**Ministry for Primary Industries**
Manatū Ahu Matua

# Discussion Paper on Future Scientific Research Programme

Prepared for the 20th Meeting of the CCSBT Extended Scientific Committee (ESC20)

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## 1. Summary

In 2013 the Extended Scientific Committee (ESC) adopted a Scientific Research Plan (SRP) for CCSBT for 2014-18. The purpose of the plan was to identify longer term research priorities required for stock assessment and management of SBT. In both 2013 and 2014 the ESC identified the highest priority research projects for the following year as part of the ESC work plan and proposed that these projects be funded by the Commission.

At the subsequent Extended Commission (EC) meetings, limits were placed on the annual increase in member contributions (5.3% increase in 2013 and 6.2% increase in 2014), which meant that parts of the SRP had to be deferred. The sum of $100,000 was made available in both years as a contribution to Australia to support the scientific aerial survey. However, the aerial survey was not carried out in 2015.

At the Strategy and Fisheries Management WG (SFM) meeting in July 2015, one of the priorities was to decide on funding in relation to both the scientific aerial survey and the ESC three year work plan. At the meeting it was agreed the 2016 scientific aerial survey would be funded by an increase in Member contributions of no more than 10% together with a contribution of approximately $330,000 from the Secretariat's cash reserves. Other elements of the SRP were not mentioned. However, if annual budget increases are limited to 5 or 10% per year it will not be possible to complete the Scientific Research Plan as currently proposed.

The objective of this paper is to promote a discussion at ESC on the way forward for research to assess and manage SBT. In particular the ESC needs to decide on an approach to monitoring recruitment of SBT that is affordable within the Commission budget and also effective in future management of the resource.

## 2. Background

At the ESC meeting in 2013 Australia presented a paper to promote discussion on the SRP (CCSBT-ESC/1309/20). The paper noted the intent of the ESC to recommend an updated five year SRP, 2014-18, for consideration by the Extended Commission. The paper suggested a possible framework that separated the regular ESC work program from strategic, longer term research activities that may be required to address key uncertainties. The ESC adopted a modified framework for the SRP structured around: 1) On-going Scientific Monitoring; 2) MP Implementation and 3) Stock Assessment (OM development), and identified potential research activities for 2104 and future years (Table B, CCSBT SC 2013 Attachment 12).

2013 ESC meeting
"The ESC recommended that the highest priorities for commencing in 2014 under
the SRP are the continued collection and archiving of samples for close-kin genetics (in Australia and Indonesia), the design study for potential close-kin and gene-tagging programs, initiating collection and preservation of ovary samples (across fisheries and size classes) and further collation and analysis of existing data on selectivity in the Indonesian spawning ground fishery." (CCSBT SC 2013 paragraph 148)

The ESC included these in the proposed 2014 work plan and noted to the Commission that the finalisation of the SRP (2014-18) would be a substantive agenda item for the ESC in 2014, involving the review of proposals and detailed costings for the SRP components.

EC meeting 2013
At the 2013 Commission meeting, funding of two scientific research projects: Continued collection of close-kin samples ($30,000) and a design study for future close-kin studies ($75,000) were agreed in addition to a continued contribution of $100,000 towards the cost of the scientific aerial survey (paragraph 21). The design study for gene tagging was deferred until 2015. The proposed budget for 2014 resulted in an overall cost increase of 5.3% in Members' contributions for 2014.

ESC meeting 2014
The following year the ESC updated the SRP (CCSBT-SC 2014 Attachment 10) and presented a 3-year work plan for projects to be funded by the EC (CCSBT-SC 2014 Attachment 12).

EC meeting 2014
The EC response in 2014 was to fund the SRP projects to a total of $210,000: Continued collection of close-kin samples ($35,000), preparatory work on the review of genotyping techniques for Close-Kin research ($85,000), a design study for future gene-tagging ($75,000) and ageing of otoliths from the Indonesian fishery ($15,000). In addition the contribution of $100,000 towards the cost of the scientific aerial survey was continued.

The proposed budget for 2015 resulted in an overall cost increase of 6.2% in Members' contributions, and it was noted that Scientific Research Plan (SRP) expenses were forecasted to increase for the years 2016 and 2017.

