Commission for the Conservation of
Southern Bluefin Tuna

みなみまぐろ保存委員会

Report of the Tagging Program Workshop

2-4 October 2001
Canberra, Australia

Report of the CCSBT Tagging Program Workshop
Canberra, Australia, 2 - 4 October 2001

A scientific Tagging Program Workshop was hosted by the CCSBT Secretariat in Canberra, Australia, from 2 - 4 October 2001. The need for such a workshop was identified at the 6th Scientific Committee meeting, in order to finalise a tagging program proposal for consideration at the 8th CCSBT Commission Meeting. The purpose of the workshop was to develop a detailed proposal for a conventional tagging program to be conducted under the auspices of the CCSBT Scientific Research Program (SRP).

The list of participants in the workshop is shown in **Attachment A**. A number of scientific papers and information documents were presented at the workshop (see list of documents in **Attachment B**), including alternate draft tagging program proposals initially presented and reviewed at the 6th SC meeting. The workshop was conducted as an informal scientific planning discussion and, as such, no formal plenary sessions were held, and no formal minutes were taken of the proceedings. The focus of the workshop was on development of the tagging program proposal, and the outcome of the workshop is therefore entirely contained in the Tagging Program Proposal, shown in **Attachment C**.

The resultant program proposal is submitted to the Commission for consideration and approval. In considering this proposal, the Commission's attention is drawn to the fact that there are substantial budgetary implications for a number of the proposed tagging program components, and important implications for the involvement of the CCSBT Secretariat in a coordinating capacity.

Attachment A

List of Participants
CCSBT
Tagging Program Workshop
2-4 October 2001
Canberra, Australia

CHAIR

Mr Andrew PENNEY
Pisces Research & Management Consultants
22 Forest Glade
Tokai Road, Tokai 7945
South Africa
Phone: +27 21 7154238
Fax: +27 21 7154238
Email: piscescc@iafrica.com

INDEPENDENT ADVISOR

Mr Kevin WILLIAMS
Fisheries Consultant
WW Fisheries (Aust) Pty Ltd
167 Burraneer Bay Road
Cronulla NSW 2330
Australia
Phone: +61 2 9523 9720
Fax: +61 2 9527 4458
Email: wwfish@ozemail.com.au

AUSTRALIA

Dr Kevin McLoughlin
Senior Research Scientist
Fisheries & Forestry Sciences Division
Bureau of Rural Sciences
Dept. of Agriculture, Fisheries & Forestry
PO Box E11, Kingston ACT 2604
Phone: +61 2 6272 4015
Fax: +61 2 6272 4014
Email: kevin.mcloughlin@brs.gov.au

Dr John GUNN
Senior Research Scientist
Tropical and Pelagic Ecosystems Program
Division of Marine Research
CSIRO
PO Box 1538
Hobart, TAS 7001
Phone: +61 3 6232 5375
Fax: +61 3 6232 5012
Email: John.Gunn@csiro.au

Dr Paige EVERSON
Tropical and Pelagic Ecosystems Program
Division of Marine Research
CSIRO
PO Box 1538
Hobart, TAS 7001
Phone: +61 3 6232 5015
Fax: +61 3 6232 5012
Email: Paige.Eveson@csiro.au

JAPAN

Dr Sachiko TSUJI
Section Chief
Temperate Tuna Section
National Research Institute of
Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka 424-8633
Phone: +81 543 36 6042
Fax: +81 543 35 9642
Email: tsuji@fra.affrc.go.jp

Mr Tomoyuki ITOH
Temperate Tuna Section
National Research Institute of
Far Seas Fisheries
5-7-1 Orido, Shimizu, Shizuoka 424-8633
Phone: +81 543 36 6043
Fax: +81 543 35 9642
Email: itou@fra.affrc.go.jp

Mr Kenichi NOTOU
Section Chief
Far Seas Fisheries Division
Resources Management Dept.
Fisheries Agency
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo 100-8907
Phone: +81 3 3502 2443
Fax: +81 3 3591 5824
Email: kenichi_notou@nm.maff.go.jp

Mr Hideki KATO
Section Chief
Resources and Environment Research Div.
Resources Development Dept.
Fisheries Agency
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo 100-8907
Phone: +81 3 3501 5098
Fax: +81 3 3592 0759
Email: hideki_kato@nm.maff.go.jp

NEW ZEALAND

Dr Talbot MURRAY
Pelagic Project Leader
National Institute of Watr & Atmospheric
Research Ltd
PO Box 14-901, Kilbirnie, Wellington
Phone: +64 4 386 0300
Fax: +64 4 386 0574
Email: t.murray@niwa.cri.nz

OBSERVERS

REPUBLIC OF KOREA

Dr Jungrak KOH
Reseracher
National Fisheries R & D Institute
408-1 Shirang-ri, Kijang-kun
Busan 619-902
Phone: +82 51 720 2321
Fax: +82 51 720 2337
Email: jrkoh@nfrdi.re.kr

