Attachment 6

REPORT ON BIOLOGY, STOCK STATUS AND MANAGEMENT OF SOUTHERN BLUEFIN TUNA: 2008

A review of fisheries indicators was conducted by the CCSBT Stock Assessment Group during 2008. In response to indications from a 2006 review of SBT farming and market data that catches over the past 10 to 20 years may have been substantially under-reported, a range of alternate past catch scenarios was also explored in 2006, but was not updated in 2008. This report updates description of fisheries and state of stock, and provides fishery and catch information, in the light of these evaluations.

1. Biology

Southern bluefin tuna (*Thunnus maccoyii*) are found in the southern hemisphere, mainly in waters between 30° and 50° S, but only rarely in the eastern Pacific. The only known spawning area is in the Indian Ocean, south-east of Java, Indonesia. Spawning takes place from September to April in warm waters south of Java and juvenile SBT migrate south down the west coast of Australia. During the summer months (December-April), they tend to congregate near the surface in the coastal waters off the southern coast of Australia and spend their winters in deeper, temperate oceanic waters. Results from recaptured conventional and archival tags show that young SBT migrate seasonally between the south coast of Australia and the central Indian Ocean. After age 5 SBT are seldom found in nearshore surface waters, and their distribution extends over the southern circumpolar area throughout the Pacific, Indian and Atlantic Oceans.

SBT can attain a length of over 2m and a weight of over 200kg. Direct ageing using otoliths indicates that a significant number of fish larger than 160cm are older than 25 years, and the maximum age obtained from otolith readings has been 42 years. Analysis of tag returns and otoliths indicate that, in comparison with the 1960s, growth rate has increased since about 1980 as the stock has been reduced. There is some uncertainty about the size and age when SBT mature, but available data indicate that SBT do not mature younger than 8 years (155cm fork length), and perhaps as old as 15 years. SBT exhibit age-specific natural mortality, with M being higher for young fish and lower for old fish.

Given that SBT have only one known spawning ground, and that no morphological differences have been found between fish from different areas, SBT are considered to constitute a single stock for management purposes.

2. Description of Fisheries

Reported catches of SBT up to end 2007 are shown in Figures 1 - 3. However, as a result of indications in SBT farming and market data that there may have been substantial under-reporting of SBT catches over the past 10 - 20 year period, there is currently substantial uncertainty regarding the true levels of total SBT catch over this period. Historically, the SBT stock has been exploited for more than 50 years, with total catches peaking at 81,750t in 1961 (Figures 1 - 3). Over the period 1952 - 2003, 79% of the reported catch has been made by longline and 21% using surface gears, primarily purse-seine and pole&line (Figure 1).

The proportion of reported catch made by surface fishery peaked at 50% in 1982, dropped to 11-12 % in 1992 and 1993 and increased again to average 33% since 1996 (Figure 1). The Japanese longline fishery (taking a wide age range of fish) recorded its peak catch of 77,927t in 1961 and the Australian surface fishery catches of young fish peaked at 21,501t in 1982 (Figure 3). New Zealand, the Fishing Entity of Taiwan and Indonesia have also exploited southern bluefin tuna since the 1970s - 1980s, and Korea started a fishery in 1991.

On average 79% of the SBT catch has been made in the Indian Ocean, 17% in the Pacific Ocean and 4% in the Atlantic Ocean (Figure 2). The reported Atlantic Ocean catch has varied widely between about 18t and 8,200t since 1968 (Figure 2), averaging about 830t over the past two decades. This variation in catch reflecting shifts in longline effort between the Atlantic and Indian Oceans. Fishing in the Atlantic occurs primarily off the southern tip of South Africa (Figure 4). Since 1968, the reported Indian Ocean catch has declined from about 45,000t to 10,000t, averaging about 21,000t, and the reported Pacific Ocean catch has ranged from about 800t to 19,000t, averaging about 5800t, over the same periods (although SBT farming and market data analyses indicate that these catches may be under-estimated).

3. Summary of Stock Status

At the 2008 Stock Assessment Group meeting the operating model was run under a number of scenarios that are generally similar to those evaluated in 2006. The scenarios indicate that spawning stock biomass is still at a very low level (generally below 10% of pre-exploitation spawning stock biomass, a level at which recruitment may be at risk of further decline). This is well below the 1980 level and below the level that could produce maximum sustainable yield. Rebuilding the spawning stock biomass would almost certainly increase sustainable yield and provide security against unforeseen environmental events. Presently, however, there is no sign of spawning stock biomass rebuilding.

Recruitments in the last two decades are estimated to be well below the levels in the period 1950-1980. All scenarios suggest that recruitment in the 1990s fluctuated at a low level with no overall trend. Analysis of the average of all indicators suggest historically low recruitments from 1999-2002. The indicators suggest that 2004 and 2005 year classes are stronger and close to the average of the 1990s.

Consistent with the poor recruitment from 1999 to 2002, a gap in the size (and presumably age) composition is apparent. By inference this gap will lead to a further decline in spawning stock biomass in coming years.