At CCSBT 21 Korea and Australia proposed that the Commission consider producing 3-year rolling budgets for future scientific and compliance work in order to assist with longer term government financial planning. It was agreed that the Executive Secretary would prepare a paper for CCSBT 22 with indicative 3-year budgets for future years and that the paper would identify the major uncertainties in the indicative budgets. It was noted that the year 2 and 3 budgets would be indicative only, and would not represent a commitment to those budget items.

The Executive Secretary circulated a report in June (CCST-SFM/1507/04) looking at the budget implications of the ESC 3-year work plan. This paper was discussed at the SFM meeting in July 2015.

Strategy and Fisheries Management Working Group (SFM) meeting
One of the priorities for the SFM meeting (July 2015) was to decide on funding in relation to both the scientific aerial survey and the ESC three year work plan. At the SFM meeting it was agreed the 2016 scientific aerial survey would be conducted in 2016 using "Option 2" from Table 1 of paper CCSBT-SFM/1507/09. Option 2 proposes a scientific aerial survey reduced from 250 to 200 charter hours with a proposed cost of $680,000. The SFM working group also recommended that any increase in Member contributions in 2016 would be restricted to no more than 10%, and that a contribution of approximately $330,000 would be made from the Secretariat's cash reserves. Other elements of the SRP were not mentioned.

It is necessary for the CCSBT to decide on funding for the research and management of the fishery. In the short term an aerial survey is required in 2016, otherwise the MP will not be able to be operated to provide TACC decisions for 2018-20.

However, with the recommendation at the SFM meeting to fund a reduced aerial survey in 2016 (approximate cost $680,000), and also restrict any increase in the budget to no more than 10%, there will be limited capability to fund other SRP research in 2016. A final budget for 2016 will be agreed at the EC meeting in October 2015.

It is obvious that if annual budget increases are limited to 5 or 10% per year it will not be possible to complete the Scientific Research Plan as currently proposed. The ESC needs to find a least cost option that provides the information required for management.

## 3. Options for recruitment monitoring

(a) Aerial survey
An agreement to fund the aerial survey in 2016 was made at the SFM meeting so that the MP can be operated to set TACC s for 2018-20. This is a pragmatic short-term solution to the immediate needs of the Commission to manage the SBT stock.

However, looking at the question of recruitment monitoring longer term, it is not clear that the scientific aerial survey provides a reliable index of recruitment. The ESC agreed in the SRP discussion in 2014 that the scientific aerial survey standardisation should be reviewed as a high priority and discussed at ESC 2015 (CCSBT-SC 2014 Attachment 10).

Although the scientific analysis of the survey data may be appropriate, the problem is that the estimates of juvenile abundance do not appear to be reliable. The indices produced from the survey data do not appear to match the year class strength estimates from the Operating Model. Figure 1 shows the estimates of year class strength from the Operating Model. The 2005 cohort stand out as a strong year class and is well represented in the recent catches of most members. As an example, Figure 2 shows the progression of this 2005 year class through the length frequency distribution of the New Zealand charter boat fishery.

Although the stock assessment for SBT estimates a strong year class for 2005 there is no strong signal of recruitment from the 2005 year class showing in the survey indices (Figure 3). Similarly, this strong year class does not show in the other recruitment indicators. There is no signal in the commercial spotting SAPUE series (Figure 4), nor in the time series of troll survey indices (Figure 5). The absence of a clear signal for the 2005 year class suggests none of these techniques provide a reliable time series of juvenile abundance.

(b) Indicators

There are other sets of data that may provide low cost, and possibly more accurate abundance indices for juvenile SBT. Figure 6 shows the age-specific nominal CPUE from the Japanese longline from the fishery indicators paper from 2014 (CCSBT-ECS/1409/16). The peak in CPUE at age 4 in 2009 corresponds exactly with the expected strong 2005 year class. The progression of this peak at older ages is seen in all the plots up to age 8 in 2013.

Similar plots are available for other fleets and the idea of a recruitment index based on the CPUE of the youngest age classes in the fishery has some promise. The fact that all SBT reported on CDS forms have accompanying length data means that size-based CPUE could be derived for all fisheries. There is not yet consensus to make these CDS data generally available to the ESC, but individual countries could work up their own data into age-specific indices.

(c) Gene tagging

The SRP currently includes projects to determine the feasibility of gene-tagging to estimate cohort strength in SBT. This technique has the potential to provide absolute estimates of recruitment for age 2 or 3 year old SBT. This would be very powerful information to put into a management procedure.

