



*Assessing operational feasibility of
stereo video and Evaluating monitoring
options for the SBTF Farm sector.*

Hender, J. and Findlay, J.

DRAFT

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Abstract

The accuracy and practicality of stereo-video to estimate the size of SBT in commercial farming transfers will be evaluated during both the current and 2007-08 seasons. In the current season, stereo video will be used to sample the size of fish transferred to holding pontoons prior to harvest. Post-harvest measurements will be used to validate the accuracy of size data collected by stereo video. Experiments in the 2007-08 season will examine the accuracy of stereo video measurements of SBT of a known size sampled from a tow cage under different conditions (e.g. varying visibility). Methods for tracking tagged individual SBT within the sample and comparison between persons undertaking the video analysis will also be evaluated. Assessment of the robustness of video sampling equipment in a commercial setting and comparability of output under varying environmental conditions are additional aims of the study.

Background

At the 13th annual meeting of the Commission for the Conservation of Southern Bluefin tuna (CCSBT), some members questioned the system of estimating catches of the Australia's SBT farm sector. Currently a sample of 40 fish of 10kg and over is captured and measured from the tow cage. For a number of years, Australia has been investigating Stereo Video technology to replace the 40 fish sample used to estimate the weight of SBT transferred into farms

Australia stated that at CCSBT13 that it would endeavour to complete work on the experimental design and experimental work and provided an undertaking to submit a draft initial experimental design to address the issues raised to other CCSBT members. On 26 February 2007 Australia presented the Australian Farm Research Program proposal to CCSBT members for comment (Appendix 1). The proposal outlines a series of experiment aimed at addressing CCSBT members concerns

The research program provided possible procedures to investigate the uncertainties raised by the independent review and some CCSBT Members. The activities in the draft proposal would have determined the accuracy of the measurements of the Australian SBT farming sector fishing mortality.

In response to Australia's CCSBT Farm Experiment design proposal, New Zealand requested Australia use SV technology to reduce the requirement of RMA, while Japan requested further investigation into the accuracy and precision of SV technology (see correspondence attached). In addition, the cost of undertaking the proposed SBT Farm Experiments would be substantial. No CCSBT members proposed to contribute funding and the costs far exceeded the SBT research funds available in Australian. To reduce the required RMA and costs, the SV trials were developed as the initial step in accordance with CCSBT member's requests.

Introduction

There have been a series of AFMA research projects since 2001 directed at obtaining representative length frequency data on Australia's SBT purse seine catch taken for grow out farms off Port Lincoln. The provisional work on stereo video and the recent reviews of the catch monitoring procedures have highlighted a number of operational issues which will need to be addressed before a decision whether or not to implement

the stereo video equipment to monitor farm catch and provide representative length frequency data is made. AFMA convened a stereo video working group (SVWG) consisting of industry, researchers, and management representatives to develop a research proposal and evaluate stereo video technology in the SBT Fishery. The working group “agreed that the immediate priority is to evaluate the use of stereo video technology under the range of conditions comparable to actual farm transfer conditions; particularly with regard to varying light and water visibility conditions and with a range of fish sizes”.

The timing of CCSBT 13 close to the start of the 2006-2007 catching season restricted the scope of potential experiments in the 2006-07 fishing season. Industry have been working cooperatively with the Australian scientists and have approved the use SV technology a pre harvest cage. However the scope for experimental manipulation of fish is limited due to the potential for substantial loss of product value as a result of experimental stress. The access to this commercial cage forms the bases of the SV trials in 2006-07. The data collection in the 2006-07 fishing season experiments is expected to occur during August 2007. As a result it is not be possible to submit the outcomes of the experiment prior to the 7 August SAG/SC document submission due date. Australia will however, provide an update to this SV paper with results as early as possible.

To allow more in depth analysis of SV technology, Australia is requesting a RMA allowance of 15 t for the 2007-08 experiments with the profits from any sale of RMA SBT provided to the Commission. It is anticipated that only 7.5 tonnes of the RMA will be used in the trial with spare quota to cover unforeseen circumstances. Without access to RMA Australia will be unable to progress the development and implementation of SV technology.

Year 1

Planned Start Date	2 August 2007
Planned End Date	1 December 2007

Year 2

Planned Start Date	January 2008
Planned End Date	July 2009

Objectives

1. Assess the accuracy and precision of SV length measurements in operational conditions.
2. Develop statistically robust sample sizes and sampling regimes for SV measurements.
3. Assess the robustness and operational suitability of the physical SV equipment in operational conditions. Including developing technical knowledge and processes required to set up and operate stereo video equipment effectively in Port Lincoln.
4. Develop options for converting SV length measurement into weight estimates.

Need

Assessing the operational feasibility of the stereo video technology remains a very important domestic and international SBT management priority. There is a need to conduct appropriate trials to determine statistically acceptable levels of SBT sampling. The project must also determine accuracy of length measurements and apply this to individual and total aggregate catches.

There is a need to evaluate the use of stereo video technology under the range of conditions comparable to actual farm transfer conditions, particularly with regard to varying light and water visibility conditions and with a range of fish sizes. It will also provide important insight into practical implementations issue such as the time and technical expertise needed to set up and calibrate stereo video equipment, and the physical robustness of the equipment under operational conditions.

Planned Outcomes

A professionally implemented and independently verified assessment of issues associated with the use of stereo video technology in the SBT Fishery farm sector under a range of conditions comparable to actual farm transfer conditions, particularly with regard to varying light and visibility conditions and with regard to fish sizes. The project will also form the initial part of the Australian farm research experiments to look at alternatives to the 40 fish sample. It is expected that the stereo video researchers will produce a number of scientific papers from the research which will be published in relevant journals.

Methods

Year 1

Field work

Stereo video equipment will be used during a commercial pre-harvest transfer to assess suitability and robustness of the stereo video equipment for measuring lengths of southern bluefin tuna during transfer.

A market ready pontoon of SBT will be split prior to harvest. During this transfer the SBT lengths will be measured with SV equipment. Following the transfer of SBT they will be harvested and the individual lengths independently observed. Furthermore the lengths of the remaining SBT in the original pontoon from which the fish were transferred from will be directly measured during harvest for comparison.

The SV footage will be sent to University of Western Australia and Protec Marine for two sets of independent analysis of SV lengths. The SV lengths and direct length measurements of the transferred fish will then be compared to estimate the robustness of SV equipment under operational conditions. Information obtained from these transfers will also be analysed to gain insights into the accuracy of SV measurements and suitable sample sizes and sampling regimes.

During the initial year of field work the project will endeavor to test non invasive tagging techniques that can allow the identification of individual tuna with SV equipment during transfers. These tagged SBT will be purchased from industry.

Statistical analyses will be performed using non-parametric methods to determine whether there are statistically significant differences between the length frequency distributions obtained from the stereo video and the direct sampling and the direct sampling of the two cages of fish i.e. transferred and not transferred. Non-parametric statistical methods will be used to determine whether there are statistically significant differences between the length measurements estimated by UWA and Protec. Regression analysis will be used to determine whether there is a trend in the size of the fish that leave the cage at the start/end of the transfer. In addition, the length frequency distributions obtained using different size subsets of the direct length measurements to that based on the entire dataset will be compared. In the absence of a trend in the size of fish transferring, bootstrapping techniques will be used to determine the variation around the derived distributions.