CCSBT SECRETARIAT

PO Box 37, Deakin West ACT 2600
AUSTRALIA
Phone: +61 2 6282 8396
Fax: +61 2 6282 8407

Mr Brian MACDONALD
Executive Secretary
Email: bmacdonald@ccsbt.org.au

Mr Morio KANEKO
Deputy Executive Secretary
Email: mkaneko@ccsbt.org.au

Mr Robert KENNEDY
Database Manager
Email: rkennedy@ccsbt.org.au

INTERPRETERS

Ms Kumi KOIKE
Ms Yuki SAYEG

Attachment B

List of Documents
Tagging Proposal Workshop

（CCSBT-TAG/0110/ ）

1. Draft Agenda & Proposed Workshop Program
2. List of Participants
3. Draft List of Documents
4. (Australia) An update of qualitative results on southern bluefin tune movements from the 1990's CSRIO/NRIFSF Tagging program. RMWS/99/9. : Preece, A, and T. Polacheck. 1999.
5. (Australia) An examination of a tag-shedding assumption, with application to southern bluefin tuna. ICES J. Marine Science 48:41-51. : Hearn, W.S., G. M. Leigh and R.J.H. Beverton. 1991.
6. (Japan) Proposal on framework of Tagging Program under the CCSBT/SRP (revised with an emphasis on 2001/2002 activities): Sachiko TSUJI.
7. (Japan) Japanese Cruise Proposal for the Tagging Program in 2001/2002 within a framework of SRP: Fisheries Agency of Japan
8. (Australia) Assessing the feasibility of tagging longline – caught SBT in the Tasman Sea : Proposal from CSIRO Marine Research

（CCSBT-TAG/0110/BGD ）

1. (Australia) Effects of observer coverage in the estimation of reporting and fishing mortality rates in tagging experiments - CCSBT-SC/0103/19.: Polacheck, T. 2001.
2. (Australia) Proposal for conventional tagging program within the Scientific Research Program of the Commission for the Conservation of Southern Bluefin Tuna - CCSBT-SC/0108/15. : Polacheck, T. J. Gunn, and C. Stanley. 2001.

（CCSBT-TAG/0110/Rep ）

1. Report of the working group on implementation of the CCSBT scientific research program - Attachment H of CCSBT7 report
2. Extract version of the Report of the Sixth Meeting of the Scientific Committee

Classification of List of Documents

（CCSBT-TAG/0110/　）

Documents to be discussed at the meeting and not yet given a document number of CCSBT, to be classified into this category.

（CCSBT-TAG/0110/BGD　）

Documents to be discussed at the meeting and already given a document number of CCSBT in the previous meeting, to be classified into this category.

（CCSBT-TAG/0110/Info　）

Documents not to be discussed at the meeting but presented for information and reference, to be classified into this category.

（CCSBT-TAG/0110/Rep　）

The previous report of CCSBT to be classified into this category.

（CCSBT-TAG/0110/WP　）

The draft of the document and report developed through the discussion of the meeting and documents of informal meetings, to be classified into this category.

Attachment C

CCSBT Conventional Tagging Program Proposal

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1. Tagging Program Objectives

The overall objective of the SRP is to provide "statistically significant data for reducing the levels of uncertainty in stock assessments". The specific role of the conventional tagging program towards this objective has been recognised as being to "provide important additional information on natural and fishing mortality rates to improve the ability to estimate changes in stock size".

In the light of these overall SRP objectives, the primary objectives of the tagging program were considered to be:

- To provide age-specific estimates of fishing mortality (F) and natural mortality (M), with associated estimates of uncertainty, for as many SBT cohorts as possible.

- To provide additional information on SBT migration and distribution patterns which may be useful in elucidating mixing rates of tagged fish.

- To provide direct estimates of growth rates of tagged and recaptured fish.

In defining these objectives, and in designing the program to meet these, it was recognised that the focus of the program would develop from initial short-term requirements towards longer-term objectives. Initially the program should focus on tagging activities to be conducted, and objectives to be met, over the 2002 - 2006 five-year period. Considering the immediate future, the purpose of scheduling the workshop before CCSBT 8 was to develop specific proposals for initiation of certain tagging activities under this program during the 2001-2002 austral summer. Practical constraints would also focus initial efforts over this period on tagging of young (mainly 1 - 3 year old) fish.

In the longer term, it was recognised that the program focus, and the feasible objectives, would develop as tagged fish move into older age-classes. The SRP also recognises that "future trend indicators will be a critical component of a feedback rule to facilitate setting of TACs". If estimates of F (and possibly M) derived from tagging programs, and the trends in these, may become components of a future CCSBT Management Procedure, the tagging program would need to become a cost-effective, long-term program. The information provided would have to be robust, and the validity of underlying hypotheses and assumptions would have to be evaluated. In particular, any longer-term tagging program would have to focus on quantifying and decreasing the uncertainties in estimates of F and M.