The design aspect of this project has been contracted in 2015 and will be reported back to the ESC in September 2015. However, it appears that with the budget limitation for 2016 the "Pilot project gene tagging project" will be deferred.

**4. Estimates of spawning biomass**

In 2014 the ESC proposed to continue with Close-Kin analysis to allow absolute estimates of spawning biomass to be determined in future years. The ESC highlighted the urgent need to review the current methodology and invest in newer smarter technology for the future.

In 2015 there is provision in the budget for preparatory work on the review of genotyping techniques for Close-Kin research ($85,000). However, it is unlikely that funds will be available in 2016 to support the "Further locus development and validation and, an expert review workshop" ($230,000). One option would be to use the current microsatellite approach to process the back-log of samples and defer the change to a new methodology. If these results were available in 2017 they could be incorporated in the updated stock assessment.

**5. Proposed way forward (for discussion)**

The following work plan (timeline) is proposed as a possible way forward so that the ESC can provide the information required for ongoing stock assessment and development of a new management procedure.

2016
- Conduct reduced scientific aerial survey
- Operate management procedure to determine TACCs for 2018-20
- Process back-log of close-kin samples using current microsatellites method
- Continue to collect close kin samples
- Investigate alternative indices of recruitment (e.g. age-specific CPUE)

2017
- Update operating model to estimate spawning biomass of SBT and stock status
- Start development of new management procedure (required for implementation by 2019)

- Carry out gene tagging pilot programme
- Continue to collect close kin samples

2018
- Release "tagged " fish for gene tagging study
- Continue to collect close kin samples

## 6. References

CCSBT-SC (2013): Report of the Extended Scientific Committee for the Eighteenth Meeting of the Scientific Committee, 2-7 September 2013, Canberra, Australia

CCSBT-SC (2014): Report of the Nineteenth Meeting of the Extended Scientific Committee for the Scientific Committee, 1-6 September 2014, Auckland, New Zealand

CCSBT-EC (2013): Report of the Extended Commission for the Twentieth Annual Meeting of the Commission October 2013, Adelaide, Australia

CCSBT-EC (2014): Report of the Extended Commission for the Twentieth First Annual Meeting of the Commission, October 2014, Auckland, New Zealand

CCSBT 2015: Report of the Fourth Meeting of the Strategy and Fisheries Management Working Group July 2015

Patterson, H. and I. Stobutzki 2014: Fisheries indicators for the southern bluefin tuna stock 2013–14 CCSBT-ESC/1409/16

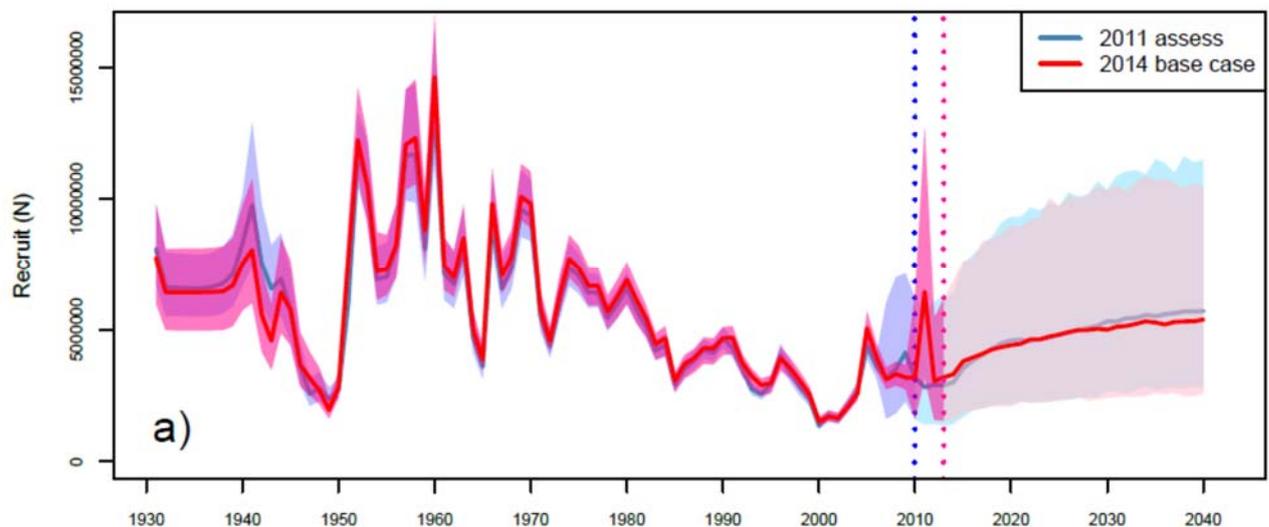Stobutzki, I, C. Davies and Ann Preece 2013: Scientific Research program for CCSBT CCSBT-ESC/1309/20