The project will include developing options for the conversion of SV length measurements to weight estimates. The options will be presented to the CCSBT for consideration in 2007-08.

Year II

Field work

15 tonnes research mortality allowance (RMA) will be requested from CCSBT. It is anticipated that only 7.5 tonnes of the RMA will be used in the trial with spare quota to cover unforeseen circumstances.

On arrival at Port Lincoln the SBT held in the towing pontoon will be moored on a commercial lease site. A 32 meter diameter research pontoon will be tied to the towing pontoon and a minimum of 500 SBT consisting of fish from a range of size classes will be caught. Each SBT will have their individual length recorded and a portion of the SBT will be tagged with a unique tag. Once the research pontoon is stocked it will be towed to another lease site where it will be connected to another static 32 meter diameter research pontoon. The SV equipment will be positioned between the two pontoons to allow the SBT to be transferred between the pontoons under a range of operational conditions (eg. Turbidity, light, weather). The SBT during this period of research will be fed a maintenance ration.

The second component of the field work will involve capturing individually SBT, measuring the length of individual SBT and placing the individual SBT back into the water where the individual fish will swim through a specially designed fish race. The fish race will lead the SBT to the SV equipment where the individual length will be recorded. The trials will be completed under a range of operational conditions and with independent observation.

The SV footage will be sent to University of Western Australia and Protec Marine for two sets of independent analysis of SV lengths. The SV lengths and direct length measurements of the transferred fish will then be compared to estimate the robustness of SV equipment under operational conditions. Information obtained from these transfers will also be analysed to gain insights into the accuracy of SV measurements and suitable sample sizes and sampling regimes.

Non-parametric statistical methods will be used to determine whether there are

statistically significant differences between the length measurements estimated by UWA and Protec as well as a comparison between the direct sampling and the SV footage obtained under a variety of operating conditions. Similarly to year 1, regression analysis will be used to determine whether there is a trend in the size of the fish that leave the cage at the start/end of the transfer, however in year II this will be performed for multiple transfers. The length frequency distributions obtained using different size subsets of the direct length measurements to that based on the entire dataset will be compared. The length measurements obtained from multiple transfers will be used to estimate the uncertainty around the length frequency distribution.

DRAFT

Appendix 1. Australian Farm Research Program

Mr Neil Hermes
Executive Secretary
Commission for the Conservation of Southern Bluefin Tuna
PO Box 37
DEAKIN WEST ACT 2600

Dear Mr Hermes,

At the 13th annual meeting of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) in October 2006, the Commission discussed the outcomes of the independent review of the Australian southern bluefin tuna (SBT) farm operations. Some CCSBT members indicated that there were matters in this study for which they sought further investigation. In particular, Japan requested that Australia investigate the following issues as a flag-state responsibility:

- a) Representativeness of the 40 fish samples, which are used to estimate catch (bias in 40 fish sample); and
- b) Weight change during towing;
- c) Accuracy in counting of dead fish during towing;
- d) Accuracy in growth rate during farming; and
- e) Number of fish transferred into farming pens.

Australia stated that it would endeavour to complete work on the experimental design and experimental work and provided an undertaking to submit a draft initial experimental design to address the issues raised to other CCSBT members by the end of November 2006.

The attached draft outline provides possible procedures to investigate the uncertainties raised by the independent review and some CCSBT Members. The activities in the draft proposal could determine the accuracy of the measurements of the Australian SBT farming sector fishing mortality

A more detailed proposal will be developed after consideration of comments from Members in relation to experimental design. At that time details of costs and logistics will be considered further, recognising that these issues will have a major impact on the feasibility of carrying out the experimental work.

Funding, access to SBT and the availability of key resources (e.g. vessels and skilled crew, purse seines, tow nets, farm cages, stereo-video systems) for an SBT farming study have not been identified and must be sourced for any research program to proceed. An initial estimate of the cost of the work outlined in the attached draft proposal is from \$50 to \$60 million over three years.

In accordance with the milestones for this work, Australia seeks comments from other CCSBT Members by the end of December 2006.

Yours sincerely,

Dr John Kalish
General Manager
Fisheries & Aquaculture
Australian Government
Department of Agriculture, Fisheries and Forestry
5 December 2006

Attachment: Draft Proposal: Australian Southern Bluefin Tuna Farming Study

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DRAFT PROPOSAL:

Australian Southern Bluefin Tuna Farming Study

Background

The Independent Review of Australian SBT Farming Operations Anomalies (AFR) concluded that the regulation of the industry is a rigorous and well managed process with no apparent anomalies and no scope for over-catching via misreporting. A diagram of the Australian southern bluefin tuna (SBT) farm process is presented in Attachment A and includes the following steps. Off southern Australia, fishers encircle schools of SBT with purse seine nets (1). The tuna are transferred to tow cages (2). Each tow cage can hold several thousand live tuna. The tow cages are then towed for two to three weeks (3) to coastal areas where the tuna are transferred to grow-out pens (5). They are fattened for up to six months (6) before harvest (7) and shipment to markets, predominantly in Japan (8).

Goal

To determine the accuracy of the measurements of the Australian SBT farming sector catch.

Challenge

SBT may not be harvested for up to six months after capture. During this period, SBT are fattened which increases the weight of each fish. This makes estimating the weight of SBT at the time of capture in the farm fishery potentially more challenging than in traditional wild-capture fisheries.

Since 1993, underwater video cameras positioned at the gate between each tow cage and grow-out pen have been used to count the total number of southern bluefin tuna transferred to each pen (5). The AFR supported the accuracy of the Australian estimate of the number of SBT caught on the basis of this method.

Prior to the transfer between the tow cage and grow-out pen, tuna are sampled from the tow cage with handline fishing gear, weighed, measured and then returned to the cage (4). The sample is limited to 40 tuna of 10 kg or larger because of concerns that stress and damage may cause depressed growth rates or mortality of the tuna. Furthermore, an independent study of the 40 fish sample found that there was no evidence of statistically significant bias with the 40 fish sample. Each tow-cage may supply several grow-out pens; and each pen may contain SBT from several tow cages and each tow cage may include SBT from multiple schools.

The average weight of sampled tuna has traditionally been multiplied by the total count from the video cameras plus mortalities during the tow, to provide an estimate of the catch weight that is deducted from Australia's national allocation. Tuna smaller than 10 kg have been excluded from measured samples since the 1997–98 season and this can result in an overestimate of the weight of SBT in a tow cage. An earlier study indicated that the catch weight can be overestimated by as much as 10% during the early season when small fish are more common in the catch.

The AFR identified two main areas where potential anomalies may occur in estimating SBT catch: weight change during tow and biases in the 40 fish sample. At the 13th annual meeting of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) Japan indicated that there were a number of uncertainties raised in the independent review that require further investigation.

