

Report of the SC to CCSBT on the Scientific Research Program

(adopted at the Seventh Annual Meeting – 18-21 April 2001)

Friday, March 23, 2001

Introduction

Following the November 2000 scientific meeting of CCSBT to discuss the development of a Scientific Research Program (SRP) the advisory panel prepared a report. At the SC meeting in March 2001 discussions were held with all member countries and the SC formulated an integrated SRP. The following report is the recommended SRP as adopted at that meeting.

The SC considers that the main objective of an SRP is to improve the quality of the data used as input to the stock assessment and to contribute to the development of reliable indices to monitor future trends in stock size. Future trend indicators will be a critical component of a feedback rule to facilitate setting TACs.

A number of topics have been proposed as desirable components of a SRP, namely:

- 1- Characterization of the SBT catch.
- 2- CPUE interpretation and analyses.
- 3- Scientific observer program.
- 4- Conventional tagging program.
- 5- Direct ageing.
- 6- Archival and pop-up tagging.
- 7- Recruitment monitoring program.
- 8- Development of a spawning biomass index.
- 9- Fisheries oceanography for improved habitat definition.

Some of these components (items 5 through 9) represent ongoing research by member countries; the SC fully endorses these programs and encourages their continued support. Items 1-4 are viewed by the SC as areas where additional directed initiatives by the CCSBT are most needed and will likely result in substantial gains in reducing uncertainty in the stock assessment in the short term. CCSBT will likely have a role to play in items 5-9 as well.

Characterisation of the SBT catch

Characterisation of the SBT catch taken by all fleets is fundamental to the stock assessment process. The information that should be collected to characterise the SBT catch includes:

A. Longline fisheries

1. Details of effort, including:
 - Number of hooks set
 - Position of set and haul
 - Date and time of set and haul
2. Details of the catch, including:
 - Catch composition (number and length or weight for SBT, other tuna and tuna like species)
 - Catch retained and discarded
3. Length, weight, sex and other biological data for SBT
4. Otoliths of SBT for age determination
5. Any tags recovered
6. Environmental data that may influence SBT CPUE (sea surface temperature, wind direction and speed, etc.)

B. Purse seine fisheries

1. Details of effort, including:
 - Size of net (length and depth)
 - Position of haul
 - Date and time of set and haul
 - Utilization of any spotting devices including aerial spotters
 - Information on schools spotted (number of schools, school size, etc.)
2. Details of the catch, including:
 - Catch composition (number and length or weight for SBT, other tuna and tuna like species)
 - Catch retained and discarded
 - Number and weight of dead fish during fishing activity
 - Number and weight of dead fish during towing process to cages
3. Length, weight, sex and other biological data for the SBT at time of capture.
4. Otoliths of SBT for age determination

5. Any tags recovered
6. Environmental data that may influence SBT CPUE (sea surface temperature, wind direction and speed, etc.)

C. Pole and line fishery

1. Details of effort, including:

- Number of poles (automatic and manual)
- Position at start and end of poling activity
- Date and time of start and end of poling activity
- Utilization of any spotting devices including aerial spotters
- Information of schools spotted (number of schools, size of schools, etc.)

2. Details of the catch, including:

- Catch composition (number and length or weight for SBT, other tuna and tuna like species)
- Catch retained and discarded

3. Length, weight, sex and other biological data for SBT

4. Otoliths of SBT for age determination

5. Any tags recovered

6. Environmental data that may influence SBT CPUE (sea surface temperature, wind direction and speed, etc.)

D. Other fisheries (e.g. Trolling, handlining, etc.)

1. Details of effort, including:

- Number of hooks set or appropriate effort measure
- Position at start and end of fishing activity
- Date and time of start and end of fishing activity

2. Details of the catch, including:

- Catch composition (number and length or weight for SBT, other tuna and tuna like species)
- Catch retained and discarded
- Time of catch

3. Length, weight, sex and other biological data for SBT

4. Otoliths of SBT for age determination

5. Any tags recovered
6. Environmental data that may influence SBT CPUE (sea surface temperature, wind direction and speed, etc.)