**Figure 1: Base case trajectories for recruitment, showing median and 90% intervals (CCSBT-SC 2014).**
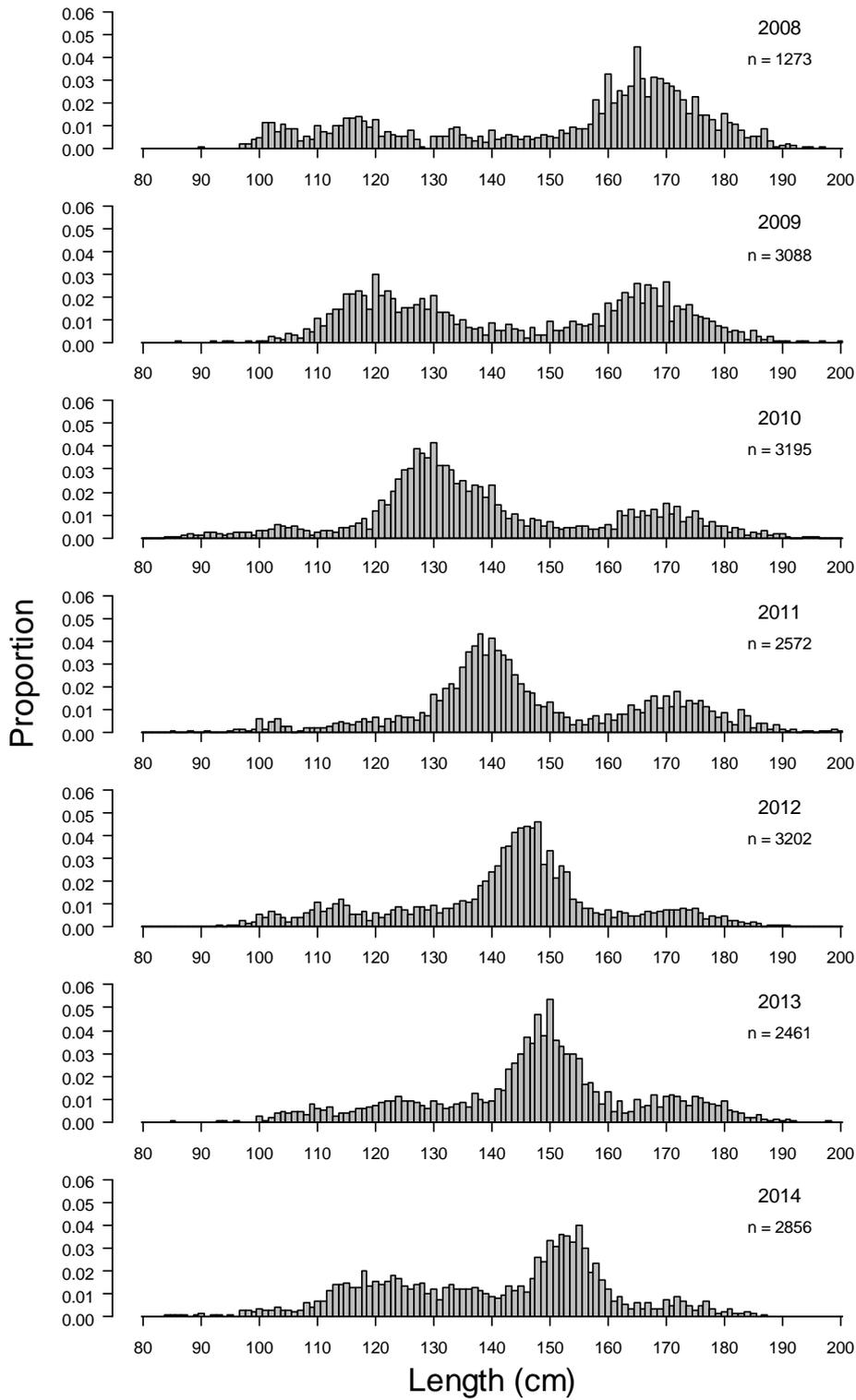
**Figure 2: Proportion-at-length for the charter fleet in New Zealand waters for 2008 to 2014
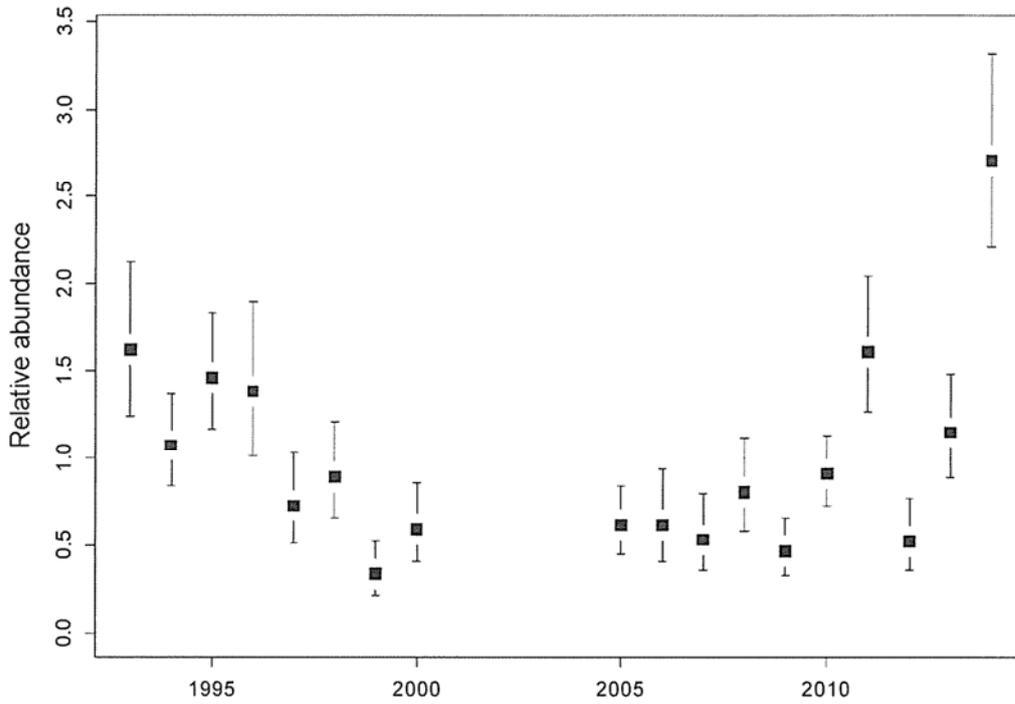(Source: Annual Review of National SBT Fisheries for the Scientific Committee, New Zealand, 2015).**

