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## **REPORT ON BIOLOGY, STOCK STATUS AND MANAGEMENT OF SOUTHERN BLUEFIN TUNA: 2006**

A review of fisheries indicators was conducted by the CCSBT Stock Assessment Group during 2006. 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. 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 2005 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 underestimated).

### ***3. Summary of Stock Status***

SBT stock status indicators were reviewed at the 11<sup>th</sup> meeting of the CCSBT Scientific Committee in 2006. 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 2000 and 2001 recruitments, and the aerial spotting survey and commercial spotting index are both 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 and 2001 year classes, but recent data indicates an increase in juveniles after the 2002 year class.

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 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 data sources and the scenarios indicate low recruitments in 2000 and 2001, 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, 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 14,925t (the current total allocated TAC) would result, on average, in a short-term decline followed by generally stable but not recovering spawning biomass. Any continued catch over 14,925t poses very serious threats to the stock. Rebuilding the spawning biomass requires catch reductions to below 14,925t under all the scenarios considered.

### ***4. Current Management Measures***

SBT were managed by means of quota limits agreed at tri-partite meetings between Australia, Japan and New Zealand from 1985 through to the establishment of the CCSBT in 1994. The global quota

was reduced several times after the initial level of 38,650t for the 1984/85 season. The combined quota for these three countries was maintained at 11,750t from the 1989/90 season through to 2002/03. Following increases in membership of the CCSBT (Republic of Korea, and the Fishing Entity of Taiwan joined in 2001 and 2002 respectively), the CCSBT applied the following national catch limits from 2003/04 to 2006/07:

Japan	6,065 tons
Australia	5,265 tons
Republic of Korea	1,140 tons
Fishing Entity of Taiwan	1,140 tons
<u>New Zealand</u>	<u>420 tons</u>
Total	14,030 tons

An additional catch limit of 895 tonnes was also allocated in 2005/06 for cooperating non-members, of which 50 tonnes was allocated to the Philippines (which was recently admitted as a cooperating non-member), and 800 and 45 tonnes set aside for Indonesia and South Africa respectively should they become cooperating non-members. In 2006, South Africa confirmed their intention to become a cooperating non-member of the CCSBT.

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.

## ***5. CCSBT Management Procedure***

The 10<sup>th</sup> 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.

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### SOUTHERN BLUEFIN TUNA SUMMARY (global stock)

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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

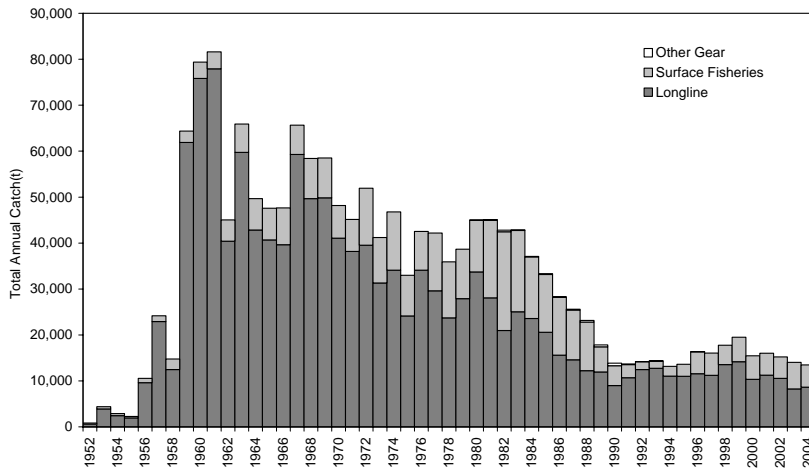
Current Spawner Biomass 112,272 - 166,312 t <sup>1</sup>