The tagging program should therefore be fully reviewed in 2006, or sooner if

information indicates the need for revision of objectives and tagging activities.

2. Program Design Considerations

A number of essential tagging program design requirements and constraints were recognised. Some relate to requirements needed to meet the objectives, and some to practical aspects of effective tagging, but all have implications for the statistical validity of the information to be generated by the program. All of the following design considerations therefore need to be explicitly considered and included in the planning of all components of the tagging program:

- *Multi-Cohort / Multi-Year Tagging*: To provide estimates of F (and M for young fish), it is essential that tags be placed in annual cohorts for a number of sequential years, for as many years as possible, within the practical constraints on tagging larger fish. This is best achieved by adopting a multi-cohort / multi-year tagging approach, in which specific cohorts are tagged for a number of sequential years. For SBT, this will require tagging of 1, 2 and 3 year-old fish each year for the duration of this program (or at least this initial 5 year phase). Differential estimates of F for fish tagged in different areas will provide useful information on the extent of mixing of these fish. This approach will also compensate for reduced availability (and therefore reduced numbers of tags placed) in any one cohort in any one year.

- *Numbers of Fish Tagged*: The number of fish tagged (or, more correctly, the proportion of fish tagged) in any cohort must be adequate to ensure the return of adequate numbers of fish to determine mortality rates for that cohort, but also to ensure retention (given a plausible range of F and M) of sufficient tags to provide information on mortalities and mixing rates for older fish.

- *Stratification of Tagging Effort by Area*: To maximize mixing of tagged fish into the SBT population, and to provide information to allow mixing hypotheses and assumptions to be evaluated, fish should be tagged across as much of their known distribution area as possible. In particular, the main target component (age 1 - 3 fish) should be tagged in all known areas of aggregation and abundance. In an effort to also place tags directly into older fish, options for conducting tagging during longline fishing across a wide area range should be investigated.

- *Stratification of Tagging Effort by School*: To minimise bias due to reduced mixing resulting from possible SBT school integrity, particularly among young fish, tagging effort should be spread across schools during tagging cruises. Where there are concerns that the target number of tagged fish may not be attained, the main objective remains tagging the required total number of fish. However, where there are indications of availability of multiple schools, effort should be shifted between these. Practically, the easiest way to achieve this is to move the vessel periodically (every day or two). As long as school identity is recorded, possible effects can be corrected for during analysis.

- *Estimation of Tag Shedding Rates*: Estimates of tag shedding rates are essential to determining F or M from tag recapture information. As multiple taggers will be used during this program, and tag placement efficiency is known to vary substantially between taggers, it must also be possible to determine estimates of shedding rates for tags placed by individual taggers. All fish should therefore be double tagged, and tagging protocols must be designed to minimise bias between shedding rates for the two tags. Tagger identity must be recorded, and taggers must also be trained effectively to minimise both poor tag placement, and variance between taggers. In addition, only healthy and undamaged fish must be tagged, to minimise tagging mortality.

- *Estimation of Tag Reporting Rates*: Estimates of tag reporting rates are equally essential to determining F or M from tag recapture information. Without reliable estimates of reporting (or non-reporting) rates, the uncertainty associated with resultant estimates of F and M could well be high enough to preclude their use in assessments. This would negate the value of the tagging program.

- *Random Tagging of Fish Sizes*: To avoid any bias in the components of any particular cohort tagged, there should be no specific selection of, for example, only the smaller fish in any particular school. Where necessary, tagging methods may need to be adapted to efficiently handle and tag particularly small or large fish encountered during tagging cruises.

- *Standardization of Tags*: To prevent any possible discrimination in reporting of tags placed by, or recaptured by, tagging program or vessels of different nationalities, the tags to be used in all tagging components under this program must be standardized. These should be issued by, and returned to, the CCSBT Secretariat, and should be labeled as CCSBT tags in both official Commission languages. In the past, one tag size has been found suitable for all fish of > 3 kg. Smaller tags may be required for fish < 3 kg.

3. Tagging Program Components

3.1 Surface Fishery

The SRP recommends that tagging primarily be conducted using a pole & line vessel to tag 10 000 - 15 000 juvenile bluefin off the Australian coast annually. The workshop proposed two separate components for this tagging operation:

Western Australia: 5 000 - 7 000 fish should be tagged annually using a single chartered pole & line vessel in the West Australian region. Based on past experience, these will primarily be age 1 fish, with a small proportion of age 2 fish. Based on past catch rates, the proposed number of fish can be caught during 45 fishing days in the period February - April, in the area between Albany in the west and the Eastern Group of Islands in the East. Prior to this, weather conditions reduce potential sea-time substantially, and fish availability declines rapidly thereafter. In this region, few fish are usually tagged per school, and there was no need to propose a maximum limit on

tags per school. However, there has been no commercial fishing or tagging in this area for many years, and current availability in the area is unknown. Should catch rates be lower than expected, cruise durations will need to be reviewed.