1. Representativeness of the 40 fish sample;
2. Weight change during towing;
3. Accuracy in counting dead fish during towing;
4. Accuracy in growth rate during farming; and
5. Number of fish transferred into farm pens.

Australia endeavoured to design and complete experimental work as soon as practical to answer these questions taking into account variability between seasons and operational practices.

This draft outline provides possible procedures to investigate the uncertainties raised by the independent review and some CCSBT Members. These activities could determine the accuracy of the measurements of the Australian SBT farming sector fishing mortality. In addition to the work proposed, Australia will review and assimilate any published literature available on tuna farm monitoring arrangements in all the fisheries where tuna farming occurs.

A more detailed proposal will be developed after consideration of comments from Members in relation to experimental design. At that time details of costs and logistics will be considered further, recognising that these issues will have a major impact on the feasibility of carrying out the experimental work.

Funding, access to SBT and the availability of key resources (e.g. vessels and skilled crew, purse seines, tow nets, farm cages, stereo-video systems) for an SBT farming study have not been identified and must be sourced for any research program to proceed. An initial estimate of the cost of the work outlined in this draft proposal is from \$50 to \$60 million over three years.

Question 1: Representativeness of the 40 fish sample

Ho: The mean weight of SBT in the 40 fish sample is representative of the weight of SBT in the tow cage.

Stage 1 Representativeness of the 40 fish sample replicates

- At least ten tow cages of SBT will be purchased from the Australian industry at the farm gate, or alternatively the Australian industry will be contracted to catch and tow Research Mortality Allowance (RMA) fish. The number of fish in a tow cage may influence the representativeness of the 40 fish sample; as a result tow cages will need to be the same size as commercial cages. The number of samples that is needed for these experiments depends on the magnitude of the variance and the required precision, but standard practice suggests that the sample size would have to be at least 10 replicates for a meaningful study.
- As many fish as possible will be sampled with handline in Port Lincoln using the same methods as for the 40 fish sample, with weights and lengths consecutively

recorded. Any remaining fish will be sampled with the assistance of divers. All SBT will be processed for sale to offset costs.

- The level of heterogeneity of fish size within a tow cage will potentially impact the representativeness of the 40 fish sample. Cages (or schools to be sampled) will be selected at random if possible. This experiment will need to be replicated over three seasons to monitor the influence of inter-annual variability.

Question 2: Weight change during towing

To determine if the weight of SBT in a tow cage has changed during tow, there are two experiments that must be completed. Firstly, an experiment must be completed to determine if the length-weight relationship changes during tow. Secondly, an experiment must be completed to determine if the length of SBT changes during the tow. Due to the inability of splitting a single tow cage into two random samples, it would be necessary to carry out these two experiments separately.

PART A: Length-weight relationship change during tow

Ho: The length-weight relationship of southern bluefin tuna does not change during towing.

- For each replicate a tow cage of SBT will be purse seined and divided as equally as possible into four separate 'quarter tow cages'. The complete contents of two randomly selected 'quarter tow cages' (half the original tow cage) will be individually measured, weighed and processed. Splitting an individual tow cage into several smaller tow cages removes the issue of insufficient replication. However, the towing of smaller quantities of fish may influence the weight change during tow.
- The remaining two 'quarter tow cages' will be towed to Port Lincoln. After the tow, the fish will be killed, individually measured and weighed.
- The SBT that are sampled will be sold with the proceeds of sale to offset experimental costs.
- The experiment will require ten replicates (detailed above) at randomly selected times over the season. The individual schools chosen to fill the tow cages will also be randomly selected from schools identified as suitable to farm. These replicates will be fed during tow. This experiment will be replicated over three seasons to monitor the influence of inter-annual variability.

Part B: Length change during towing

Ho: The length of southern bluefin tuna does not change during towing.

- Ten tow cages of SBT will be purse seined with the length of fish monitored with stereo-video technology during the transfer to the tow cage. It should be noted that the stereo-video technology has not been used on the fishing grounds and will potentially be impacted by adverse weather.
- Due to operational issues associated with the stereo-video system, further tests of the system are planned for the 2006/07 catching season. Completion of these tests and confirmation of the suitability of the stereo-video system will be required before the system could be used for the detailed study of SBT length.
- It may be possible to complete this experiment as a part of commercial operations with industry support.

- The tow cage will be towed to Port Lincoln. After the tow, the fish will be measured again with stereo-video.

Question 3: Accuracy in counting dead fish during tow

- The current procedure for counting dead fish during the tow is for divers to count and/or collect the mortalities from the tow cages.
- Due to operational, particularly occupational health and safety, issues associated with this method other techniques will be investigated including the deployment of fixed digital cameras or sonar on tow cages to monitor mortalities during the tow.

Question 4: Accuracy in growth rate during farming

If the remaining questions raised at CCSBT are addressed through rigorous experiments, the question of the accuracy of growth rate estimates during farming will be resolved. For this reason, Australia has not designed a specific experiment to answer this query at this time.

Question 5: Number of fish transferred into farm pens

The AFR supported the current Australian methods of monitoring the number of fish transferred from tow cages to farm pens. Counts of fish based on the tapes are made by AFMA, the tapes are audited by compliance officers and AFMA completes a reconciliation of the number of fish into the cages for fattening and out of the cages at harvest. Australia will endeavour to provide CCSBT members with access to the raw data tapes of fish transfers, under suitable confidentiality arrangements. Independent counts of numbers of fish from these tapes can be compared with the number of fish harvested.

Appendix 2. Members comments to the proposed Australian Farm Experiments.

New Zealand

22 December 2006

Neil Hermes
Executive Secretary
Commission for the Conservation of Southern Bluefin Tuna
PO Box 37
DEAKIN WEST ACT 2600
Australia

Dear Neil

New Zealand thanks Australia for the opportunity to comment on the paper describing a draft proposal for the experimental work that Australia intends to carry out to investigate aspects of its catch estimation and farming operations for southern bluefin tuna. New Zealand notes that the accuracy of catch estimation is critical to maintaining the integrity of the catch allocation system used under CCSBT.

The two areas of uncertainty raised by the Australian Farming Review (AFR) were in relation to the representativeness of the 40 fish sample and the potential for weight change during towing. These relate to questions 1 and 2 in the proposal. New Zealand believes that these two questions should be the focus on any experimental work. New Zealand has not commented on the proposed approaches for questions 3-5, but will note that we are in agreement with Australia that if questions 1 and 2 can be answered then it will make question 4 redundant.

Below are some general and then more specific comments on the draft proposal:

General comments

- New Zealand acknowledges a lack of familiarity with the many aspects of the farming operations so in turn acknowledges that some of its suggestions may not be feasible, however;
- To the extent possible the experiments should be conducted in conjunction with standard commercial operations. This is critical to ensure that any findings are in fact representative of

the types of outcomes that may occur from commercial activities, and may help minimize costs;

- Given New Zealand's concerns over the current exploitation rates on juvenile SBT, we would like the approaches used to minimize mortality in excess of the current Australian national allocation;
- We believe that the stereo-video system currently under development will be critical to the experimental work; and
- New Zealand is surprised at the lack of statistical analyses provided in support of the proposed approach. We see that a clear presentation of the statistical power of any analyses is critical to an evaluation of the experimental design. In particular, it would be useful to be able to comment on any trade-offs between costs/mortality and the power to prove that there is no "significant" bias.