**Figure 3: Scientific aerial survey of relative abundance for juvenile SBT in the Great Australian Bight, Jan-Mar. (Source: Figure 1 in CCSBT-ESC/1409/16).**
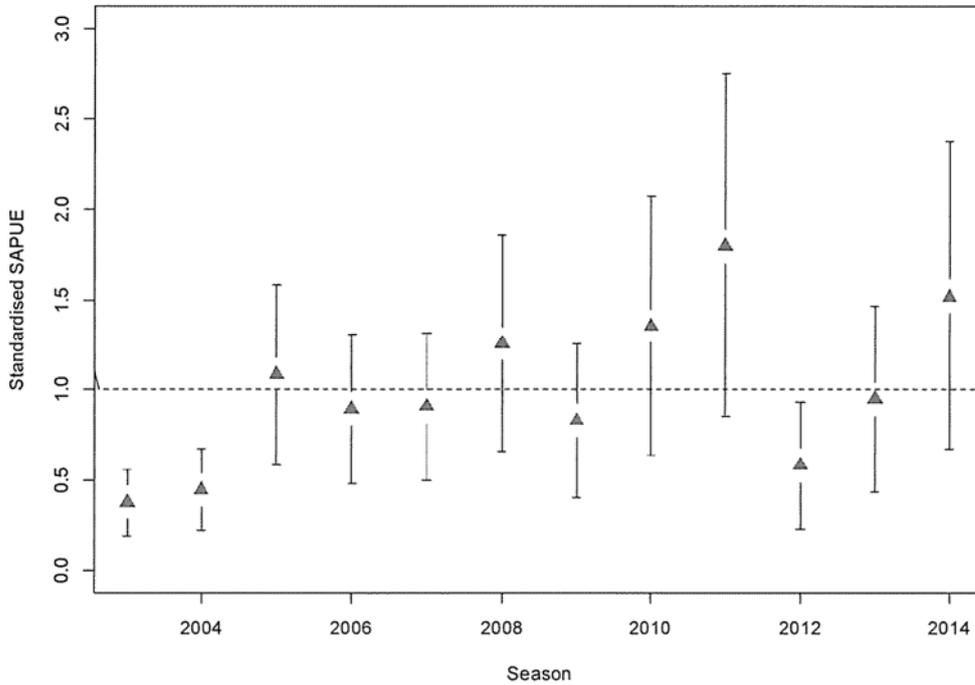


