REPORT ON BIOLOGY, STOCK STATUS AND MANAGEMENT OF SOUTHERN BLUEFIN TUNA: 2007

A review of fisheries indicators was conducted by the CCSBT Stock Assessment Group during 2007. 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 2007. 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 2006 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 81,605t 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 30% 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 73% of the SBT catch has been made in the Indian Ocean, 21% in the Pacific Ocean and 6% in the Atlantic Ocean (Figure 2). The reported Atlantic Ocean catch has varied widely between about 300t and 8,200t since 1968 (Figure 2), averaging about 1,000t 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). The reported Indian Ocean catch has declined from about 54,000t to 11,000t, averaging about 14,600t, and the reported Pacific Ocean catch has ranged from about 1,200t to 19,000t, averaging about 2,100t, over the same periods (although SBT farming and market data analyses indicate that these catches may be under-estimated).

3. Summary of Stock Status

SBT stock status indicators were reviewed at the 12th meeting of the CCSBT Scientific Committee in 2007. The indicators continue to support previous evidence for poor recruitment in the 2000 and 2001 year class, and ongoing recruitment below the 1994-1998 levels. The size distribution in the NZ LL fishery and the Japanese LL fishery continue to indicate poor 1999, 2000, 2001 and 2002 recruitments, and the aerial spotting survey is consistent with a reduction in average recruitment below the 1994-1998 levels. The high fishing mortality rate estimates for age 3 and 4 from recent tagging are also consistent with low recruitments in these years. Trends in year class strength in the Japanese LL fleet show poor strength of the 2000, 2001 and 2002 year classes, but indicate the 2003 year class may be similar in size to the average between 1980 and 1999. However, this indicator could be biased by catch anomalies as in the case of the 2000-2002 year classes. Scientific Research Programme tag returns may suggest declining recruitment between 1999 and 2003. The Great Australian bight aerial survey indicates poor recruitment through to 2004.

In 2006 the SBT Operating Model was used to evaluate a range of possible past under-reported catch scenarios, to investigate the potential effect of these scenarios on current understanding of the state of the SBT stock. The Operating Model was not updated in 2007, so these conclusions are based on the 2006 results. The scenario evaluation results were consistent with the 2005 assessment of the overall stock status and 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. Recruitments in the last decade are estimated to be well below the levels in the period 1950-1980. All scenarios suggest that recruitment in the 1990s fluctuated with no overall trend. Analysis of several independent fishery indicators indicate low recruitments in 2000, 2001 and 2002, and the scenarios suggest low recruitment in 2002 and 2003, although the low estimates of 2003 year class strength is inconsistent with the Japanese length frequency data from 2006.

The primary implication of the higher catch levels in the scenarios evaluated in 2006,

compared to the assumed catch history used in the 2005 assessment, is that estimated total spawning stock size is more than double that assessed at the 2005 meeting. Nonetheless, in the scenarios considered, future total catches of 14,925 t (the total allocated TAC in 2006) would result, on average, in a short-term decline followed by generally stable but not recovering spawning biomass. Any future catch over 14,925 t poses very serious threats to the stock. Rebuilding the spawning biomass requires catch reductions to below 14,925 t under all the scenarios considered. In 2006 the Commission set a global TAC of 11,810 t per year for the period 2007 – 2009.

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 is a TAC reduction of 3,115 tonnes. The TAC will only be reviewed before 2009 if exceptional circumstances emerge in relation to the stock. The allocation of the TAC amongst Members, Cooperating Non-Members and Observers are specified below:-

Members

The allocations below are fixed to 2011 for Japan and to 2009 for other Members.

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

Cooperating Non-Members and Observers

The allocations amongst Cooperating Non-Members and Observers has only been set for 2007.

Indonesia	750 tonnes
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. This will result in an actual catch level below 11,530 tonnes for a 3 year period.

The CCSBT has also implemented a Trade Information Scheme (TIS) for SBT. This 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 and are used to maintain a database for monitoring catches and trade. As markets for SBT are now developing outside CCSBT member countries, the TIS scheme was recently amended to require the document to be issued for all exports, and to include the country of destination.