Specific comments

Question 1:

- It is the view of New Zealand that this analysis is best undertaken within standard commercial operations.
- One possible approach is described as follows:
 - Take 40 fish (or larger) samples as is typically done from tow cages prior to transfer. These fish would be sampled for length and weight. It may be useful also to tag these fish for future identification.
 - Use the stereo-video system to estimate the size composition of the entire tow cage when its contents are transferred to farm cages.
 - Compare these size distributions for evidence of bias.
- Noting that critical to this is validation of the stereo-video system, one possible approach to validate it would be to use the stereo-video system while farm pens were being harvested. We note that this experiment would not be possible until late in the season during harvesting, but it should represent a direct and cost-effective approach.

Question 2:

- In general we agree with the two-part approach to address this uncertainty, but again suggest that it be carried out during standard commercial operations.
- One possible approach is identical to that described for question 1 (both the taking of the 40 fish samples and use of the stereo-video system), except that the samples are obtained prior to towing. We note that as tow cages often contain multiple sets, this may need to be considered.
- This approach would provide more observations to test the suitability of the "40 fish sample" technique to obtain representative samples from the cages.
- The same sampling approach would be used once the cages had been towed back to the farming area. It may be possible to use the data collected in question one if the same cages are used throughout.
- One would then compare the length-weight relationships and "before and after" length compositions. We note that there are many statistical approaches that could be used to compare the length-weight relationships, but propose that any approach taken should focus on estimators of the mean weight in a sample.

Again our thanks for the opportunity to comment and we would appreciate it if you could forward these comments to Dr Kalish for consideration.

Yours sincerely

Arthur Hore
HMS and RFMO Manager
Ministry of Fisheries
New Zealand

Japan

(Informal Translation)

Comments on the draft proposal on Australian Southern Bluefin Tuna Farming Study

1. General comments:

CCSBT Members, as a matter of course, have responsibilities to manage their own SBT (Southern Bluefin Tuna) fisheries. During the Independent Review of Australian SBT Farming Operation Anomalies (AFR), Japanese panel members asked many questions to Australia, but there were insufficient answers. Consequently, there are still uncertainties in fisheries management of Australian SBT farming operations.

Flag states have responsibilities to manage their own fisheries, and the responsibilities include planning fisheries management, making necessary fisheries regulations, and bearing fisheries management costs. If a flag state does not plan fisheries management, make necessary fisheries regulations, or bear fisheries management costs, it means that the flag state does not carry out its responsibilities. If Australia would request the CCSBT to bear costs of the proposed Australian SBT farming study, Australia would not implement its own fisheries management by its expenditure. Furthermore, if the proposed Australian SBT farming study involves mortalities of SBT, the mortalities should be deducted, in all reason, from the Australian quota (5265 ton) because the study will be implemented for Australian domestic fisheries managements.

The draft proposal on Australian SBT farming study lacks for major research items. Such poorly-designed proposal can not reveal actual catch by Australian surface fisheries, actual growth rate of SBT during farming, or actual survival rates of SBT, all of which are essential for fisheries management of SBT farming.

Japan, as a traditional fishing nation and developed fisheries management country, provides the following comments by every particular item.

In addition, in order to ensure the transparency, the proposed Australian SBT farming study, including implementation of this study at field (at sea), should be open for CCSBT Members, Cooperating non-Members, NGO (Non Governmental Organizations), and mass media (press). Japan would like to actively contribute to SBT fisheries management through providing comments to the proposed study and attending the implementation of this study at field (at sea). Japan believes that Australia will accept scientific comments on the proposed study, including comments on research items, from the other CCSBT Members.

2. Background:

As mentioned above, the proposed Australian SBT farming study, including implementation of this study at field (at sea), should be open for CCSBT Members, Cooperating non-Members, NGO, and mass media in order to ensure the transparency. CCSBT13 decided to treat the report of AFR (Independent Review of Australian SBT Farming Operation Anomalies) as confidential. Inclusion of references to the AFR report in the proposed study is not appropriate. Therefore, the first paragraph should be deleted. Also, the other references to AFR in the draft proposal should be deleted.

3. Goal:

In order for proper management of SBT resources, it is necessary to accurately know SBT catch by Australian surface fisheries. Therefore, the goal should be changed to “To determine the level of under/over-reporting of the Australian SBT farming sector catch”. Furthermore, the proposed study should reveal under/over-reporting of the Australian SBT farming sector catch from 1992 and contribute to the SBT stock assessment process.

4. Challenge, including Questions:

At the CCSBT 13, Japan pointed out the following 5 major research items.

- a) Representativeness of the 40 fish samples, which are used to estimate catch (bias in 40 fish sample);
- b) Weight change during towing;
- c) Accuracy in counting of dead fish during towing;
- d) Accuracy in growth rate during farming; and
- e) Number of fish transferred into farming pens.

In order to reveal under/over-reporting of the Australian SBT farming sector catch from 1992, study on other research items, in addition to the above-mentioned 5 major research items, are necessary.

(1) Study at the time of catch:

- It is told that, according to Australian domestic laws/regulations, catch means transferring SBT to tow cages and catch amount means amount of SBT which are transferred to tow cages. Is it true?
- Between encircling SBT with purse seine nets and transferring SBT to tow cages, there is possibility that some SBT die or that some SBT are released and die after release. How many SBT die between encirclement with purse seine nets and transferring to tow cages?
- Is there any occasion for fishers to release or kill SBT after they encircle SBT with purse seine nets because the size of encircled SBT is not suitable for farming (or other reasons)? If yes, how many SBT are released or killed? If no, how it is verified? How survival rates of released SBT are estimated?
- How many SBT die between encirclement with purse seine nets and transferring to tow cages?
- Are all encircled SBT transferred to tow cages? Are there any discard of dead SBT or release of feeble SBT? If yes, is such SBT included in quota?

(2) Representativeness of the 40 fish samples (Question 1):

Normally, it is necessary to measure each SBT in weight and length at the time of catch. Measuring each SBT during transferring to tow cages can provide accurate catch amount. Furthermore, putting tags on SBT during transferring to tow cages enables to know growth rate of each SBT and accurate catch. Also, the tagging can prevent introduction of illegally caught SBT into farm cages. The tags should have their identifiable tag numbers so that flow of SBT from purse seine vessels, tow cages to farm cages can be monitored by the tag numbers.

The draft proposal on Australian SBT farming study mentions usage of RMA (Research Mortality Allowance) and proposes to kill and sell SBT after measurement (in weight and length). However, study on representativeness of the 40 fish samples can be done by using tags without killing SBT (without any RMA). In fact, the 40 fish sampling has been conducted without killing SBT, and, during the 40 fish sampling, about 10 SBT are measured, tagged

and returned into tow cages. Therefore, study on representativeness of the 40 fish samples can be done without killing SBT.