**Figure 4: The SAPUE index of relative surface abundance of juvenile SBT in the Great Australian Bight, Dec-Mar. (Source: Figure 2 in CCSBT-ESC/1409/16).**

**Figure 5: Trolling index, showing number of schools per 100 km off the Western Australian coast in January (Source: Figure 3 in CCSBT-ESC/1409/16).**
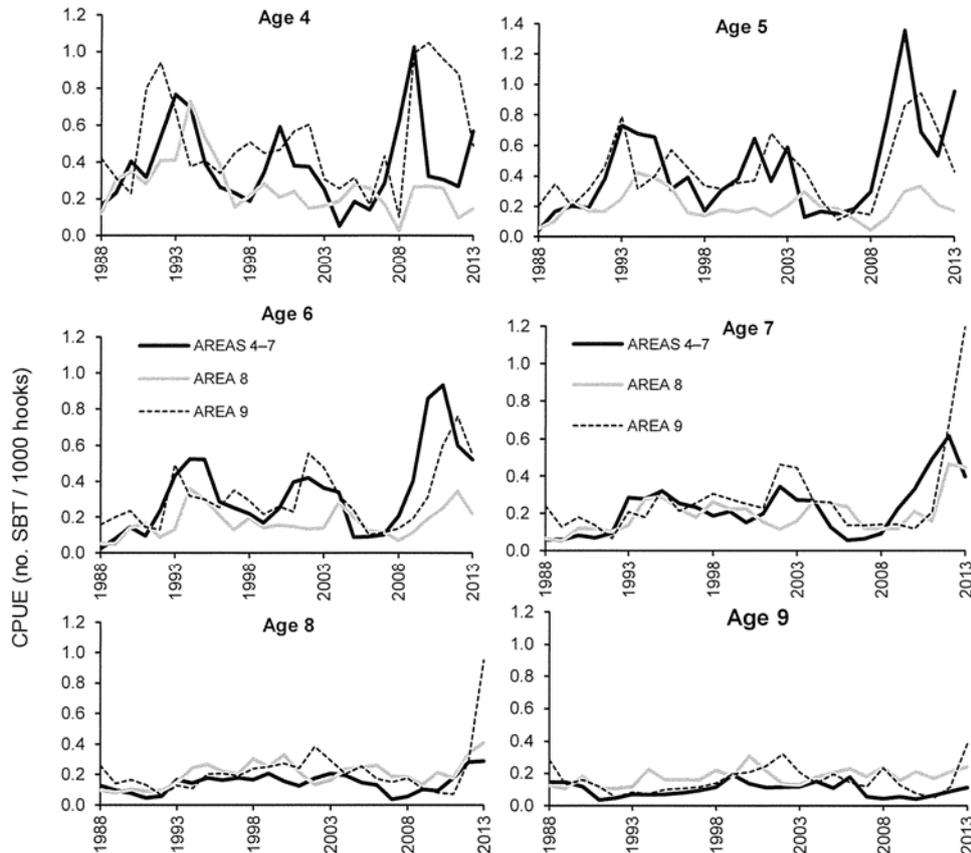


**Figure 6: Comparison of age-specific nominal CPUE for Japanese longliners in different statistical areas in months 4-9 (Source: Figure 16 in CCSBT-ESC/1409/16).**