Should time and vessel availability permit, it would be interesting to also place tags in fish SW of Fremantle, to investigate mixing of fish from these two areas. Consideration was being given to placing a few small archival tags in these western fish.

There are potential problems with availability of vessels and suitably experienced fishermen, and efforts to secure these should be initiated immediately after approval of the program.

South Australia: 8 000 - 10 000 fish should be tagged annually in the area from approximately 130° E to the inshore reefs West of Port Lincoln in the Great Australian Bight (GAB), and along the shelf edge from 130° - E 131° E in the current commercial purse-seine fishery area. Fish in this area are primarily 2 and 3 year olds, with <10% of four year olds (with a maximum weight of about 30 kg). This is the size range available in the area, and it is unlikely that larger fish will be found. Past experience shows that fish of 5 - 25 kg can effectively be caught and tagged using pole & line. Should substantial numbers of larger fish be unexpectedly encountered, fish handling methods will have to be adapted, but there is confidence that this can be done successfully.

The commercial fishery is active in this area during January - February, sometimes extending into March, and tagging will have to be conducted so as to minimise immediate re-captures in this fishery. However, the fish leave the GAB area by mid-March, so tagging cannot wait until the end of the commercial fishing season. Tagging will have to start in the inshore reef areas (the "Lumps") from January, targeting 1 and 2 year olds, moving from W to E, and then out into the shelf edge area from February onwards, as commercial fishing activity decreases, to catch larger 3 (and some 4) year olds. Tagging will be conducted using a dedicated pole & line vessel fishing for 40 days.

Vessel availability is a particular problem in this area, particularly early in the season, when most vessels are involved in the commercial fishing, towing or farming operations. It is also essential to have a good fishing unit (vessel and crew) in this area. Vessel charter will consequently be more expensive.

3.2 Longline Fisheries

It was recognised that scientific understanding of the most effective way to tag reasonable numbers of fish caught in longline operations, and particularly larger (age 4+) fish, was currently limited. For the first year of the tagging program, longline tagging operations would necessarily be, to some extent, feasibility studies or pilot programs. Nonetheless, certain aspects of longline tagging are understood:

- Longline fishing currently offers the only opportunity to extend tagging to large

SBT, or to aggregations of smaller fish in areas other than the S / W Australian nearshore area. In particular, catch data analyses indicate availability of small (age 2 and 3) fish off SE Africa in Nov/Dec, when these fish also occur off south Australia

- Results of tagging larger fish could contribute to estimates of F for these fish, but only if adequate numbers are tagged to quantify the uncertainty in estimates. Results from tagging in areas other than southern Australia will increase understanding of mixing and spatial dynamics of the SBT population.

- Past experience has shown that it is feasible to tag larger SBT (up to at least 220 cm) caught using longlines. However, archival tag results indicate high tagging mortality (2 out of 6 tagged large fish died within weeks). Tagging mortality could be reduced by using specialized equipment for larger fish, such as tagging chutes or scoopers.

- There are many problems associated with tagging SBT during SBT-targeted commercial fishing operations, particularly where tagging is incidental, observers with little tagging experience, and many other responsibilities, are used and only small (discarded) fish are tagged.

- Conversely, tagging of SBT by expert taggers on commercial longline vessels that are releasing all their SBT catch (due to quota limitations), or on dedicated longline tagging cruises, have proved effective.

For 2002, three longline tagging pilot studies were proposed. These three pilot studies will all initially be considered to be one-year projects. The results of these three longline tagging pilot studies will need to be presented and reviewed at the 7th Scientific Committee meeting in late 2002, where proposals will be developed for the extension, revision or termination of these tagging program components:

Southeastern African Area: Japan plans to tag about 250 SBT during a dedicated multi-species longline tagging trip to the south-eastern African region (40° S, 20° - 50° E) from November 2001 - January 2002. At this time, juvenile SBT are known to occur both in this region and off southern Australia. Simultaneous tagging in both regions will provide important information on mixing of juvenile SBT between these areas. It is hoped to place a combination of 250 conventional tags, 45 archival tags and 7 pop-up tags to investigate the mixing of small fish known to occur in this area, and to contribute to information on migratory patterns of larger fish. Given the low tag numbers, this cruise would largely be a study to assess the feasibility of tagging adequate numbers of juvenile SBT in the area, and to evaluate options for handling and tagging of larger fish off large vessels. To maximize the chances of locating aggregations of juvenile SBT in the area, it was suggested that communication should be established during the cruise with Taiwanese longline vessels fishing the area at that time.