4. Current Management Measures

At its Thirteenth annual meeting the CCSBT agreed to a total allowable catch (TAC) for 2007-2009 of 11,810 tonnes, which was a TAC reduction of 3,115 tonnes. This TAC will only be reviewed before 2009 if exceptional circumstances emerge in relation to the stock. The current allocation of the TAC amongst Members and Cooperating Non-Members are specified below:-

<u>Members</u>

The allocations below are fixed to 2011 for Japan and to 2009 for other Members except for Indonesia which will be reviewed at CCSBT15.

Japan	3,000 tonnes
Australia	5,265 tonnes
Republic of Korea	1,140 tonnes
Fishing Entity of Taiwan	1,140 tonnes
New Zealand	420 tonnes
Indonesia	750 tonnes

Cooperating Non-Members and Observers

The allocations amongst Cooperating Non-Members have only been set for 2008.

Philippines	45 tonnes
South Africa	40 tonnes
European Community	10 tonnes

Furthermore, to contribute to the recovery of the SBT stock, Taiwan and the Republic of Korea undertook to maintain their actual catch below 1,000 tonnes for a minimum of 3 years from 2007. This will result in an actual catch level below 11,530 tonnes for a 3 year period.

The Fourteenth annual meeting of the CCSBT noted that the report from the Extended Scientific Committee did not show any indication of a change in the status of the stock since 2006 and that the TAC set by CCSBT 13 was in the range recommended by the Extended Scientific Committee. Consequently, the Extended Commission reconfirmed CCSBT13's decision on the TAC and its allocation as summarised above.

The CCSBT has also implemented a Trade Information Scheme (TIS) for SBT, in which a CCSBT TIS document must be issued for all exports of SBT. The scheme also requires all Members of the CCSBT to ensure that all imports of SBT are to be accompanied by a completed CCSBT TIS Document, endorsed by an authorised competent authority in the exporting country, and including details of the name of fishing vessel, gear type, area of catch, dates, etc. Shipments not accompanied by this form must be denied entry by Members and Cooperating Non-Members. Completed forms are lodged with the CCSBT Secretariat where they are used to maintain a database for monitoring catches and trade and for conducting reconciliations between exports and imports of SBT.

At its annual meeting in October 2003, the CCSBT agreed to establish a list of vessels over 24 metres in length which are approved to fish for SBT, to be completed by 1 July 2004. The list included vessels from CCSBT Members and Cooperating Non-Members. At its annual meeting in October 2004, the CCSBT agreed to expand the list to include all of the vessels, regardless of size, that are authorised to catch SBT. Members and Cooperating Non-Members are required to refuse the import of SBT caught by vessels not on the list.

The CCSBT has recognised the critical importance of adopting and fully implementing at the earliest possible time an integrated package of compliance measures which would ensure the elimination of unreported catch and provide accurate data as a basis for proper stock assessment. At its Thirteenth annual meeting, the CCSBT adopted draft resolutions on the following compliance measures and work will be undertaken during 2007 towards refining and implementing these measures:

- A catch documentation scheme;

- A vessel monitoring system; and
- Regulation of transhipments by large scale fishing vessels.

Further work was conducted on developing these and other MCS measures during 2007 and 2008, but consensus has yet to be reached between CCSBT Members concerning the details of these measures.

5. Scientific Advice

In the light of the current stock status and concerns, management advice is as follows.

Positive factors affecting sustainability of future catches are:

- the reported catch has been reduced; and
- indicators suggest that the 2004 and later year classes are not as low as the 2000, 2001, and 2002 year classes.

However, there remain serious sources of concern from new and previous information including:

- a very low spawning stock;
- at least three poor recruitments in the recent past which will lead to a further decline in spawning stock biomass;
- a general decline in recruitment since about 1970, coincident with declining spawning stock sizes;
- increased exploitation rates, particularly on recent weak year classes;
- overall, exploitation has shifted towards younger ages, the abundances of which are poorly estimated; and
- there is the potential for increasing exploitation rate with declining recruitment, which would pose a serious risk to rebuilding.

The Extended Scientific Committee (ESC) notes that given the current reported catch and previously reported constant catch projections (SAG 7), the stock is likely to rebuild very slowly in the long term. However, there is about a 50:50 chance that the spawning stock will decrease over the next 6 years. The possibility of further decline is of concern.

The ESC recognises the CCSBT has set a constant TAC until 2009. However, given the current stock status, the ESC recommends that the Commission consider:

- **Reducing fishing mortality by immediately eliminating all unreported/under-reported catches.** The 2007 ESC also made this recommendation, as follows: "*To ensure a high probability of stock rebuilding, all unreported and under-reported catches must be eliminated…"; and*
- **Applying a broader suite of technical measures after the 2009 fishing season. If the Extended Commission so decides it should seek specific advice from the ESC.**

The ESC makes the additional **recommendations**:

- **A management procedure needs to be adopted by no later than 2011 as a basis to guide management advice.** The 2007 ESC also made this recommendation, as follows: *"… a management procedure needs to be adopted as a basis to provide TAC*

advice in 2011 or 2012 when catch quotas will again be reconsidered by CCSBT. A work plan has been agreed to advance the development of an MP, with initial emphasis placed on re-conditioning the operating model and refining the scenarios used for testing different candidate decision rules, and the extent to which they will result in management objectives being achieved in the face of uncertainties."