Current Depletion  $SSB_{2006} / SSB_K : 0.101 - 0.127$  <sup>1</sup>

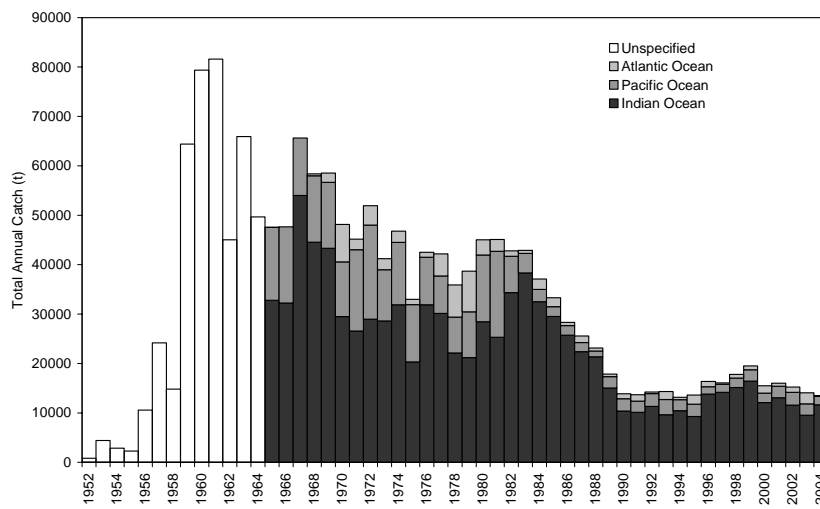
Current Management Measures Global catch not to exceed 14030t for members (Australia, Fishing Entity of Taiwan, Republic of Korea, Japan, and New Zealand), 95t limit for cooperating non-members (Philippines & South Africa), plus a provision of 800t for future cooperating non-members.

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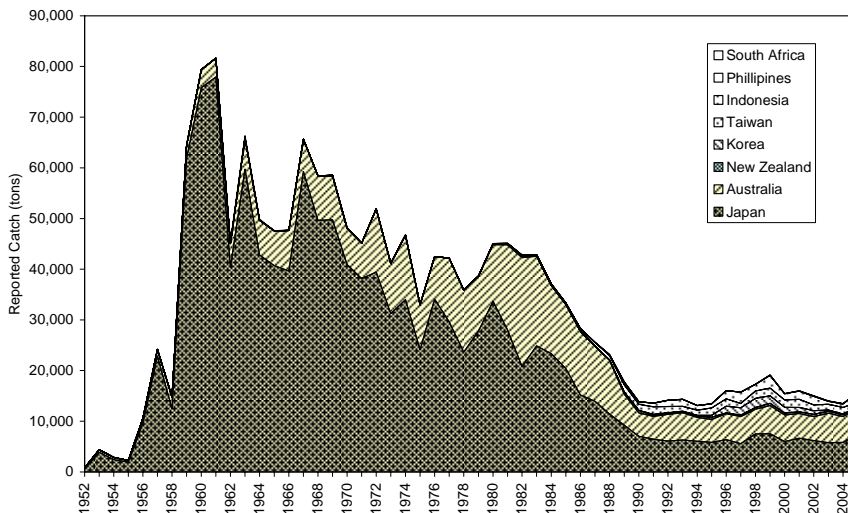
<sup>1</sup> These are the ranges in estimates of median spawning biomass obtained from evaluation of a range of alternate possible past catch scenarios during the 2006 Stock Assessment Group meeting.