The CCSBT SC (Scientific Committee) doubts age compositions of reported Australian SBT catch. Therefore, the following hypothesis should be included into this study. Furthermore, to examine this hypothesis, each SBT should be measured in weight and length at the time of harvest.

Ho: The estimated age composition of SBT in the 40 fish sample is not different from that at harvest (at the end of the farming).

To study representativeness of the 40 fish sample, it is necessary to conduct the 40 fish sampling from commercial tow cages and then compare, in weight and length, the 40 fish samples with the remaining SBT in the tow cages.

(3) Weight change during towing:

Putting tags on SBT at the time of catch enables to examine weight change during towing, number of SBT caught, and number of dead SBT during farming. Tags could be attached not only on body of SBT but also on fins of SBT. There is very low possibility (almost zero) for SBT to be killed by tagging. In fact, during the 40 fish sampling, about 10 SBT are measured, tagged and returned into tow cages without being killed. Study on weight change during towing can be done without killing SBT.

The CCSBT is conducting a tagging program in Australian EEZ. Some of the tagged SBT were caught by Australian surface fisheries and raised in farm cages. Tagging SBT during transfer to tow cages involves very low SBT mortality, if not zero. Also tagging would not put any negative effect on the quality of final product (price of farmed SBT).

While the draft proposal on Australian SBT farming study proposes to divide a tow cage into four to conduct experiment, experiment should be done at commercial tow cages without division because conditions on experiment should be same to those on commercial activities.

(4) Accuracy in counting dead fish during tow:

Divers should check the number of dead SBT twice a day during towing. Of course, amount and kind of feed should be accurately recorded.

(5) Accuracy in growth rate during farming:

Study on growth rate during farming is one of the most important issues. Without information on accurate growth rate, it is impossible to know past under/over-reporting and, consequently, it is impossible to contribute to SBT stock assessment process.

Growth rate during farming should be examined through the following ways. At first, when SBT is transferred from tow cages to farm cages, SBT should be measured in weight and length and be put a tag. Then, when SBT is harvested, SBT should be measured in weight and length so that growth rate of each SBT can be monitored. All SBT should be tagged in all farm cages. If statistically significant number of SBT is tagged in farm cages, growth rates during farming could be known with reasonable confidence interval. Of course, farming conditions (i.e. amount and kind of feed, density of SBT in farm cages) should be recorded.

Effect of tagging on SBT growth rate can be examined through comparison of growth rates between SBT with tag and SBT without tag.

Furthermore, it is necessary to do verification of growth rates that Australia reported to the CCSBT. PROTEC has growth rate data on SBT that were tagged during the 40 fish sampling. Australia should provide CCSBT Members with access, under suitable confidentiality arrangements, to the growth rate data kept by PROTEC. Furthermore, Australia should provide CCSBT Members with access, under suitable confidentiality arrangements, to information on past (up to 10 years) farming conditions (i.e. amount and kind of feed, density of SBT in farm cages)

(6) Number of fish transferred into farm pens:

Australia should disclose methods of the current video monitoring to CCSBT Members. Australia should also disclose methods of the stereo-video monitoring. Furthermore, Australia should disclose, to CCSBT Members, all video tapes that recorded transfer from tow cages to farm cages.

Japanese side believes that the stereo-video system can not practically measure length of tuna species, including SBT, even though Australia changes from the current system to the stereo-video system. If Australia makes farfetched claims that the stereo-video system can measure length of SBT and that the system is perfect, Japanese side would like to receive, from Australia, enough evidence of such claims and reasons why Australia does not implement the stereo-video system immediately.

(7) Study on Australian domestic SBT market:

Some SBT die during purse seine operations and farming operations. Also, there may be farmed SBT that are not suitable for exportation. Such SBT are consumed within Australia, and study on Australian domestic SBT market is necessary.

(8) Others:

If Japan has additional comments, Japan will provide them later.

Fishing Entity of Taiwan

From: Shiu-Ling Lin

Sent: Thursday, 28 December 2006 11:54 AM

To: Neil Hermes

Subject: Re: Draft Australian Farm Study

Dear Mr. Hermes,

Thank you very much for forwarding the draft proposal of Australian SBT Farming Study.

In respect of the draft proposal, we have no comment. However, for the purpose of further understanding the detailed experimental design, please circulate the detailed proposal to all members when it is developed.

Regards,

Linda

Appendix 3. Australia's response to CCSBT members comments of the Australian Farm Experiment Proposal

Mr Neil Hermes

ニール・ハーミス殿

Executive Secretary

事務局長

Commission for the Conservation of Southern Bluefin Tuna

みなみまぐろ保存委員会

PO Box 37

DEAKIN WEST ACT 2600

Dear Mr Hermes,

拝啓 ハーミス殿

Thank you for forwarding the comments you received from Japan, New Zealand and the Fishing Entity of Taiwan concerning the Southern Bluefin Tuna (SBT) Australian Farm Research Programme (AFRP). I am writing to respond to the comments and would be pleased for these to be passed to Members for their information. I look forward to further refining the AFRP based on the comments and responses so that we may progress an expeditious implementation of the AFRP.

みなみまぐろ(SBT)のオーストラリア蓄養調査計画(AFRP)について、日本、ニュージーランド及び漁業主体台湾から受領したコメントを回章いただき、ありがとうございました。コメントへの回答を申し上げますので、メンバーの参考となるよう転送いただければ幸いです。我々がAFRPを迅速に実施できますよう、コメント及び反応をもとに、AFRPをさらに改善することを望んでおります。

The main substance of comments was from Japan and New Zealand, referring to several issues of a general nature and others on specific issues. The views expressed in the reviews were divergent in terms of the research methods and their likely effectiveness as well as the relevance of certain potential elements of the research programme. I provide the following in response to the issues raised:

コメントの主たる内容は、日本とニュージーランドからの、一般的な性質のいくつかの問題及び具体的な問題に関するその他の問題に言及したものでした。論評に表明された見解は、調査計画の特定の潜在的な要素についての妥当性はもとより、調査手法及び見込まれる有効性の点において、相違していました。提起された問題に対し以下のとおり回答いたします。

Australia welcomes observers from the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) during the AFRP experiment. If Members would like to visit the Australian SBT farming operations in Port Lincoln to see the transfer and fish counting process first hand, arrangements will

need to be made before mid-March, allowing for a period of up to 5 days in Port Lincoln for contingencies such as poor weather or delays in the arrival of pontoons. Members may recall that during the Australian Farm Review, the panellists had full access, in February 2006 and again in May 2006, to senior representatives from Australian industry and permission to film and photograph processes.

オーストラリアは、AFRPの実験期間において、みなみまぐる保存委員会(CCSBT)のオブザーバーを歓迎します。CCSBTメンバーが直に活けこみと計数プロセスを見るためにポートリンカーンのオーストラリアSBT蓄養事業を訪問することを望むのであれば、天候不順やポンツーンいけすの到着の遅延といった不測の事態に備え、ポートリンカーンでの5日までの期間を可能にしつつ、アレンジメント(準備)を3月中旬までに行う必要があります。オーストラリア蓄養レビューの間、2006年2月及び5月において、オーストラリア蓄養レビューのパネリストが豪州業界の上級代表への面会ができ、プロセスを映像及び写真として残す許可が与えられていたことを、CCSBTメンバーは思い起こすことでしょう。

The Australian Government previously arranged for an international observer to monitor the Australian SBT fishery during 2006 and this arrangement is being repeated for the 2007 season. The observer reports provide details of the catching and towing operations and demonstrate the effectiveness of regulation of the industry. We would like to encourage all Members to similarly install international observers within their fisheries so we may all share the benefits of international observer reports.