- **Reduce uncertainty about historical catch and effort.** The 2007 ESC also made this recommendation, as follows: "*While some progress has been made towards development of new historical CPUE series, further work is needed to reduce the uncertainty about historical catches (including that associated with possible bias in the 40-fish sampling used to estimate size composition and mean weight of the surface catch), and to evaluate the effect of market anomalies on CPUE and determine appropriate adjustments."*
- **Accurate future catch and effort reporting needs to be ensured.** The 2007 ESC also made this recommendation, as follows: "*In terms of future data, accurate catch and effort estimates are critical to any stock assessment or management procedure. There needs to be assurance that these data are accurate through some combination of comparison of data from vessels with and without observers, and other monitoring and compliance measures, including the possibility of further market and farming monitoring. Increased levels and quality of observer coverage would increase the value of these analyses as well as the value of information from tagging programmes, though this needs to be considered in the light of cost and benefit analyses. Also, monitoring of recruitment and of the spawning biomass must continue, and where possible, be improved."*
- **Consider using a wider range of indicators within MPs to guide management**. The 2007 ESC made this recommendation, as follows: "*Previous MP development used LL1 [Japanese longline] CPUE and its age structure as the sole input. The ESC agreed that future MPs should be based on inputs from a broader range of indicators."*
- **Reliable indices of recruitment and spawning biomass need to be developed and maintained long-term.**

In summary, the ESC stresses to the Extended Commission that the SBT stock is in a very poor state, that management decisions must take serious account of this, and that adoption by 2011 of a management procedure to guide TAC setting must be given a high priority.

6. Biological State and Trends

Analyses suggest the SBT spawning biomass is at a low fraction of its original biomass and well below the 1980 level as well as below the level that could produce maximum sustainable yield. Rebuilding the spawning stock biomass would almost certainly increase sustainable yield and provide security against unforeseen environmental events. Recruitments in the last decade are estimated to be well below the levels in the period 1950-1980.

Exploitation rate: High fishing mortality
Exploitation state: Overexploited
Abundance level: Low abundance

SOUTHERN BLUEFIN TUNA SUMMARY (global stock)	
Maximum Sustainable Yield	Not estimated
Current (2007) Catch	Reported to be 11,540t.
Current Replacement Yield	Not estimated
Current Spawner Biomass	112,272 - 166,312 t [1]
Current Depletion	SSB_{2006} / SSB_K : 0.101 - 0.127 [1]
Current Management Measures	Global TAC for Members and Cooperating Non-Members of 11,060t.

[1] These are the ranges in estimates of median spawning biomass obtained from evaluation of a range of alternate possible past catch scenarios during the 2006 Stock Assessment Group meeting.

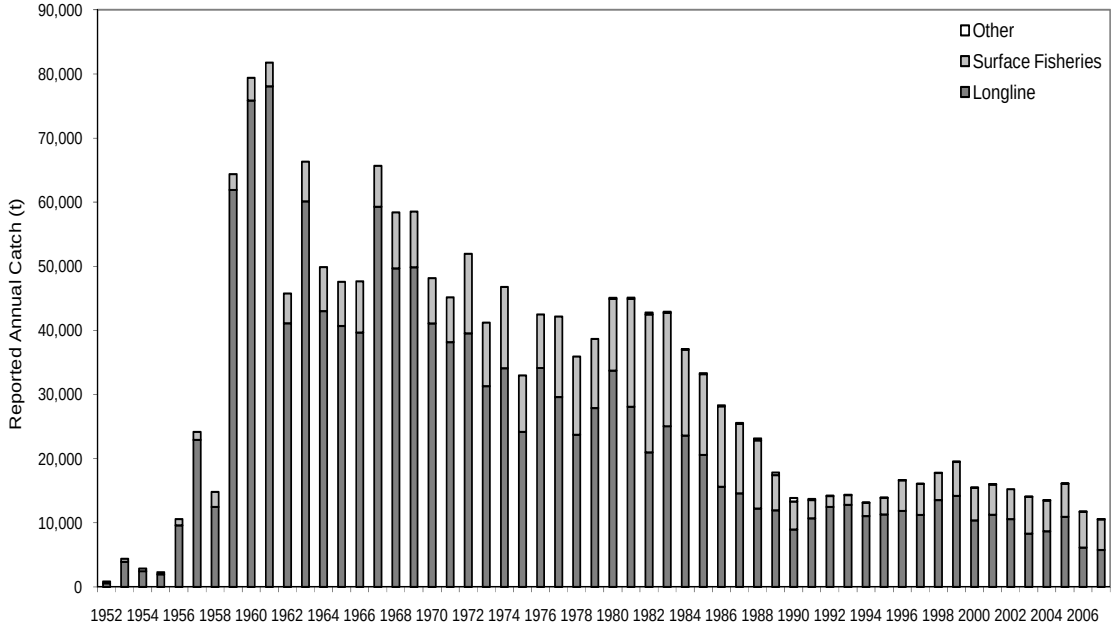

Figure 1: Reported southern bluefin tuna catches by fishing gear, 1952 to 2007. Note: Recent review of SBT farming and market data suggests that these catches may have been substantially under-reported over the past 10 to 20 years.

