pacific, 1987 – 2001, 5x5 – month, raised	Tunas, billfishes, and other in weight and numbers

Mexico	Catch and effort	EPO, 1981 – present, logbook (some partial, may be missing navigation log)	All species in numbers and/or weight
	Landings	EPO, 1981 – 2001, as unloadings from various trips, incomplete	Tunas and billfishes
Nicaragua	Landings	EPO, 1997 – 2001	Tunas and billfishes, with major category groupings
Panama		no information	
Peru	Landings	EPO, statistical yearbook reports and IATTC contacts	Various species
French Polynesia	Catch and effort	EPO, 1992 – 2002, 1x1 – month, sample	Tunas and billfishes in numbers and weight
	Total catch	Pacific and EPO	Tunas and billfishes in weight
El Salvador	Landings	EPO, 2000 – 2002	Tunas and billfishes, with major category groupings
Taiwan	Catch and effort	Pacific, 1964 – 2000, 5x5 – month, raised	Tunas, billfishes, sharks (pooled), and other in numbers and weight
	Total catch	Pacific, 1999 – 2001	Tunas, billfishes, sharks (pooled), and other in weight
USA	Catch and effort	EPO, 1991 – 2000, 1x1 – month, sample Logbook, miscellaneous, incomplete	Tunas, billfishes, sharks, misc spp (by species) in numbers
	Average weight	Hawaii market sample	Tunas, billfishes, sharks, misc spp (by species)
	Landings	California, ~1950 – 2000, by vessel, all gear types	All species in weight

Appendix C

Categories and levels of data for reporting information from longline fisheries.

Category	Level	Resolution	Data
Catch and effort sample data	1	Set-by-set, logbook data with gear configuration and targeting information	Catch in numbers, and weight if available; effort in number of hooks
	2	1x1 – month, sample by gear configuration (e.g. hooks per basket), with targeting information	
	3	5x5 – month, sample by gear configuration (e.g. hooks per basket), with targeting information	
Length frequency	1	Set position, start or end of set	Length or weight of individual fish
	2	Grid position, best possible spatial-temporal resolution of area of capture	

Total catch and effort with description of method used to obtain raised data.

Proposed reporting requirements for aggregated longline data provided on an annual basis based on categories and levels identified in the table. It is noted that standardized logbooks and data collection procedures for longline vessels has been addressed in various forums, including SCTB, and that the IATTC has participated in the standardization process for the western Pacific. It is also noted that Japan, Korea, Taiwan and the United States participate in the FFA/SCTB logbook data standardization program. It is recommended that a Pacific-wide standard for data collection be developed and adopted.

It is also noted that scientific analyses require detailed data, and the quality of the analysis presented is directly related to the quality of the data available for analysis.

Catch and associated effort data –

Preferred – Level 1, set-by-set data, from which data may be aggregated by IATTC staff at resolutions appropriate for the assessment method and ancillary data (e.g. fine scale environmental data in habitat-based standardization) being used.

First Alternate – Level 2, aggregated 1x1 – month data with gear configuration and targeting information.

Second Alternate, if gear configuration data not sampled on 1x1 – month resolution

(It is noted that increasing understanding of longline gear operations and species specific behaviors may require data at the set-by-set resolution for some standardizations. As well, for certain species, e.g. sailfish, set-by-set data have been recommended for use in stock assessment due to the number of sets with zero catch.)

Total catch data –

Estimated total catch in numbers, and weight if available.

Biological/Length or weight frequency data –

Preferred – Level 1, exact location of the sample

Alternate – Level 2, Grid position, best possible spatial-temporal resolution of area of capture

Along with all data provided, details should also be provided on collection methods, assumptions used in raising data or in converting information from one measure to another (e.g. length to mass).