オーストラリア政府は、オーストラリアのSBT漁業を監視するための国際オブザーバーを2006年にアレンジしており、このアレンジメントは2007年漁期にも繰り返し実施いたします。オブザーバー報告書は、漁獲及び曳航操業の詳細を提供し、業界規制の有効性を明らかにします。我が方としては、国際オブザーバー報告書の利点を共有するため、すべてのCCSBTメンバーが自国の漁業に類似の国際オブザーバーを導入することを奨励したいと思います。

It was suggested that Australia should bear the costs of the AFRP. Australia is committed to the continuous improvement of its fishing industries and makes substantial investments to ensure progress. Such work includes ongoing research into stereo-video measurement and counting methods for SBT in Australian farming operations. However, some elements of the AFRP represent an additional, urgent activity, requested by the CCSBT, which are beyond the normal management and research and development contributions made by industry and the Australian Government. It is therefore appropriate that the costs that are above and beyond those required for effective management of the Australian fishery and development and refinement of these systems, should be borne by CCSBT members. For example, certain experimental protocols that have been suggested would result in very high mortalities of SBT and these should be covered by mechanisms such as the Research Mortality Allowance.

オーストラリアがAFRPの費用を負担すべきとの指摘がありました。オーストラリアは、漁業業界の継続的な改善を約束しており、進展を確保するためのかなりの投資を行っています。それらの仕事は、オーストラリア蓄養事業におけるSBTに対するステレオビデオによる測定及び計数方法といった現在実施中の調査を含みます。しかしながら、AFRPのいくつかの

要素は、CCSBTによって要求された追加的かつ緊急の活動であり、それは、豪州政府及び業界が行っている通常の管理、調査及び開発を超えるものであります。それゆえ、オーストラリア漁業の効果的な管理並びにそれら管理システムの開発及び改善を上回る部分に必要なコストは、CCSBTメンバーが負うのが適当でありましょう。例えば、提案された特定の実験プロトコールはSBTの非常に高い死亡を招くものであり、それらは調査死亡枠といった仕組みでカバーされるべきです。

It was suggested that any SBT mortalities for the AFRP should be deducted from the Australian allocation. Australia has conducted substantial research into SBT over many years as a part of normal industry operations and under specific CCSBT-supported research and development projects for which Australia has provided substantial funding. The AFRP is an urgent project requested by the CCSBT with scientific requirements which will result in mortalities beyond those expected from existing research activities. It is therefore appropriate that the mortalities are recorded under the CCSBT Research Mortality Allowance (RMA).

AFRPのいかなるSBT死亡もオーストラリアの漁獲枠から除されるべきであるとも提案されています。オーストラリアは、通常の業界操業の一環として、また、豪州が多額の資金提供しCCSBTが支援する調査及び開発プロジェクトとして、長年にわたってSBTについて相当程度の調査を実施してきております。AFRPは、現行の調査活動で見込まれる以上の死亡をもたらす科学的要件をとともなう、CCSBTによって要求された緊急のプロジェクトです。それゆえに、死亡魚についてはCCSBT調査死亡枠(RMA)のもとに記録されることが適当です。

At the 13th meeting of the CCSBT (October 2006) Australia advised that the proposed AFRP would not be achieved without the use of the RMA (CCSBT13 report, paras 43 and 104 refers). Accordingly, Australia will seek agreement from CCSBT Members on the level of RMA for what is likely to be a three year experimental programme of the AFRP. We will prepare a formal request for access to a specific level of RMA after the details of the AFRP are agreed by Members. Further, Australia proposes that, to offset the cost of SBT research activities, any SBT mortality would be sold with any profits provided to the CCSBT, similar to previous arrangements undertaken in the CCSBT tagging programme.

第13回CCSBT年次会合において、オーストラリアは、提案されたAFRPはRMAの使用なくして実現できない旨発言しています(CCSBT13報告書、パラ43及び104参照)。したがって、オーストラリアは、3ヶ年計画のAFRPとして相応しいRMAのレベルについて、CCSBTメンバーの合意を求める予定です。AFRPの詳細がCCSBTメンバーによって合意された後、具体的なRMAレベルの利用について、正式な要求を準備する予定です。さらに、CCSBTタギングプログラムにおいて実行されている従前の取極め同様に、SBT調査活動の費用を相殺するため、SBT死亡魚を販売し、利益が発生した場合にはCCSBTへ提供することを提案します。

The proposal to tag SBT instead of using the RMA is not considered workable because it would introduce an unquantified variable into the scientific method with a potentially strong and direct affect on the growth potential and mortality of caught and farmed SBT. The stresses of being hooked or

netted, man-handled, tagged and released are not inflicted during normal Australian farming operations (except for the 40-fish samples) and therefore tagging would introduce a potential bias into the AFRP assessment. Neither is it known the degree of deleterious effect caused by a tag through muscle and/or fin. However, the scientific literature contains several examples of adverse impacts of tagging on the condition and mortality of bluefin tuna. Two relevant articles from the international refereed scientific literature (Hampton, 1986 and Ticina et al., 2004) have been included with this letter (as PDF files) for Members' information.

RMAを使用せずにSBTにタグを装着するという提案は機能するとは考えられません、なぜならば、そのことによって、漁獲、蓄養されたSBTの潜在的な成長率及び死亡率に対し、潜在的に強く、直接的な影響を与えることで、科学的方法に計量不能な変数を投入することになるからです。通常のオーストラリア蓄養事業においては(40尾サンプルを除く)、釣鈎又は網、人が触る、タグ装着及び放流によるストレスは負わされておらず、それゆえにタギングはAFRP評価に潜在的なバイアスを招くこととなるでしょう。筋肉及び(又は)ヒレにタグを通すことによりもたらされる有害な影響の程度は知られていません。しかしながら、科学的文献は、ブルーフィントナのコンディション及び死亡について、タギングの悪影響のいくつかについて例をあげています。レフリーによるレビューがある国際的な科学的文献から、関連する2つの論文を、CCSBTメンバーの参考のため、本信に添付します(PDFファイル)。

- Ticina, V., L. Grubisic and I. Katavic (2004) Sampling and tagging of live bluefin tuna in floating grow-out cages. *Aquaculture Research* 35: 307-310.
洋上の蓄養いけすにおける活クロマグロのサンプリング及びタギング。 *養殖の研究*
- Hampton, J. (1986) Effect of tagging on the condition of southern bluefin tuna, *Thunnus maccoyii* (Castlenau). *Australian Journal of Marine and Freshwater Research* 37: 699-705. タギングがミナミマグロのコンディションへ与える影響。 *海洋及び淡水の研究に関する豪州ジャーナル*

As shown by the papers, tuna tagging creates weight loss and increased mortality, so it is not a suitable technique for use in the AFRP.