New South Wales Area: Large (90 - 220 cm) SBT migrate up and back down the Australian southeast coast during May - September annually, in association with the

Sub-Tropical Convergence Zone fronts, over which period high longline catch rates (up to 150 fish / 1000 hooks) can be made. Australia proposes to evaluate the feasibility of tagging fish in this Tasman Sea area using chartered commercial longline vessels. Experienced tagging staff should be able to tag 500 - 1000 SBT of average 80 kg weight during 100 - 150 days at sea over this period. In addition to conventional tags, pop-up archival tags would be deployed to provide detailed information on spatial dynamics of this stock component. The life status of all fish caught would be evaluated to ensure tagging of healthy fish, and to provide information on the impact of mono-filament longline gear on the health of larger SBT. Where space is available for more than one tagger, participation by other CCSBT scientists will be welcomed.

New Zealand Area: New Zealand vessels are available for use for SBT tagging after their annual quota allocation has been caught. They are interested in cooperating with tagging programs, particularly using archival or pop-up tags, to increase understanding of SBT ecology and spatial dynamics in the New Zealand area. Tagging would primarily be conducted during June - July. Based on past catch rates, off the west coast of South Island a Japanese design longliner would be able to tag about 45 fish of 50 kg average weight during 30 days fishing. Off the northeast coast of North Island, a fleet of 5 smaller vessels could cooperatively tag about 280 fish during a combined 125 days fished. There would be space on these vessels for CCSBT member scientists and taggers. Further planning of this proposed tagging will proceed if this is accepted as a tagging component under the SRP.

3.3 Tagging Mortality Estimates

The estimated mortality during surface fishery tagging operations is expected to be 15 MT. The estimated maximum mortality of SBT resulting from the three proposed longline tagging projects is not expected to exceed 50 MT. The total SBT mortality resulting from all proposed tagging operations during 2001 / 2002 should therefore not exceed 65 MT. The Commission will need to consider options for allocation of a suitable research quota / tagging mortality allowance for these tagging operations during TAC allocation debates at the 8th CCSBT Commission meeting. It is understood that any tagging mortality allowance will only be available to approved tagging program components under the SRP.

3.4 Tagging Protocols and Training

It was recognised that standardized tagging protocols, instructions and training guidelines were necessary to ensure collection of standard tagging data (for inclusion in the CCSBT tagging database), and to maximize the efficiency and success of all tagging operations conducted under this program (by minimizing tagging mortality and tag shedding). The primary components of this standardization are:

Standard Tags and Applicators: It was proposed that, wherever possible, use be made of Hallprint® plastic dart tags and stainless applicators for all components of the CCSBT tagging program. At least 30 000 tags would be required to double tag the proposed number of fish each year, with at least 150 000 tags being required for the first five years of the program. These tags should be yellow, 12 cm - 14 cm in length and

labeled with the tag number (one letter and five digits, on the barb and tip), "CCSBT" and contact details (postal address, phone and fax). The ordering and distribution of tags should be handled by the CCSBT Secretariat, although initial purchases could be made (and refunded) by member countries if tags are required before CCSBT approval and funding becomes available.

It was noted that, for tagging larger fish off large vessels with high gunwales, use may have to be made of long tagging poles to minimise injury resulting from raising fish to the deck for tagging. In this case, it was strongly recommended that use not be made of old design metal barb gamefish tags, which have been shown to have very high shedding rates. Rather, use should be made of the nylon-barb tags developed by the Billfish Foundation, and shown to have high retention rates in large fish. The labeling of these should be the same as the plastic dart tags. Even where these tags are used, double tagging should be conducted using separate poles or specific double-tag poles.

CCSBT Tagging Manual: Training guides had been produced by Australia and Japan for past tagging programs. Copies of these should immediately be exchanged to allow members to incorporate aspects of these in any tagging operations to be conducted before any standard manual becomes available. However, there was a need to consolidate and update these, particularly to reflect any standards adopted by the CCSBT tagging program. It was proposed that the updating of this manual be done on a contract basis, with a view to developing a first CCSBT Tagging Manual by the end of 2001. In developing this manual, the contracted consultant must consult with all member countries to ensure that recent information regarding fishing gear and tagging platform characteristics is adequately updated and incorporated. The manual would be expected to provide clear technical guidance regarding all aspects of effective SBT tagging, from fishing gear configuration to data recording. Certain aspects of the manual would be standard for all fisheries, particularly with regard to tag placement and data recording. However, fishery-specific sections will also be required, particularly for fishing gear configuration and fish handling issues.

It was further proposed that video footage be specifically collected by program participants during training cruises in 2002, and that this be used to produce a tagging training video towards the end of 2002.