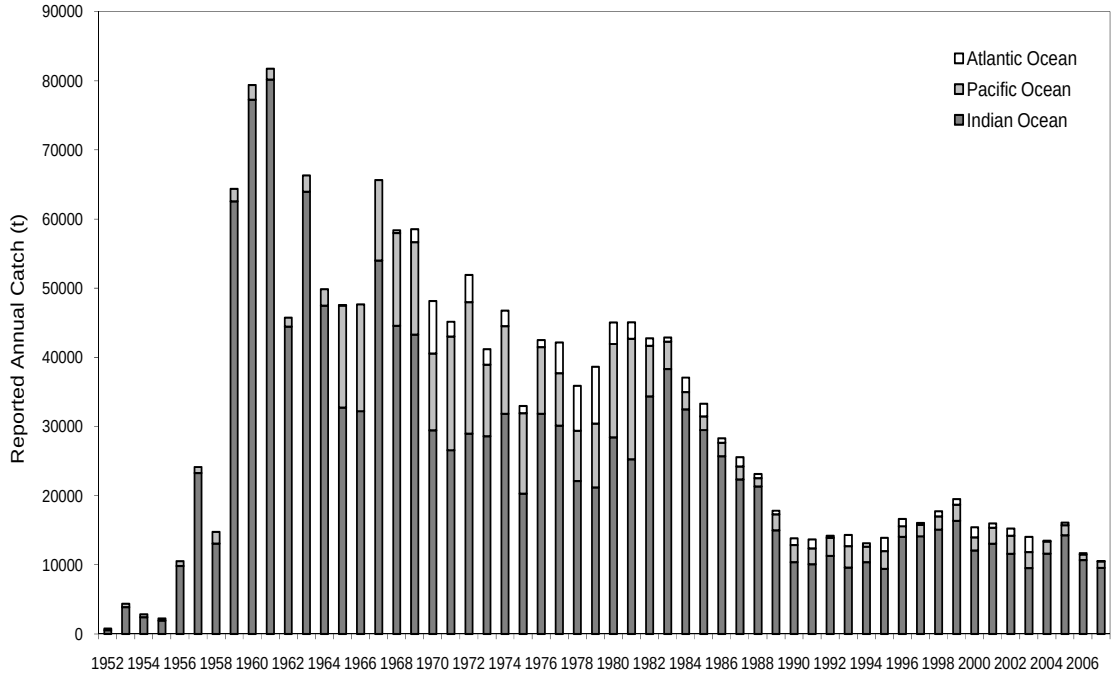

Figure 2: Reported southern bluefin tuna catches by ocean, 1952 to 2007. Note: Recent review of SBT farming and market data suggests that these catches may have been substantially under-reported over the past 10 to 20 years.

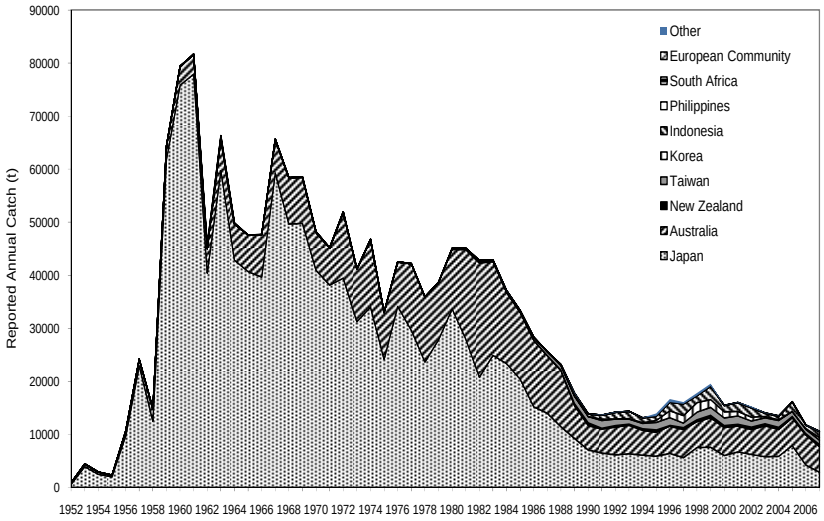

Figure 3: Reported southern bluefin tuna catches by flag, 1952 to 2007. Note: Recent review of SBT farming and market data suggests that these catches may have been substantially under-reported over the past 10 to 20 years.