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.

5. CCSBT Management Procedure

The 10th meeting of the CCSBT Scientific Committee held in 2005 finalised the development and evaluation of candidate management procedures for SBT, and recommended a final management procedure and initial catch reduction for consideration by the Commission. However, implementation of this management procedure has been postponed until uncertainties in estimates of past catch and CPUE levels can be resolved. The magnitude of these past catch uncertainties is such that the management procedure will likely have to be modified. Substantial efforts will also have to be made to improve the reliability of total catch and CPUE series before these can be used as the basis of a management procedure.

SOUTHERN BLUEFIN TUNA SUMMARY (global stock)	
Maximum Sustainable Yield	Not estimated
Current (2005) Catch	Reported to be 15,690t, although review of SBT farming and market data suggests that this may be an underestimate.
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 plus a provision of 750t for Indonesia (which has yet to become a Cooperating Non-Member).

[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.

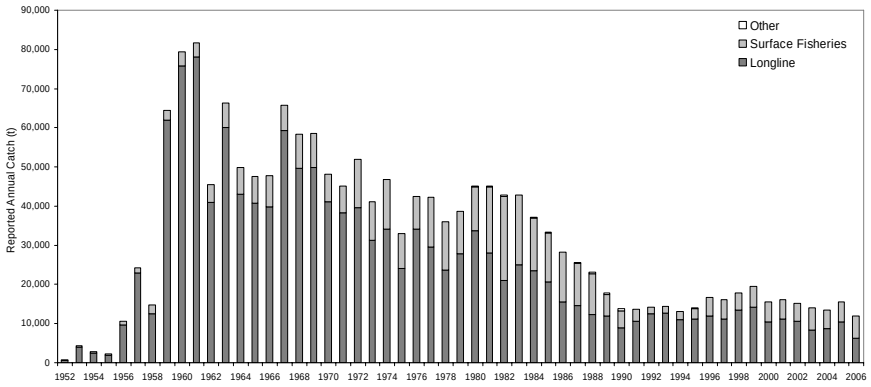

Figure 1. Reported southern bluefin tuna catches by fishing gear, 1952 to 2006[2].

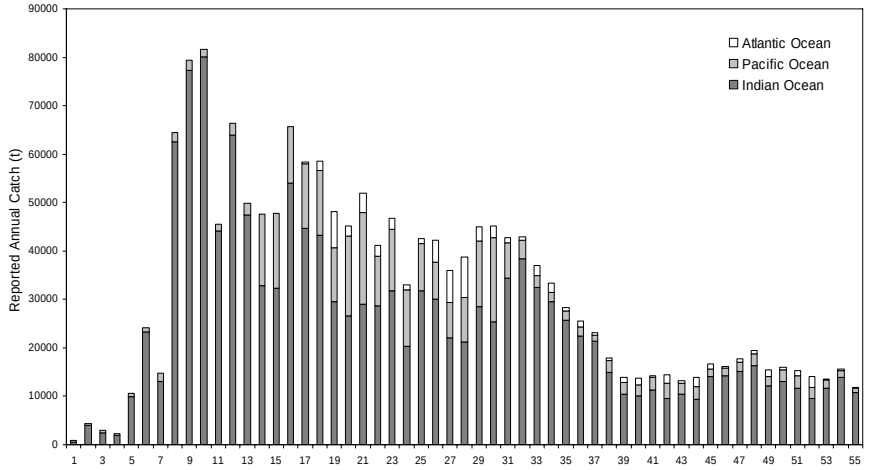

Figure 2. Reported southern bluefin tuna catches by ocean, 1952 to 2006.

Figure 3. Reported southern bluefin tuna catches by flag, 1952 to 2006.

[2] 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.