Tagging Training Programs: As far as possible, training programs for SBT tagging should be standardized between participants. These programs should primarily rely on at-sea training during actual SBT tagging operations, preferable during dedicated training cruises on the intended tagging platforms, and tagging live SBT. Every effort should be made to deploy experienced taggers on these training cruises, to train and supervise trainees. If tagging is to be initiated in early 2002, suitable training platforms would have to be provided, and tagging training cruises arranged, immediately after approval of the tagging program.

There should also be some periodic review of the training programs being run by various participants to promote continued comparability and standardization between these. In this regard, exchange of experienced personnel, or of trainee staff, would help to ensure comparable training, particularly should there be any involvement of new

members, or cooperating non-members, in SBT tagging programs

4. Tag Recovery

Once adequate numbers of tags have been effectively placed in the target components of the SBT population, the success of any CCSBT tagging program is entirely dependant on maximizing the return of any recaptured tags, and on quantifying the degree of non-reporting of recaptured tags. Effective optimization and estimation of tag reporting rates should include adequate publicity for the program, effective incentive (tag reward) schemes, direct monitoring of landings at key ports used by tuna vessels and direct observation of tag recaptures by fishery observers. Unless tag reporting rates can be maximized, and the non-reporting adequately quantified, high uncertainty associated with estimates of mortality from tagging data could preclude the use of data in assessments. In this case, the tagging program would fail in its primary objective.

4.1 Tagging Program Publicity and Incentives

Tagging publicity programs (particularly tagging posters) and tag-return incentives (tag rewards) have been important and successful components of past SBT tagging programs. Both these processes should be retained as components of the CCSBT tagging program. The CCSBT Secretariat should establish direct liaison with representatives of all fishing fleets and fisheries organizations known to be involved in SBT fisheries, or monitoring of SBT fisheries. Regular contact should be maintained to distribute tagging program posters and publications, encourage monitoring and return of recaptured tags and provide feedback to participating fishermen and organizations.

Tagging Posters and Information: The CCSBT Secretariat should be responsible for establishing and maintaining close liaison with all major SBT fishing associations and fisheries monitoring agencies. In particular, a CCSBT tagging program reward poster must be developed and distributed as widely as possible to these organizations, and through them to fishermen. These should be available in all languages used by SBT fishing fleets, and could be based on recent posters of this nature. The Secretariat should liaise with agencies who have recently produced tagging posters with a view to designing one suitable for the CCSBT tagging program. Posters and popular articles describing the program should also be sent to fisheries publications, ship chandlers and others involved in SBT fisheries. Distribution of these materials should coincide with the time when vessels start fishing for SBT in 2002.

The relevant fishing industry associations identified for each country are:

Australia: Australian Tuna Boat Owners Association, East Coast Tuna Boat Owners Association, West Coast Tuna Boat Owners Association and West Australian Pelagic Longline Association.

Japan: Federation of Japan Fisheries Cooperative Associations, National Ocean Tuna Fisheries Associations.

Korea: Korean Deep and Far Sea Association.

Taiwan: Taiwan Tuna Association.

New Zealand: Seafood Industry Council, Tuna New Zealand Ltd, Tuna & Pelagic Ltd.

South Africa: South African Tuna Longline Association.

Tag Rewards: These should remain at A$10 per tag (A$20 for both tags), at least for the next year, with a mix of cash rewards, t-shirts and caps. If an expected 10% return rate is received, the annual reward cost would therefore be about A$30 000. it should be noted that return rates could be higher.

4.2 Control of Tag Returns

The expected workload associated with receiving returned tags and providing feedback would be substantial once returns started. Although the Secretariat should act as the central coordinating facility for returns, aspects of this could be devolved to suitably experienced fisheries agencies. All tagging data should be captured electronically by those conducting the tagging, and transmitted to the Secretariat. Tag return information, payment of rewards and provision of feedback could also be handled by agencies with experience in these issues. The Secretariat, and particularly the Database Manager, would have to liaise closely with those wishing to handle tag returns to ensure adequate access and correct use of the tagging database, as well as effective administration of the tag rewards.

4.3 Fleets and Landing Sites to be Monitored

In addition to the general liaison activities to be conducted by the CCSBT Secretariat, there are a number of specific landing areas at which special efforts should be made to directly liaise with tuna fishermen and monitor or encourage tag returns:

Australian Surface Fishery: The entire Australian surface fishery harvest can be monitored by a dedicated port sampler stationed at Port Lincoln during the harvest period (primarily May - July annually). A dedicated sampler would be in a position to observe the entire harvest from particular pens, recover all tags and obtain accurate measurements and counts of numbers of fish tagged. This would be substantially more effective than relying on a central coordinator, particularly one stationed elsewhere. It is proposed that some tag-recovery incentive be provided for such a sampler over the primary harvest period.