Programs to collect this information to characterise the catch should comprise a combination of the following approaches:

1. Reporting of information on catch and effort by the fishing fleet using a logbook system
2. Monitoring and sampling of landings by port samplers
3. Monitoring and sampling of catches at sea by scientific observers
4. Verification procedures through mechanisms such as the Trade Information Scheme

There is obvious overlap between this component of the proposed SRP and some of the other proposed components, such as the scientific observer program. The following guidelines should govern the collection of these data

- 1- Member countries will be responsible for collection of these data for their own flag vessels.
- 2- CCSBT shall prepare quality standards for the data that are collected
- 3- The CCSBT data manager shall work with member countries to assure that the data collected by member countries is integrated into the CCSBT data base with the spatial resolution of the data transmitted to CCSBT determined by agreement
- 4- Where existing bi-lateral agreements with non-member countries exist for collection of catch data, the data obtained from these bi-lateral agreements shall be transmitted to the CCSBT data manager for integration into the CCSBT data base so long as this is within the framework of the bi-lateral agreement. If the bi-lateral agreement does not permit transmission to other parties every effort should be made to develop such an arrangement.
- 5- Where there are no existing arrangements for determination of catch from a non-member state, the CCSBT Secretariat shall take a lead role in securing such data collection.
- 6- The CCSBT data manager shall take responsibility for assembly and maintenance of data regarding non-member catch.
- 7- National confidentiality requirements may limit the detail of data transmitted to CCSBT, and CCSBT will need to develop confidentiality protocols for release of data stored by CCSBT.

CPUE Interpretation and Analysis

The General Objective of CPUE Interpretation and Analyses would be to reduce the uncertainty in historical trend in stock size and thus the uncertainty in current assessments, and to provide a reliable index to monitor future trends in stock size to be used as a part of a decision rule to set TAC.

Experimental Fishing Programs conducted in the past were conceived in the context of the two extreme interpretations of CPUE trends represented by the Constant-square (CS) and the Variable-square (VS) models. The data available indicate that the VS interpretation of CPUE trends is not valid; there are many fish in areas not now being fished by Japanese longliners. This is demonstrated, at a large spatial scale, by the distribution of effort by other parties and, at a local scale, by results of past Experimental Fishing Programs. One potential problem with the CS interpretation is that some of the CPUE rise since 1990 in younger ages may be due to the contraction in the area fished, and not exclusively to increases in abundance.

Thus previous CCSBT stock assessments that used VS and CS as bounds have overestimated the uncertainty in the CPUE trend and the Scientific Committee recommends that all parties further explore methods intermediate between these two. For fine-scale analysis, the B-ratio method (Campbell et al. SBFS/95/, SBF/96/10) seems appropriate as a lower bound, because it assumes excellent ability of vessels to target high catch rate areas. We believe the geostatistical method merits further work as well as other methods for fitting spatial and temporal trends. The following guidelines should govern the development of CPUE analysis methods in the future.

- 1- A complete algebraic formulation and input data base for all methods should be available so that any party can replicate the method once it is tabled
- 2- Before a CPUE analysis method is used in an assessment, all interested parties should have computer code to replicate the method
- 3- Before a CPUE analysis method is used in an assessment, the CCSBT protocols for introduction of new information or a new method will be followed.

The SC does not believe it will be practical to meet the above standards in time for an assessment in July-September 2001 using Bratio or geostatistical approaches, and the SC will need to adopt some interim CPUE time series for the 2001 assessment as guided by the Advisory Panel

Once one or more CPUE analysis methods are developed, it will then be possible to evaluate the need for and design of a CPUE interpretation experiment.

Scientific Observer Program

Scientific Observer Programs are internationally accepted as an essential component in any fisheries management system and will be a key element of a SRP for CCSBT.

Information that should be collected by scientific observers includes:

1. Details of effort to aid the interpretation and standardisation of CPUE data, including:
 - Amount of gear used and technical details of gear
 - Position of fishing activity
 - Date and time of fishing activity
2. Details of the catch, including:
 - Catch composition (number and length or weight for SBT, other tuna and tuna like species)
 - Catch retained and discarded
3. Length, weight, sex and other biological data for SBT
4. Otoliths of SBT for age determination
5. Monitoring of tag recoveries
6. Environmental data that may influence SBT CPUE (sea surface temperature, wind direction and speed, etc.)
7. Research duties – qualified observers may collect detailed reproductive samples, and tag fish as practical and appropriate etc.

The following principles should govern the implementation of an observer program for CCSBT

- 1- The SC recommends an observer coverage of 10% for catch and effort monitoring as a target level.
- 2- The appropriate level of observer coverage for estimation of tag returns will depend on the scale of the tagging program and the tag recovery rate. The trade-off between more intensive observer coverage and more intensive tagging will need to be explored in planning the tagging program.
- 3- CCSBT shall prepare standards for training of observers, operation of observer programs and the data to be collected including the forms to be used.
- 4- The CCSBT Secretariat shall work with observer coordinators in member countries to assure that the data collected becomes part of the CCSBT data base as agreed in CCSBT protocols.
- 5- Member countries will be responsible for operation of observers in high seas and domestic EEZ fisheries on their flag vessels.