**Figure 1.** Reported southern bluefin tuna catches by fishing gear (t), 1952 to 2004<sup>2</sup>.

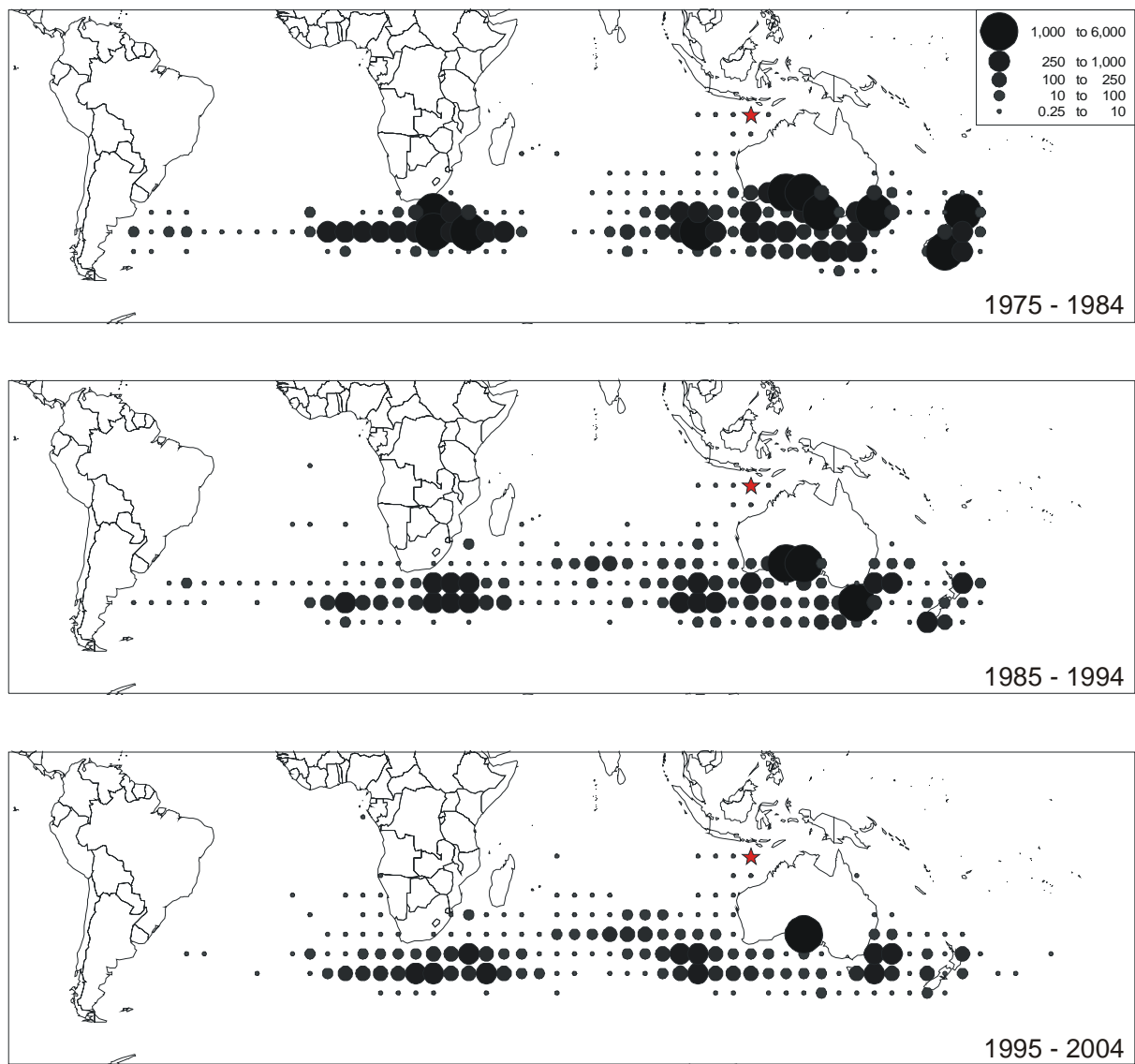


**Figure 2.** Reported southern bluefin tuna catches by ocean (t), 1952 to 2004<sup>2</sup>.



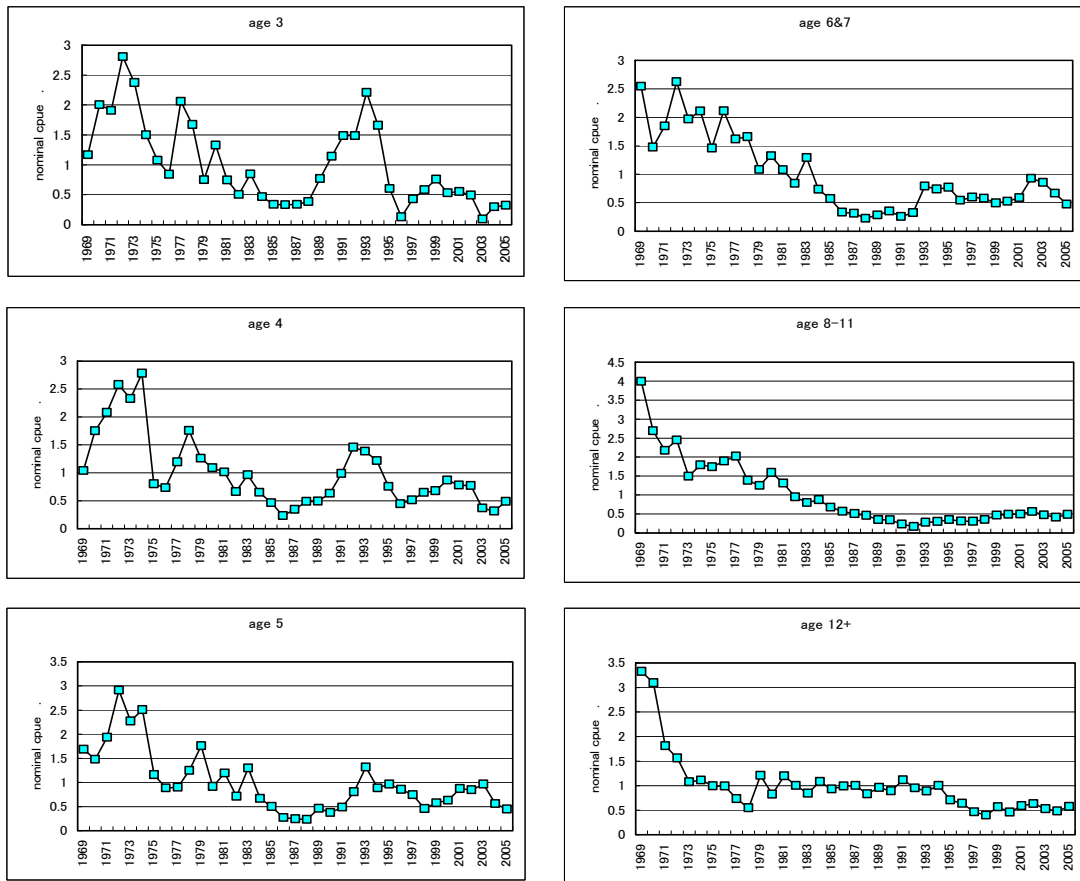
**Figure 3.** Reported annual southern bluefin tuna catch (t) by flag, 1952 to 2005<sup>2</sup>.

<sup>2</sup> 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. Due to the uncertainties in catch data, the catch