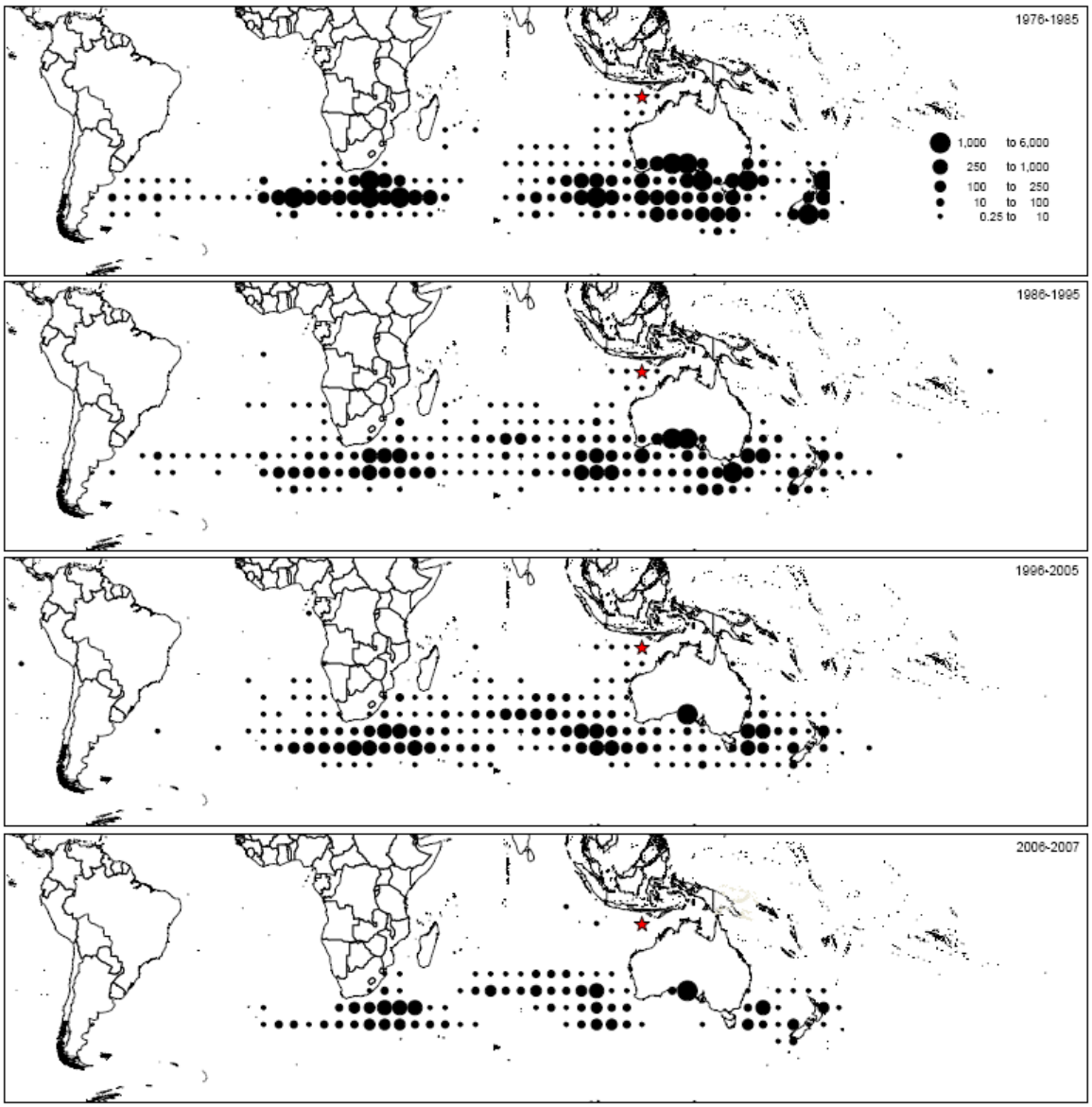

Figure 4: Geographical distribution of average annual southern bluefin tuna catches (t) by CCSBT members and cooperating non-members over the periods 1976-1985, 1986-1995, 1996-2005 and 2006-2007 per 5° block by oceanic region. The area marked with a star is an area of significant catch in the breeding ground. Block catches averaging less than 0.25 tons per year are not shown. Note: This figure may be affected by past anomalies in catch.