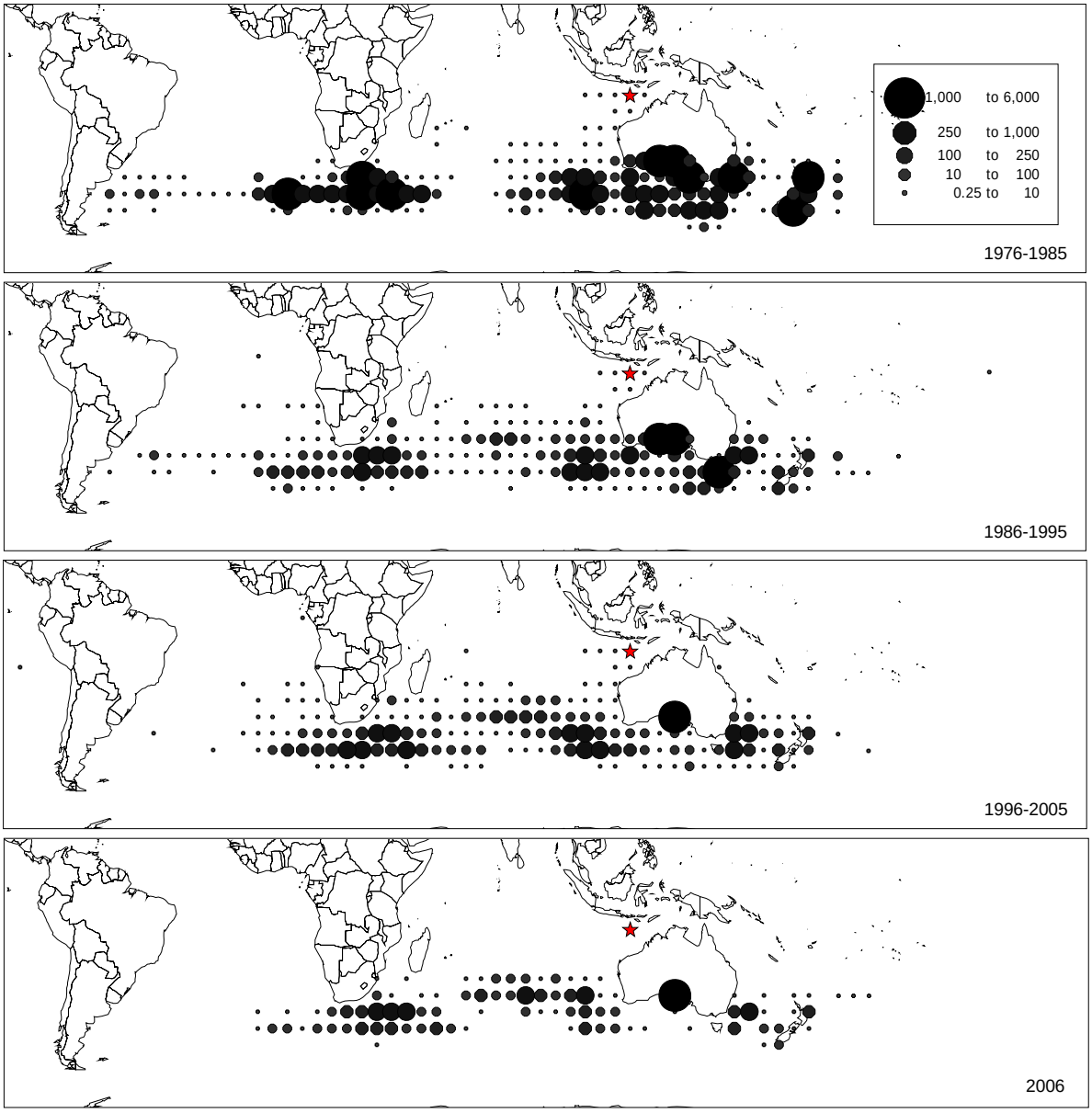

Figure 4[3]. Geographical distribution of average annual southern bluefin tuna catches (t) by CCSBT members and cooperating non-members over the periods 1976-1985, 1986-1995, 1996-2005 and 2006 per 5° block by oceanic region. The area marked with a star is an area of significant non-member catch. Block catches averaging less than 0.25 tons per year are not shown.