by gear and catch by ocean figures have not been updated from last year's report.

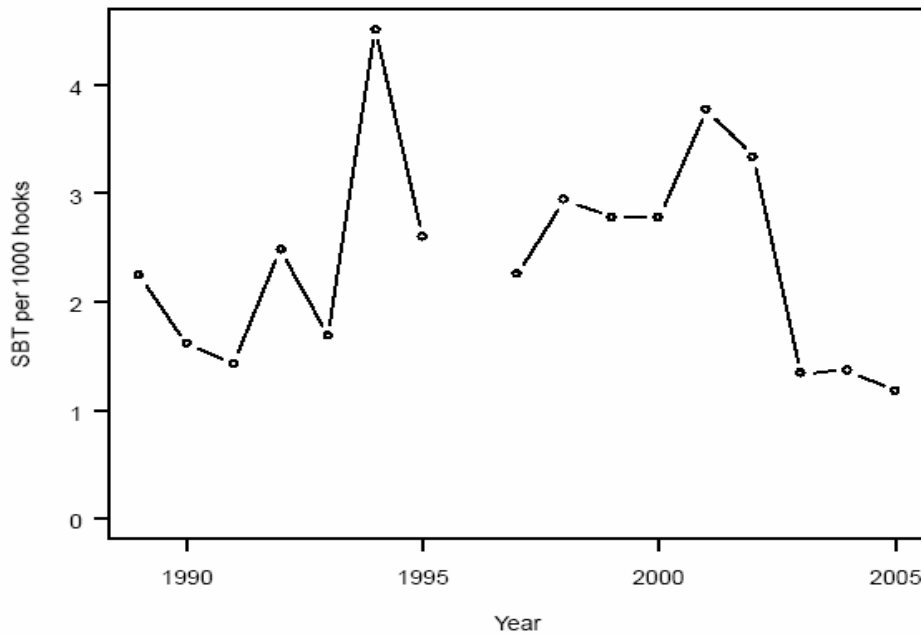


**Figure 4<sup>3</sup>.** Geographical distribution of average annual southern bluefin tuna catches (t) by CCSBT members and cooperating non-members over the decades 1975-1984, 1985-1994 and 1995-2004 per 5° block by oceanic region. The area marked with a star is an area of significant non-member catch. Block catches averaging less than 0.25 tons per year are not shown.