Longline Fisheries: SBT targeting longline vessels primarily operate from, or land fish at, relatively few ports around the Indian Ocean. It is proposed that incentives also be offered to personnel at these ports to liaise with tuna longliners, and retrieve SBT tags. Wherever possible, use should be made of any port samplers already established in these ports, particularly those that might be deployed under the auspices of the IOTC. The people used should ideally be capable of speaking the languages of the vessels

calling at these ports. The CCSBT Secretariat should liaise closely with these other port sampling schemes to arrange recovery of CCSBT tags. The main ports used by SBT-targeting longline vessels are:

- *Australia*: Sydney, Hobart, Perth, Fremantle. When Japanese vessels again start using Australian ports, these could again become important re-supply or transshipment ports. Australia should investigate options for use of existing personnel in these ports to liaise with vessels and monitor CCSBT tag recoveries.

- *Japan*: Yaizu and Shimizu. These ports are used for final offloading of SBT caught by Japanese and other longline vessels. Japan should investigate options for use of existing personnel in these ports to liaise with vessels and monitor CCSBT tag recoveries.

- *Indonesia*: Cilacap Muaru Baru and Benoa. These are the main ports used by Indonesian longline vessels, including Taiwanese vessels fishing for Indonesia. SBT landed at these ports are usually adult fish, and so there is less urgency with establishing port sampling here. It is also possible that the IOTC will deploy port samplers at these ports. If so, the CCSBT Secretariat should liaise closely with the IOTC regarding recovery of CCSBT tags.

- *Mauritius*: Port Louis. This is one of the two major ports used by Taiwanese longliners targeting SBT in the southern African region. This is considered to be a crucial CCSBT tag recovery site, and every effort must be made to implement some port sampler coverage here during 2002. It is possible that the IOTC will deploy a port sampler at these ports. If so, the CCSBT Secretariat should liaise closely with the IOTC regarding recovery of CCSBT tags. Alternately, Taiwanese operators in the area have been highly cooperative in the past, and could be approached to administer a dedicated CCSBT port sampling operation, using existing personnel.

- *South Africa*: Cape Town. This is the other major port used by Taiwanese longliners, and is also used for re-supply and transshipment by Japanese vessels. The South African fisheries agency should be approached for cooperation in using existing personnel to liaise with vessels and monitor CCSBT tag recoveries during 2002.

Of these various SBT fishing ports, the three main areas to initiate dedicated monitoring during 2002 are Port Lincoln, Port Louis and Cape Town. In addition, it remains an important responsibility of all CCSBT members to make every effort to encourage the return of all tags recaptured by their own fisheries. These efforts should include establishment of suitable monitoring and liaison programs at their own ports.

4.4 Observer Program Input to Tag Return Monitoring

The SRP recognises the value of the possible contribution that at-sea observer programs could make to the direct recording of recaptured tags, and to the estimation of non-reporting rates. Failure to adequately quantify uncertainty associated with

estimates of tag reporting rates will substantially degrade the value of any resultant mortality estimates for use in stock assessments. Most importantly, it is essential to know whether tag reporting data contain any inherent biases resulting, for example, from differential reporting from different areas, or from catches of younger and older fish.

High levels of observer coverage could contribute substantially to both improved return of tags, and reliable estimates of non-reporting rates. However, there are substantial practical difficulties in implementing increased observer coverage, particularly in the short-term. In certain fleets, it may not even be possible to attain the SRP-recommended 10% observer coverage level by the end of 2002. It was noted that every effort should be made to work towards this 10% coverage level rapidly, particularly for fleets that catch substantial quantities of juvenile (2 - 4 year old) fish. However, it was scientifically preferable to determine what acceptable CVs would be for the parameters to be estimated from tagging data, and to then determine optimal observer coverage rates from simulation analyses. Such a process should, in fact, address other program design issues than observer coverage, including factors such as the effect of tagging mortality rates and alternate mixing hypotheses. However, conducting such analyses would take some time.

Estimates of recruitment and F on 2 - 4 year old fish have not previously been available as inputs to stock assessments. Provision of these estimates should improve assessments. The tagging program design is expected to achieve a target CV of 20% on recruitment and F values for 2 - 4 year old fish under model assumptions and specific hypotheses of mixing. Since most tag recoveries in the short-term are expected to be in the surface fishery, there is an opportunity to initiate tagging in 2002, and resolve remaining design issues, including necessary observer coverage rates. Further simulation studies of optimal observer coverage rates for the proposed multi-cohort / multi-year tagging program need to be conducted to determine expected CVs on other stock assessment parameters, and the results of these studies should be reviewed at the next SAG meeting. If it is determined that the tagging program will not adequately improve SBT stock assessments over the time of the tagging program, the problems will be reviewed at the SC7 and referred to the CCSBT9 meeting for further consideration

5. Tagging Program Coordination

It is proposed that the CCSBT Secretariat have the primary coordinating , administration and management role in the proposed tagging program. Numerous coordinating activities are identified in the program proposal above. The most important of these relate to:

- Development and maintenance of the CCSBT tagging database, based on the data collection standards agreed on for the Tagging Manual. This will require close liaison with members to finalise these data standards. The Database Manager will also have to facilitate and control access to the database, and ensure accurate capture of all tag and recapture information.