[3] This figure may be affected by past anomalies in catch.

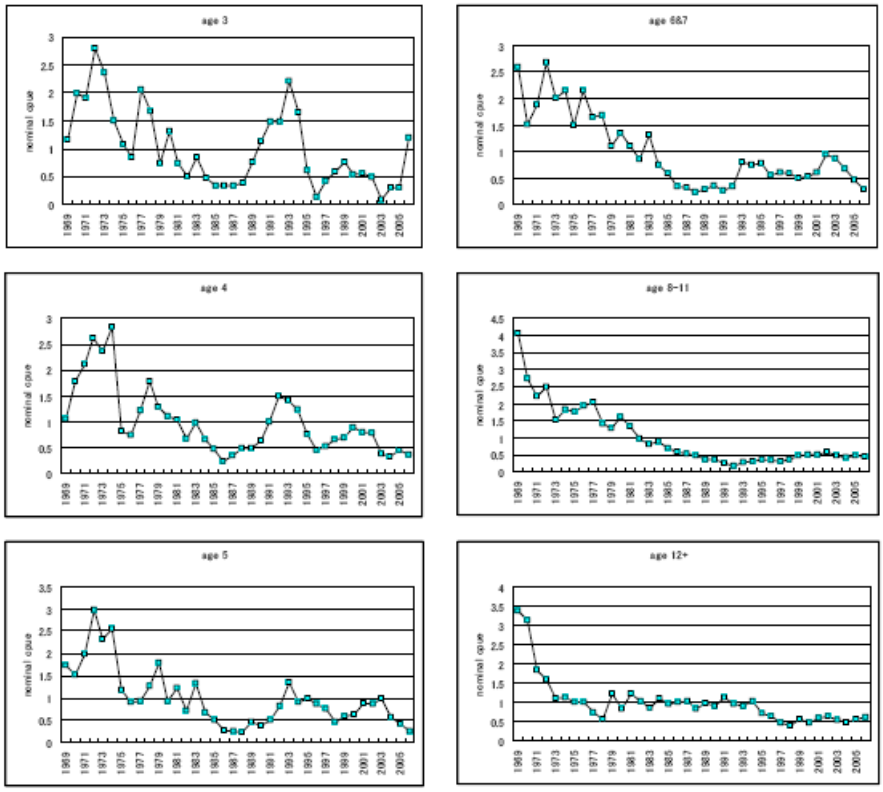

Figure 5. Trends in nominal catch rates (numbers per 1000 hooks) of SBT by age group (ages 3, 4, 5, 6-7, 8-11 and 12+) caught by Japanese longliners operating in CCSBT statistical areas 4-9 in months 4-9.