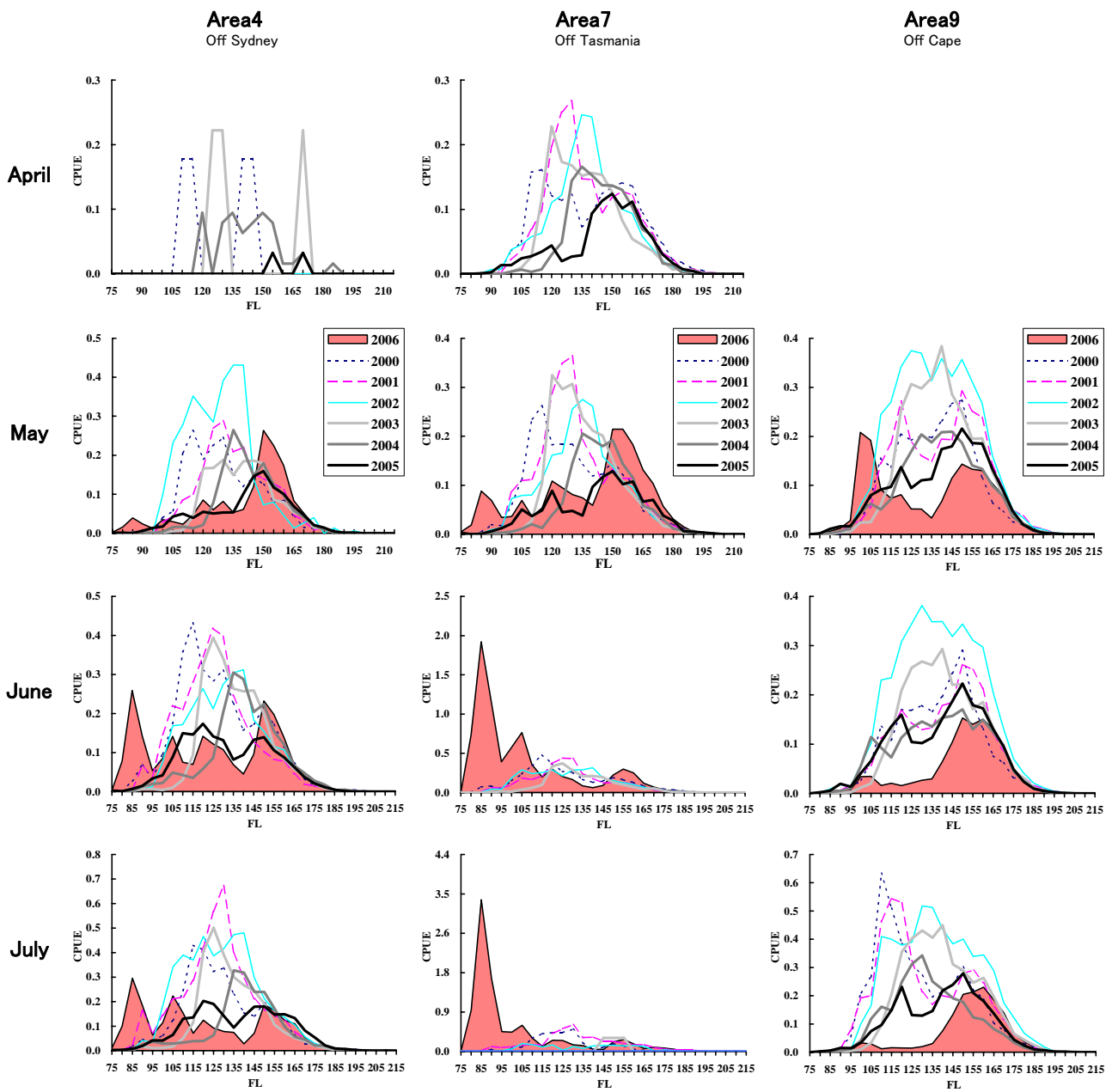
<sup>3</sup> This figure may be effected by anomalies in past catch