- Arrangement, printing, storage and distribution of tagging posters and publicity materials, administration of the tag reward system (including liaison with other agencies handling aspects of this process).

- Coordination of port sampling activity for liaison with tuna vessels and encouragement of tag returns. This will also require close liaison with other agencies implementing port sampling schemes, as well as actual coordination of the SBT-related aspects of any port sampling, particularly the payment of incentives.

- Administration of the CCSBT tagging program budget, including payments for tags, posters, rewards and port sampling incentives.

- Summary and reporting of progress with the tagging program, and results obtained, to the Commission.

6. Budgetary Implications

Expected costs of all components and activities proposed under this tagging program will be substantial. Even though some of the costs will be carried by members, a substantial budget allocation will still required from the Commission. These expenses detailed in **Annex 1**, relate primarily to the coordinating requirements of the Secretariat, the provision of tags, publicity materials and tag rewards, and incentives for monitoring of tag returns in fishing ports.

CCSBT- Proposed Tagging Program

A. COORDINATION

	Activity	Unit cost	# units	Total cost
	CCSBT Tag Cordinator	100000	1	100,000
	Administrative costs	40000	1	40,000
	Tag purchase	1	40000	40,000
	Tag rewards (assuming both tags for 20%)	12	6400	76,800
	Freight/mail costs	3000	1	3,000
	Printing (data sheets, posters, promotional)	5000	1	5,000
	Tagging equipment (cradles, needles, blocks)	6000	1	6,000
	Tagging working group meeting (annual)	4000	1	4,000
	Tagging Manual	15000	1	15,000
	Training			
	NZ Training *			
	Japan Training*			
	Korea Training*			
	Taiwan Training?*			
	Australia Training*			
	* At time of workshop estimates of costs not available. These costs will be identified as the program evolves.			
	Sub-total costs			**289,800**

B. TAG DEPLOYMENT

SURFACE FISHERY				
South Australia	Tagging vessel charter (40 days)	7000	40	280,000
	Tagger costs (2 people each for 40 days at sea)	700	80	56,000
	Shore per diem (2 people for 10 days)	125	20	2,500
	Travel (1 cocordinator+2 tagging crews)	2000	5	10,000
	Car hire	120	6	720
	Sub total South Australia			**349,220**
Western Australia	Tag deployment			
	Tagging vessel charter (45 days)	3000	45	135,000
	Tagger costs (2 people each for 45 days at sea)	700	90	63,000
	Shore per diem (2 people for 25 days)	125	50	6,250
	Travel (1 coordinator+2 tagging crews)	2500	5	12,500
	Car hire	120	15	1,800
	Sub total Western Australia			**218,550**
	Sub-total surface fishery deployment costs			**567,770**
LONGLINE FISHERY				
Japan	Deployment costs (as per CCSBT-TAG/0110/06)			**2,000,000**
	Proposal is to release 250 conventional, 45 archival and 7 pop-up tags			
New Zealand	Deployment costs			
	Vessel charter (per vessel per day)	3400	155	527,000
	Tagger costs	350	120	42,000
	Travel (4 observers)	800	4	3,200
	Shore per diem (4 observers, 4 days each@	120	16	1,920
	NZ Coordinator (Incl data entry)	20000	1	20,000
	Sub-Total			**594,120**
	Proposal includes no numbers of tags to be released			
Australian	Total costs (incl. deployment, data entry)			**300,000**
	Proposal is to release 500-1000 conventional tags and 10 pop-up tags			
	Sub-total high seas fisheries deployment costs			**2,894,120**

C.RECOVERY

	Australian Surface Fishery - South Australia			
	Monitoring 10% of harvests (based on days)	250	100	25,000
	Travel to harvests for liaison co-ordinator	2000	1	2,000
	Port Officers for Pt Lincoln Tag Return Centre	5000	2	10,000
	Sub-total South Australia recovery			**37,000**
	High Seas			
	Port Officers in member countries (Perth, Sydney, Hobart)	5000	3	**15,000**
	Port Officers in non-member countries (Cape Town and Mauritiu	5000	2	**10,000**
	Coordinator travel for liaison	5000	2	**10,000**
	Sub-total recovery			**72,000**
	Tag recovery in Japanese ports*			
	Tag recovery in Korean ports*			
	Tag recovery in Taiwanese ports*			
	Tag recovery in Indonesian ports*			
	* At time of workshop estimates of costs not available. These costs will be identified as the program evolves.			

TAGGING PROGRAM TOTAL COSTS **3,823,690**