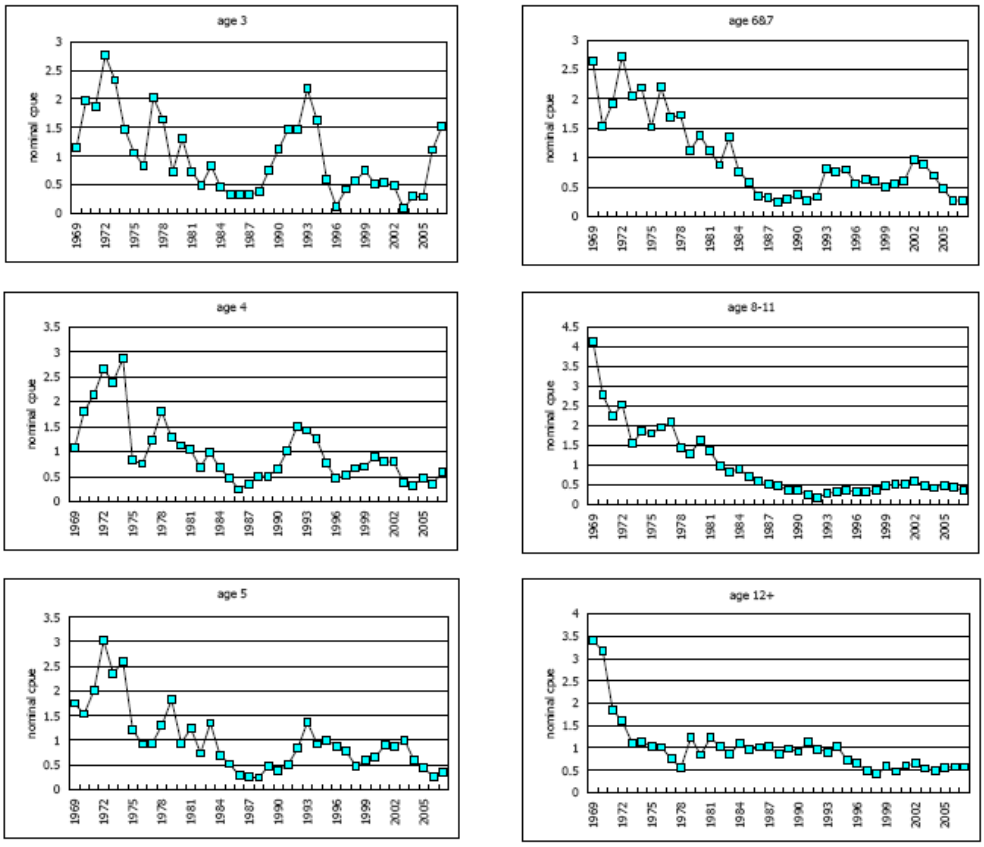

Figure 5: Trends in nominal catch rates (numbers per 1000 hooks) of SBT by age group (ages 3, 4, 5, 6-7, 8-11 and 12+) caught by Japanese longliners operating in CCSBT statistical areas 4-9 in months 4-9. Note: This figure may be affected by past anomalies in catch.

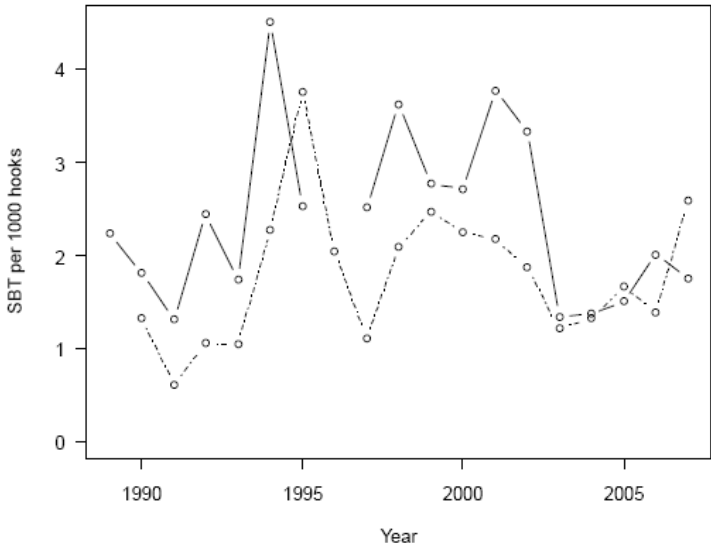

Figure 6: Nominal catch per unit effort (number of SBT per thousand hooks) by calendar year for the New Zealand Charter (solid line) and domestic (dashed line) longline fleets based only on effort from sets that either targeted or caught southern bluefin tuna.