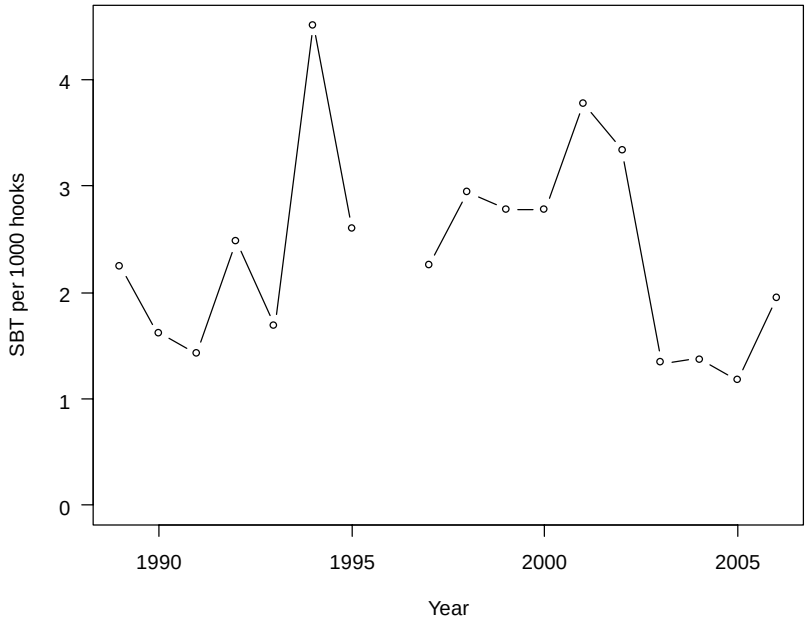

Figure 6. Nominal catch per unit effort (number of SBT per thousand hooks) from the New Zealand charter fleet in Region 6 (west coast South Island).

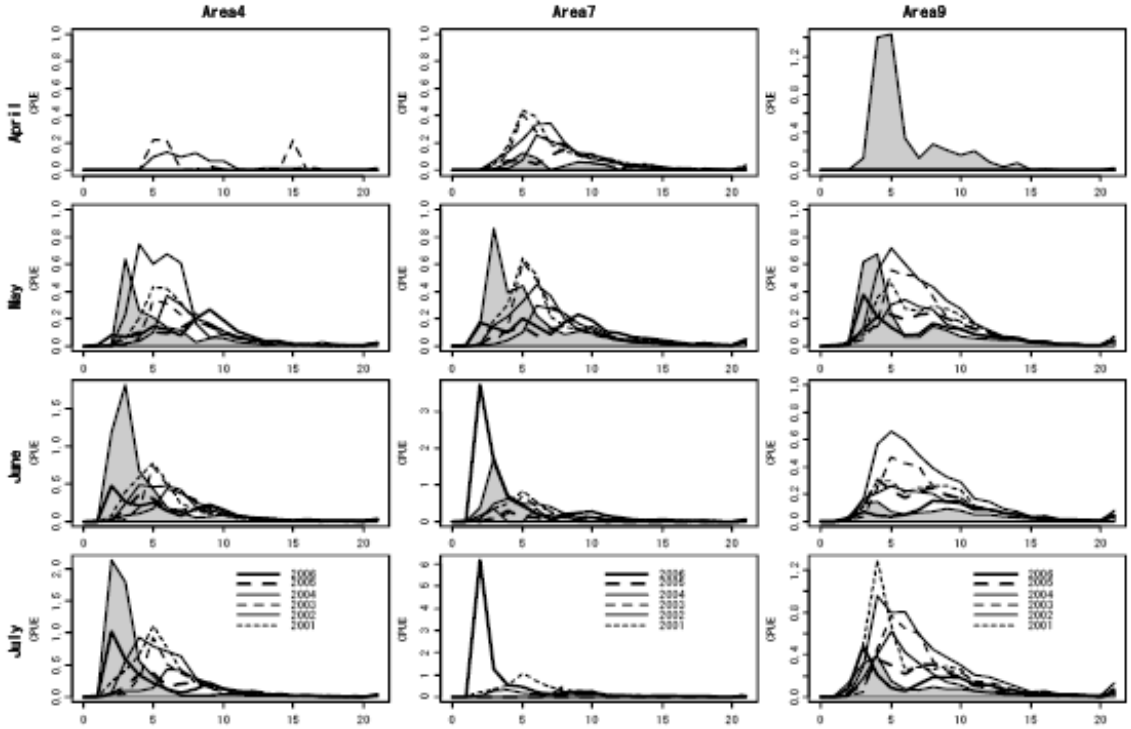

Figure 7. Size composition of nominal CPUE of Real Time Monitoring Program data for the Japanese longline fishery for recent seven years by month and area.