- 6- All fleet components should be observed and target levels of observer coverage should be the same for all fleet components.
- 7- In the interests of maintaining consistency between fleets and increasing mutual trust in the results of the observer program, exchange of observers between countries on a regular basis and recruiting some observers from non-member nations should be encouraged.

Conventional tagging program

Stock assessment models are to some degree, predicated on fishing and perform best under contrast due to catches. Simulation studies have shown that the ability of depletion-type methods to correctly estimate abundance trends is particularly limited during population recovery (since catch is not a major factor explaining the trend in stock size). In other words, declining populations are estimated somewhat more accurately than increasing ones. Therefore, the SC feels that a tagging program can provide important additional information on natural and fishing mortality rates to improve the ability to estimate changes in stock size. Such age-specific information on tag-recapture rates can be important since it is relatively independent from other abundance indices.

To minimise problems on assumptions about mixing rates the SC recommends that tagging occur over a broad geographic area. While it is clearly most cost effective to tag young fish, a tagging program must make every effort to tag all components of the SBT stock. In addition, to provide good estimates of recovery and reporting rates, this component of the SRP should be linked to appropriate observer coverage.

A well designed and conducted conventional tagging program will provide information that supplements abundance indices from CPUE trends and aerial surveys. This additional information will help achieve the overall objective of an SRP of “providing statistically significant data for reducing the levels of uncertainty in stock assessments made by the Commission and to identify directions for future research”. A well-designed tagging program will yield estimates of fishing mortality rates, which, when combined with estimates of the catch, provide estimates of the stock size.

The SC recommends that a conventional tagging program should be conducted using the following approaches:

1. Use of a dedicated pole and line vessel to tag juvenile SBT off the coasts of Australia during the summer months. The target number to be tagged annually is 10,000 to 15,000 fish. This appears to be the most cost effective way of releasing tags into the SBT population.
2. Concerns have been raised about the subsequent mixing of juveniles tagged off Australia into the SBT population. The SC recommends that where other sources of juvenile SBT can be identified, tagging in these areas also be initiated.
3. Ideally tagging would occur across all ages and locations of the SBT population. In order to achieve this, a well balanced tagging program would include some

combination of chartered longline tagging and voluntary tagging from commercially operating longliners by onboard observers. The details of this mix will need to be determined in the final design stages of the program.

4. CCSBT should explore the possibility of using some form of cryptic tag such as PIT tags to assist in determining the tag return rate of the traditional visible tags, and possibly as a replacement for visible tags. A number of possible problems have been identified with cryptic tags, primarily relating to impacts on the marketability of the fish. This problem is not unique to SBT and should be further explored.
5. As tag recovery is often one of the most problematic components of a tagging program, CCSBT should establish strong incentives for both effective tagging and returning recaptured tags
6. Any tagging programs will be co-ordinated by CCSBT and the data retained and managed by CCSBT and available to all members.

There is obvious overlap between this component of the proposed SRP and some of the other proposed components, specifically the scientific observer program. The determination of where, how, and by whom a tagging program should be conducted is the responsibility of the Commission to decide upon advice from the SC. Some tagging programs may best be conducted by the individual parties, while others may best be conducted using a centralised approach.

The SC believes that the results from a well-designed conventional tagging program that provides estimates of fishing mortality rate and therefore current stock size offers an opportunity to reduce the current uncertainty in the stock assessment. The SC recognizes that for a tagging program to provide a relative index of stock size assumptions about tag reporting rates, tagging mortality, tag shedding and mixing must all be met.. The SC therefore recommends that the Commission addresses the issues of where, how, and by whom a tagging program should be conducted with some urgency to ensure that the information is obtained as soon as possible for input into future assessments.

Recommendations

The SC makes the following recommendations for a SRP.

- The highest priority item is the characterisation and quantification of the overall catch.
- The second priority is development and acceptance of CPUE analysis methods for inclusion in the stock assessments. Once one or more CPUE analysis methods are developed, it will then be possible to evaluate the need for and design of a CPUE interpretation experiment.

- Two items ranked third in priority. One of them is the implementation of a well designed conventional tagging program. The SC recommends that the results of this program have the potential to reduce uncertainty in the stock assessment in the future and the potential to augment CPUE as the main tuning index in the stock assessment. The SC believes that tagging of juveniles from pole and line boats should have priority over tagging of older ages from longliners due to the estimated high cost of longline tagging, but recognizes that tagging older fish will provide more useful information about stock mixing and distribution of older SBT.
- The other third priority item is the implementation of a more complete scientific observer program.