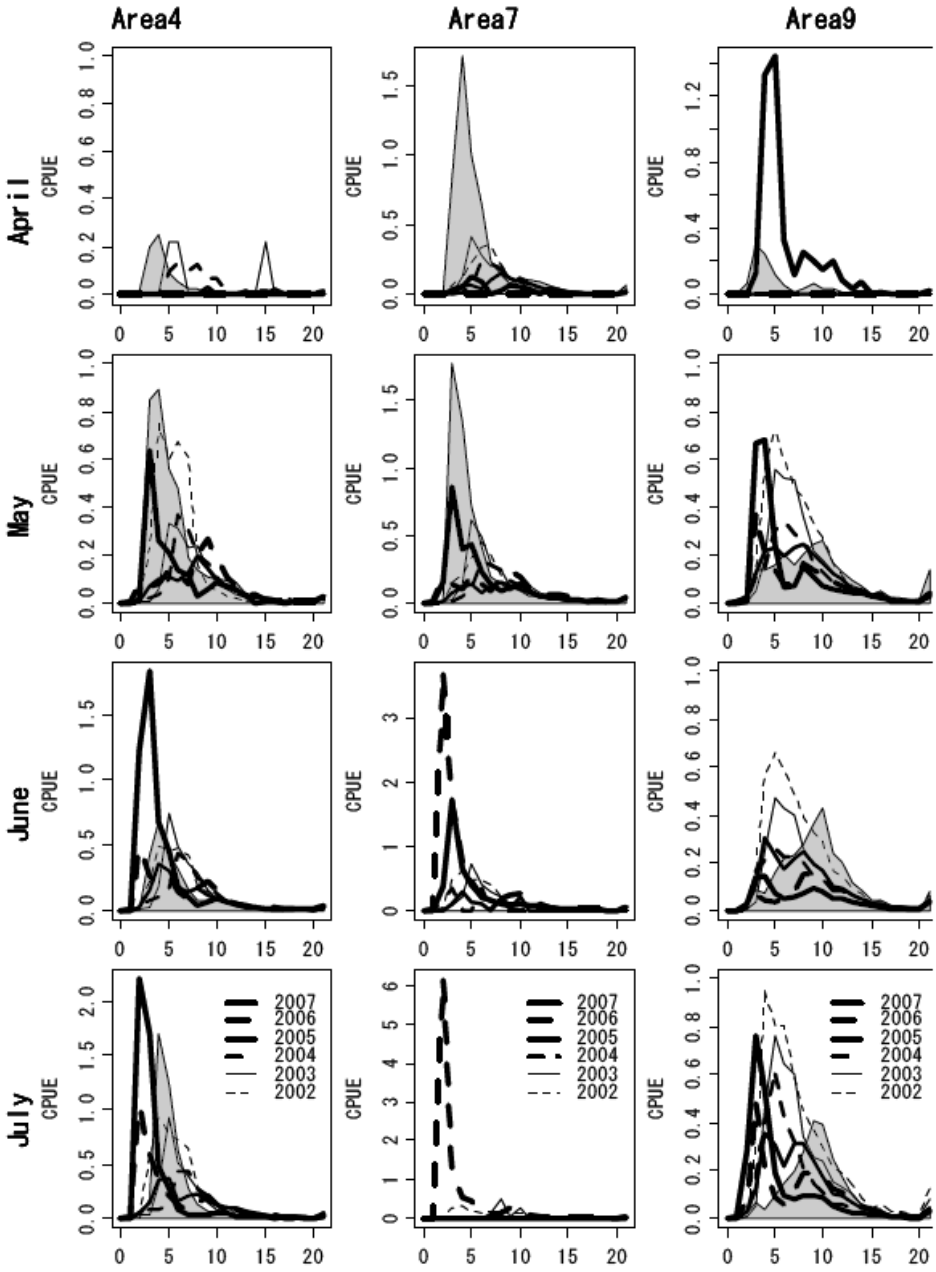

Figure 7: Age composition of nominal CPUE of Real Time Monitoring Program data for the Japanese longline fishery for recent seven years by month and area. Note: This figure may be affected by past anomalies in catch.