文書が示すとおり、マグロへのタギングは体重減をもたらし、死亡率を増加させるので、AFRPで用いるためには相応しい技術ではありません。

The option of using stereo-video technology was suggested as a means to improve the AFRP method for monitoring the initial catch (weight and number), comparison with the 40-fish sample, mortalities and weight change during tow; while also reducing the research mortality and providing answers at less cost. Australia concurs that stereo-video could assist the AFRP, but notes that further investigation is needed to confirm that the technology can be implemented practically and provide reliable measurements. During 2007, Australia proposes that the AFRP should focus on completing commercial trials of stereo-video technology. A working group has been formed under the Australian Southern Bluefin Tuna-Management Advisory Committee with a detailed proposal to be completed in mid-February (letter to the Chair of that Committee at Attachment A).。 As is evident in the letter, we

have been working closely with this group to ensure that the needs of the AFRP can be satisfied in the development of further work on the stereo-video technology.

ステレオビデオ技術の利用という選択肢が、当初漁獲量（重量及び尾数）、40尾サンプルとの比較、ならびに、曳航中の死亡魚及び体重変化をモニターするためのAFRPにおける手法を改善するための手段として提案されており、それは同時に調査による死亡魚を減らし、少ない費用で結果を提供するものです。オーストラリアは、ステレオビデオがAFRPを補助することには同意しますが、当該技術が現実的に実施できるのか、又信頼できる測定値を提供できるのかを確認するにはさらなる研究が必要であることに留意します。2007年においては、オーストラリアは、AFRPがステレオビデオ技術の商業化試験を完遂することに集中することを提案します。ワーキンググループが、2月中旬までに完成される詳細な提案とともに、オーストラリアみなみまぐろ管理諮問委員会のもとに結成されました(オーストラリアみなみまぐろ管理諮問委員会議長への手紙は別紙A)。当該手紙にあるように、AFRPでの必要性がステレオビデオ技術のさらなる機能開発によって満たされることを確保すべく、我々はこのワーキンググループと緊密に作業を続けております。

Several experimental designs are being investigated for stereo-video trials. For example, one possible method would be to establish two adjacent commercial-size floating pontoons, with one pontoon containing a sample (e.g. 1000 fish) of southern bluefin tuna. These fish could be transferred between the two pontoons with the stereo-video system deployed to count and measure the length of the fish as they were transferred. Multiple transfers could be carried out over a period of a month or more to determine the effectiveness of the stereo-video system under a range of environmental conditions. Following the final transfer the fish could be killed and the size frequency distribution of the fish in the pontoon could be compared with the distributions determined by the stereo-video system.

いくつかの実験デザインがステレオビデオの試験のために研究されています。例えば、一つの実行可能な方法は、2つの隣接する商業規模のフローティングポンツーンを設置し、片方のポンツーンにみなみまぐろのサンプル(例として1000尾)を入れるというものです。それらのミナミマグロは、移動中に尾数及び体長を測定するためのステレオビデオシステムが設置された2つのポンツーン間を移動することができます。様々な環境条件のもとでのステレオビデオシステムの有効性を特定するために、複数回の移動を1ヶ月又はそれ以上続けることができます。最終的な移動の後、魚を殺し、ポンツーン内の魚の体長組成をステレオビデオシステムによって特定された体長組成と比較することもできます。

With further regard to the assessment of growth rates during farming operations, as noted by some comments, this aspect is not the main purpose of the AFRP. CCSBT has prime responsibility to ensure Members' captures of SBT are within catch limits. However, this responsibility does not extend to reviewing post-capture aquaculture operations, including farm management regimes and growth rates. Under Australian laws, Australian industry cannot be compelled to provide industry-owned growth rate data or commercially sensitive details of farm management regimes. The Australian tuna farming industry has developed many refinements based on the skill and experience of its farmers. These

refinements have a significant component of commercial confidentiality which the Australian Government is legally committed to maintaining.

いくつかのコメントによって言及された蓄養操業期間中の成長率の評価に関しては、AFRPの主目的ではありません。CCSBTは、漁獲量制限内にCCSBTメンバーの漁獲量を留めることを確保するという第一義的な責任を持っています。しかしながら、この責任は、蓄養管理体制及び成長率を含む漁獲後の養殖活動のレビューには適用されていません。オーストラリアの法においては、オーストラリアの業界に対し、業界の所有する成長率のデータ又は商売上センシティブな蓄養管理体制の詳細を提供するように強要することはできません。オーストラリアのまぐろ蓄養業界は、養殖業者としての技術と経験を元に多くの改善点を開発してきました。それらの改善点は、オーストラリア政府が法的に守ることを約束した企業秘密の重要な構成要素であります。

During the 2006 SBT Farm Review, considerable data were provided to the panel, much of which was commercial-in-confidence or confidential, derived from the Australian SBT industry as well as a number of Australian Government agencies and state government authorities. On behalf of CCSBT Members, the Australian Government will discuss with the SBT farming industry further access to tapes of transfers from tow cages to farm cages. As requested, we will also provide details of Australian domestic consumption of SBT.

2006年のSBT蓄養レビューの間、相当量のデータがパネルに提供されており、多くのオーストラリア政府機関及び州政府機関のみならずオーストラリアSBT業界から得られた企業秘密又は機密事項が多く含まれていました。CCSBTメンバーに代わり、オーストラリア政府は、曳船用いけすから蓄養いけすへの活けこみを撮影したテープへのアクセスについて、SBT蓄養業界と協議をもつ予定です。また、求められたとおり、オーストラリアの国内SBT消費の詳細についても提供する予定です。

As the 2007 Australian farm fishing season will conclude in the near future, through the Secretariat, I would request Members to provide any further responses prior to 5 March 2007 so that they may be considered in revising the AFRP. After the 2007 stereo-video trials, we will seek to incorporate the technology into the AFRP with continuing input from all CCSBT Members. A timeline for the AFRP that takes into account the initial comments received from members is provided in Attachment B for consideration.

近日中に2007年のオーストラリア蓄養漁期が終了しますので、AFRP修正する際に考慮できるよう、CCSBT事務局を通じて、2007年3月5日以前にさらなるコメントをご提供いただきますようCCSBTメンバーにお願いしたいと思います。2007年のステレオビデオ試験の後、すべてのCCSBTメンバーからの継続的なコメント等の提供とともに、当該技術をAFRPに導入することを模索して行く予定です。CCSBTメンバーから受領した当初コメントを考慮したAFRPのスケジュールを、検討のために別紙Bとして別添いたしました。

Yours sincerely

敬具

Dr John Kalish

ジョン・カリッシュ

General Manager

部長

Fisheries & Aquaculture

漁業養殖業

Australian Government

オーストラリア政府

Department of Agriculture, Fisheries and Forestry

農漁林業省

23 February 2007

2007年2月23日

事務局による翻訳

Attachment A. Letter from the Stereo Video Working Group to the SBTMAC



Australian Government
Australian Fisheries Management Authority

1 February 2007

Ref: F2004/0472

Mr Peter Neville
Chair, Southern Bluefin Tuna MAC
C/- Mr Tony Kingston
155 Faulkland Rd
GLOUCESTER NSW 2422

Dear Peter

As you are aware, at its 29th meeting SBTMAC noted AFMA's intent to establish a Stereo Video (SV) Working Group to oversee the development of a project to resolve the issue of possible SBT sampling bias¹. As Chair of this group, I am writing to inform you of the outcomes from our first meeting, held in Port Lincoln on 17 January.