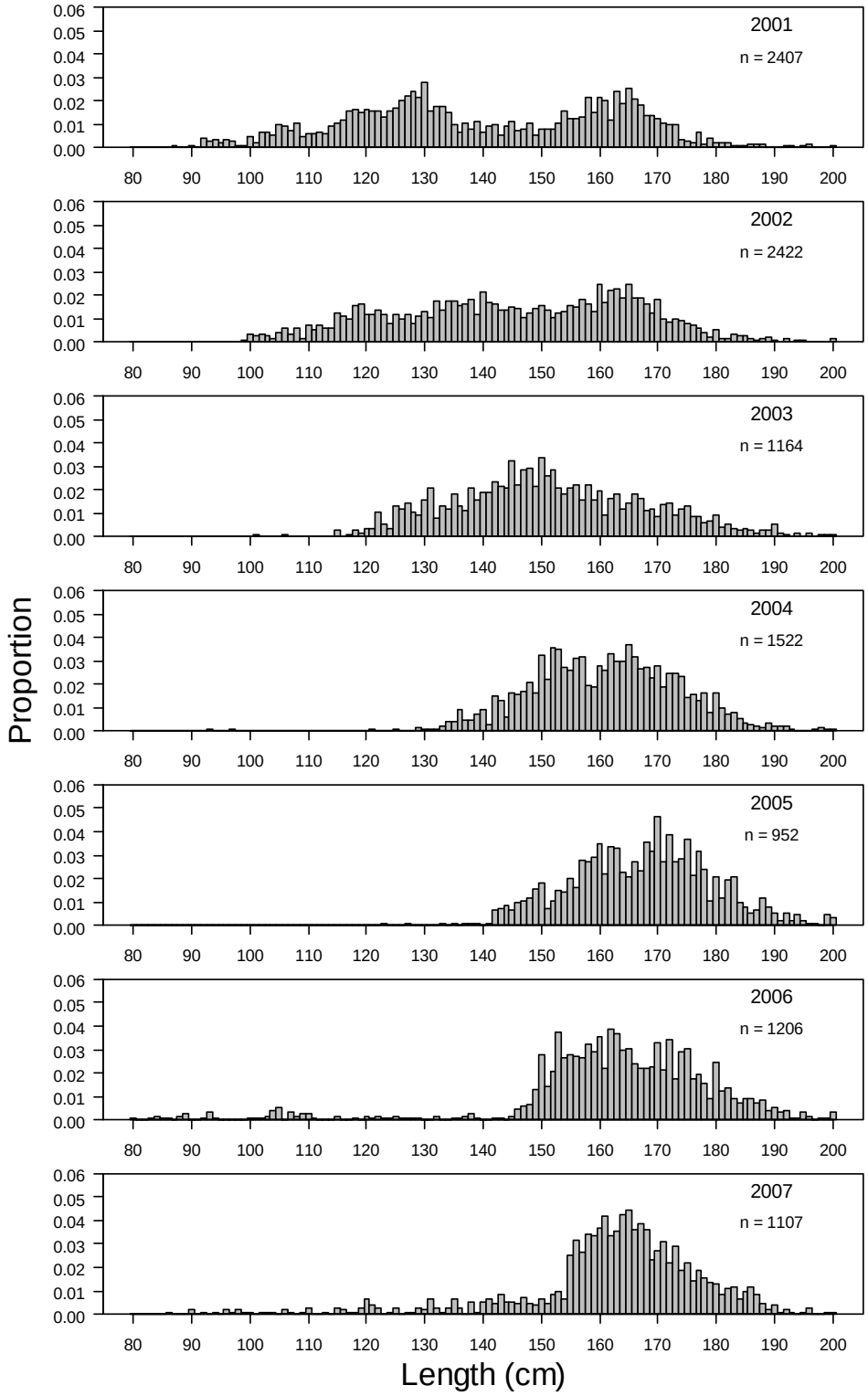

Figure 8. Proportion at length of SBT from the New Zealand charter fleet for 2001 to 2007 (Data for 2007 is preliminary and does not contain data from all vessels).