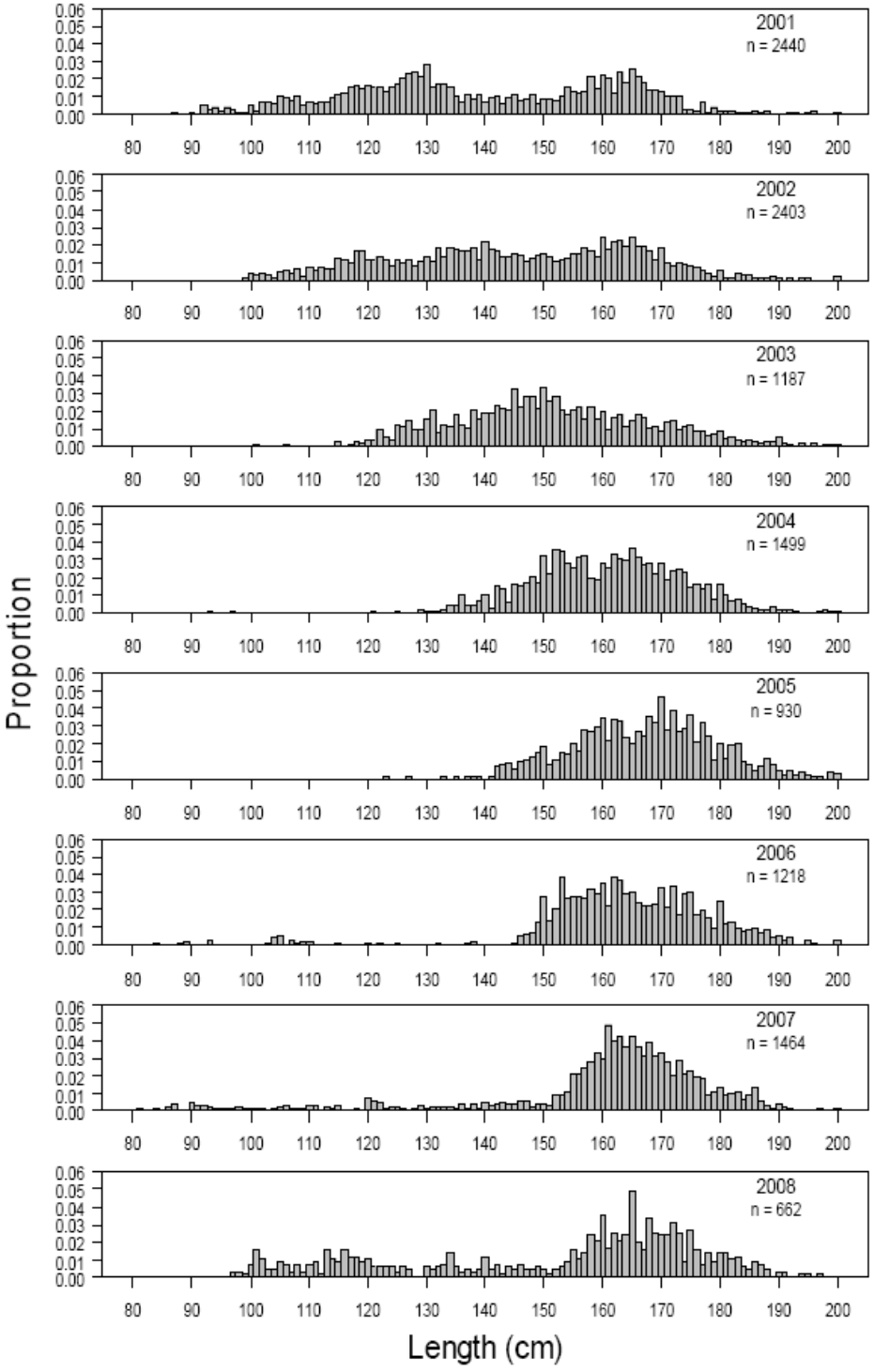

Figure 8: Proportion at length of SBT from the New Zealand charter fleet for 2001 to 2008 (Data for 2008 is preliminary and does not contain data from all vessels).

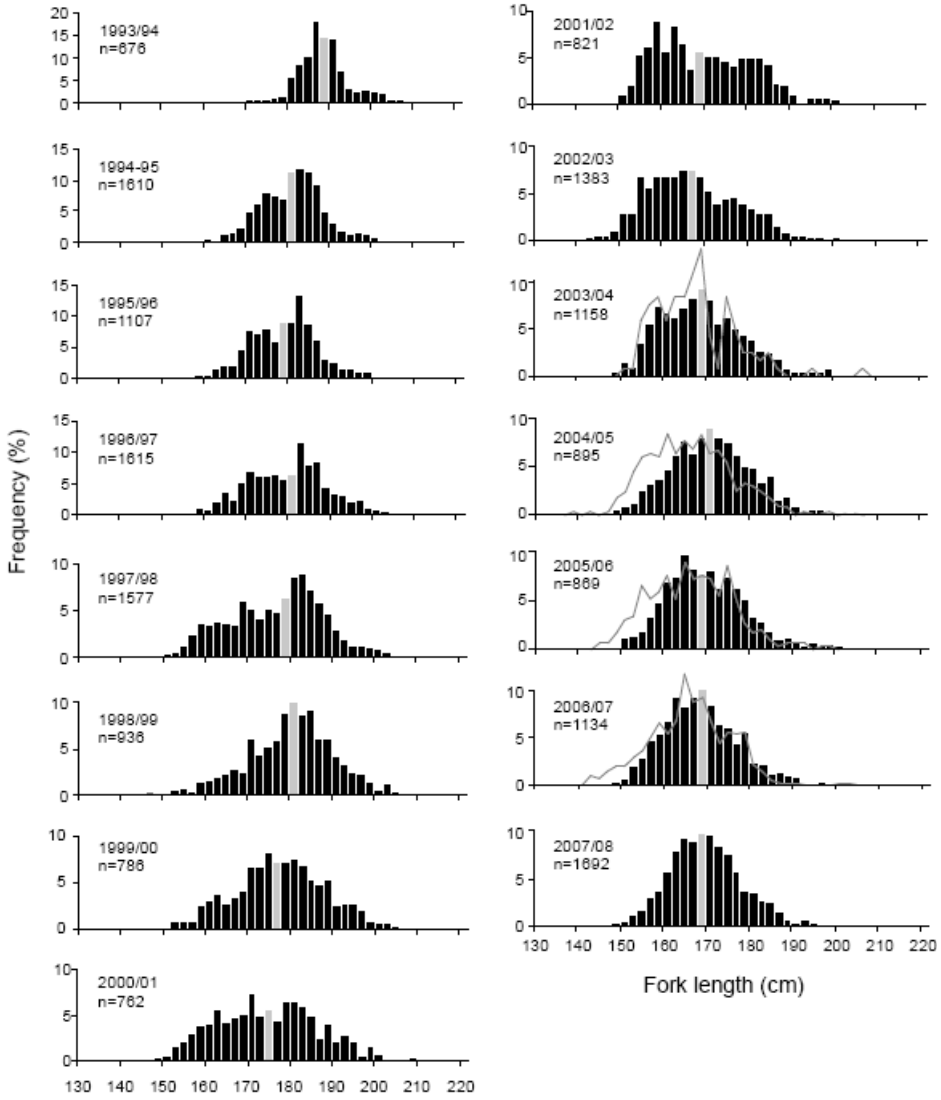

Figure 9: Length frequency (2 cm intervals) of SBT caught on the Indonesian spawning ground (bars) by spawning season. The grey bar shows the median size class. For comparison, the length distribution of SBT thought to be caught south of the spawning ground (Processor A) is shown for the 2003/04 (n=121), 2004/05 (n=685), 2005/06 (n=311) and 2006/07 (n=452) seasons (grey line). A spawning season is defined as July 1 of the previous year to June 30 of the given year.