You may also recall that the AFMA Board considered recommendations arising from the O'Neill review of SBT catch monitoring arrangements at its February and April 2006 meetings. The Board then requested that AFMA Management describe a project using the stereo linear method recommended by Professor O'Neill to resolve the issue of possible sampling bias. Subsequently, CCSBT members agreed in October 2006 to implement the Australian Farm Experiment (AFE) to examine various catch monitoring issues identified as a result of the earlier Australian SBT Farm Review.

Consistent with its Terms of Reference, one of the first tasks of SBTMAC's Stereo Video Working Group was to ensure that further development and implementation of any future stereo video work was carefully considered in parallel with the objectives of this CCSBT driven Australian Farm Experiment. The working group identified synergies between the objectives of these two processes and has attempted to develop an approach that meets the requirements of the AFE, as well as the Board's earlier request for a project describing application of the stereo linear method. The approach discussed below has been developed to ensure that both initiatives can be delivered in a cost effective and efficient way.

Development of a three year research proposal

The working group endorsed the principle that new technologies should be applied to improve the management of the SBT fishery wherever such technologies have demonstrated their suitability and cost effectiveness under operational conditions. Accordingly the working group developed an outline for a three year research project to further trial and test stereo video technology in order to provide accurate estimates of Australia's SBT farm catch, as well as improved SBT farm catch at age estimates from stereo video derived length data.

¹ The steering group has now been established and comprises three industry members (Daryl Evans, David Ellis and Brian Jeffriess), a scientific member (James Findlay, BRS) and an AFMA member (Ryan Murphy), with secretariat support provided by SBTMAC Executive Officer Tony Kingston.

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The working group agreed that the immediate priority is to evaluate the use of stereo video technology under the range of conditions comparable to actual farm transfer conditions; particularly with regard to varying light and water visibility conditions and with a range of fish sizes. These first year trials would be professionally implemented and independently verified. They would also provide important insight into practical implementation issues such as the time and technical expertise needed to set-up and calibrate the stereo video equipment, and the physical robustness of the equipment under operational conditions. David Ellis (TBOA Research Manager) has undertaken to draft a detailed project design for these year one trials and circulate this to the working group for initial comment in early February.

The working group recognised that aside from the technical performance of the equipment in field conditions there are a range of other issues that will determine the suitability and acceptability of the stereo video approach to sampling SBT farm catch. In summary these are:

- i) the ability to automate the measuring component of the stereo video process to ensure close to real time information on the weight of fish transferred, and to reduce implementation costs;
- ii) alternatively, in the absence of near real-time information, the development of revised quota management arrangements that correspond to operational practice and also meet AFMA's management requirements;
- iii) the development of an appropriate and cost effective sampling design identifying the number of fish lengths that need to be obtained from a transfer;
- iv) how to convert the measured lengths of SBT into weights for quota reconciliation purposes;
- v) appropriate contingency provisions to minimise any disruptions to farm operators, whilst meeting quota reconciliation requirements, in the case of any failure of the stereo video equipment;
- vi) the number of units required to meet the operational requirements for concurrent transfers whilst also ensuring cost effectiveness; and
- vii) carefully managing AFMA and industry's intellectual property rights in relation to stereo video technology and its application.

The working group reviewed these requirements in the context of years 2 and 3 of the project, and subject to successful outcomes from technical trials in year 1. AFMA has agreed to coordinate development of a research proposal to specify the objectives and work required for years 2 and 3 culminating in the use of this equipment and methods to accurately estimate Australia's total SBT catch, and catch at age.

Timing

The working group recognised the importance of prompt outcomes to demonstrate the operational suitability of the SV technology and agreed that the technical trials should proceed during the 2006/07 Australian season.

Funding

The Working group agreed that the stereo video technology is not ready for immediate implementation under operational conditions and that elements of the proposed three year research program constitute further development work. At industry's request AFMA agreed to review the background to the AFMA Board's decision to use government derived funding to cover developmental costs for the

ETBF longline drum monitoring equipment in case this presented a relevant funding precedent.

Noting the importance of the SV project in meeting both domestic and international SBT management obligations, the working group discussed the possibility of developing a joint funding approach drawing-on contributions from the DAFF-administered Scientific Research Program (SRP) fund, AFMA, and FRDC. Some industry members questioned the appropriateness of using industry derived FRDC funds for this work.

The Working group acknowledged that any work by David Ellis in implementing the research would need to be fully costed to the project.

Other related issues

The DAFF member considered that the work proposed by the working group is consistent with Australia's CCSBT obligations to conduct the Australian Farm Experiment, and that this work would be in addition to proposed DAFF research planned for 2007 on towing mortality rates. DAFF also agreed to explore the feasibility of obtaining CCSBT out-of-session approval for Australia to receive a research mortality allowance for the stereo video work.

Industry advised that having implemented standardised fishing gear for the 40 fish sampling, it would soon be drafting a set of common operating conditions to assist AFMA in ensuring consistency in the existing 40 fish sampling regime. Industry also advised that irrespective of the stereo video issue it intends proposing the removal of the current 10kg exclusion rule used under the current 40 fish sampling approach.

I will forward the detailed draft project proposal to SBTMAC after finalisation by the working group and prior to consideration of the proposed approach by the AFMA Board, and senior DAFF and BRS staff.

In summary the working group performed cooperatively and effectively, and we are confident that the outline discussed above offers a practical and cost effective way forward. Please contact me at AFMA on 02 62255316, or mobile 0439 602769 if you would like to discuss the issues outlined above in more detail.

Yours sincerely



Andy Bodsworth
Chair, SBTMAC Stereo Video Working Group

cc: Tony Rundle, Chair of the AFMA Board

別紙 B オーストラリア蓄養調査計画(AFRP)

ステップ 1 2007年3月から6月

商業的なSBT活けこみのシミュレーションを含む試験を通じた実験方法 (ステレオビデオ技術) のテスト。

ステップ 2 2007年6月

実施した試験の当初結果のCCSBTへの提出。

ステップ 3 2007年6月から9月

導入試験の第1年目の結果の後、直ちに、オーストラリアによる要求として、AFRP全体はさらなる開発と修正がなされる。CCSBTメンバーからのコメント等に基づき、さらなる改善が検討される。ステレオビデオ技術が機能しないとされたならば、調査は代替の方法を検討する。

ステップ4 2007年9月から10月

調査計画は、SAG/SCにおいて最終化され、2007年10月の第14回CCSBT年次会合において採択される。

ステップ5 2007年12月

2008年に向け改良された方法によって、調査計画の2年目が実施される。