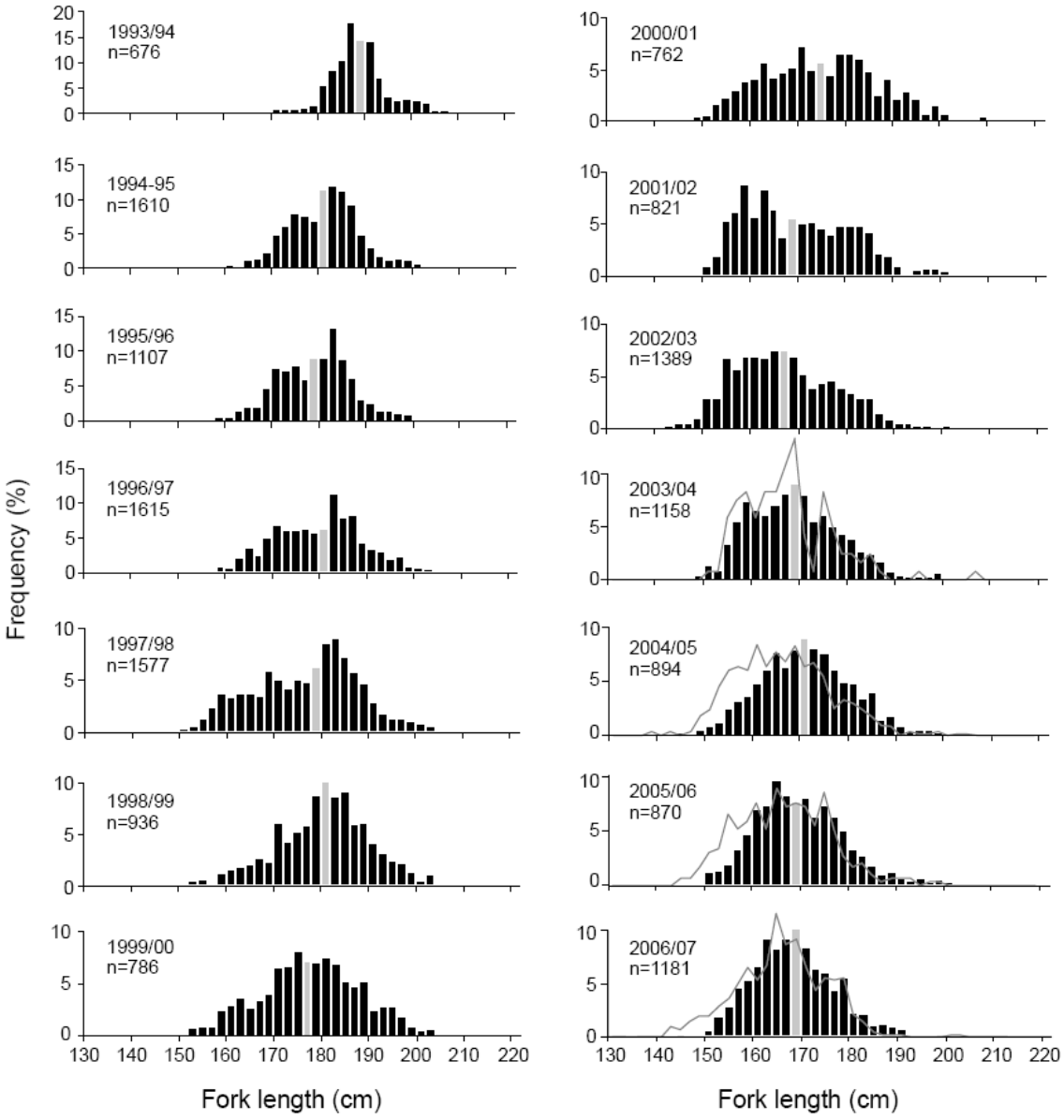

Figure 9. Length frequency (2cm intervals) of SBT by spawning season from the Indonesian spawning ground longline fishery from 1993/94 to 2006/07. The grey bar shows the median length class. For comparison, the length distribution of SBT thought to be caught south of the spawning ground is shown for the 2003/04 (n=121), 2004/05 (n=685), 2005/06 (n=311) and 2006/07 (n=411) seasons (grey line). A spawning season is defined as July 1 of the previous year to June 30 of the given year