**Figure 5<sup>3</sup>.** 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.

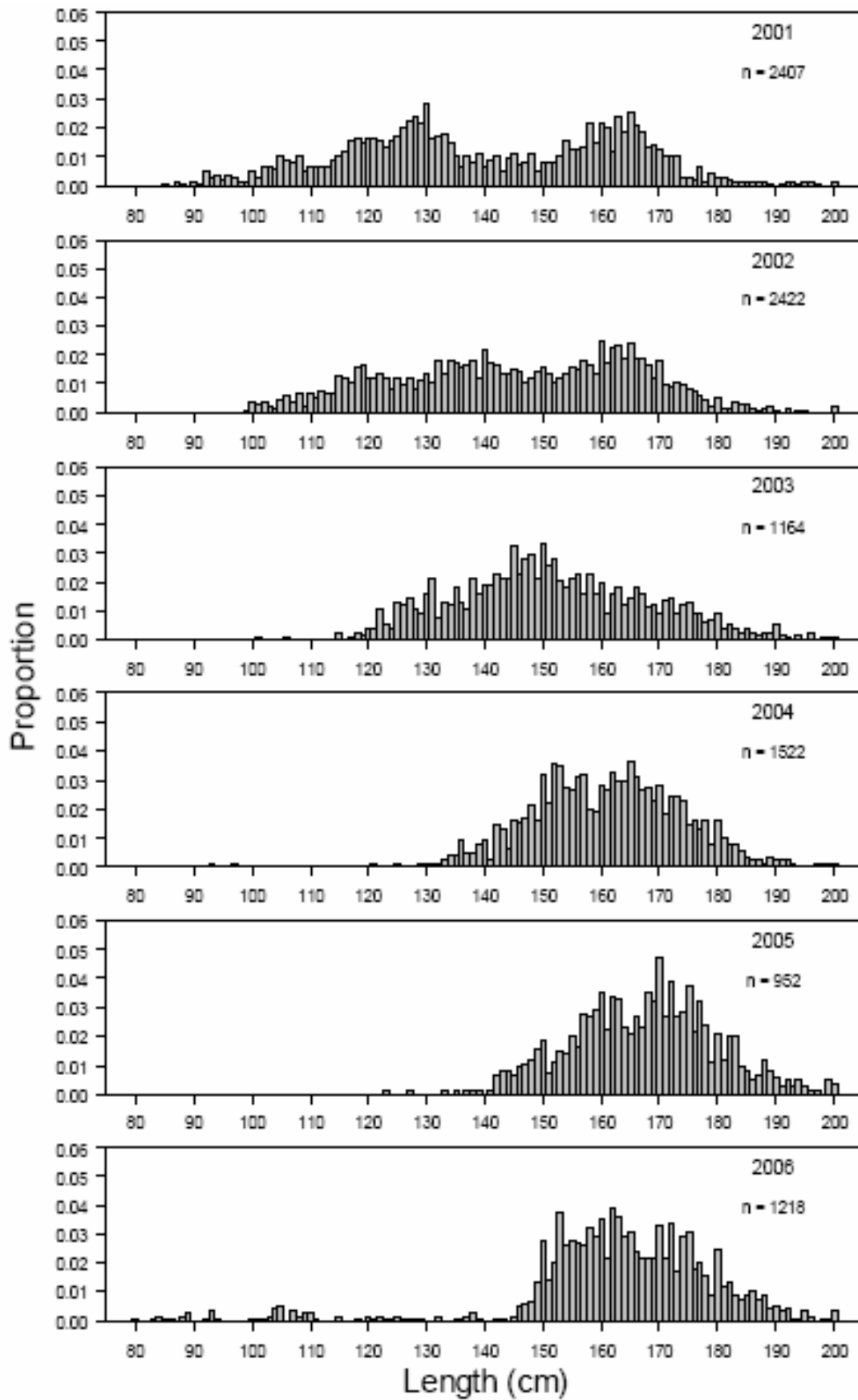


**Figure 6.** Nominal catch per unit effort (number of SBT per thousand hooks) from the New Zealand charter fleet in Region 6 (west coast South Island).

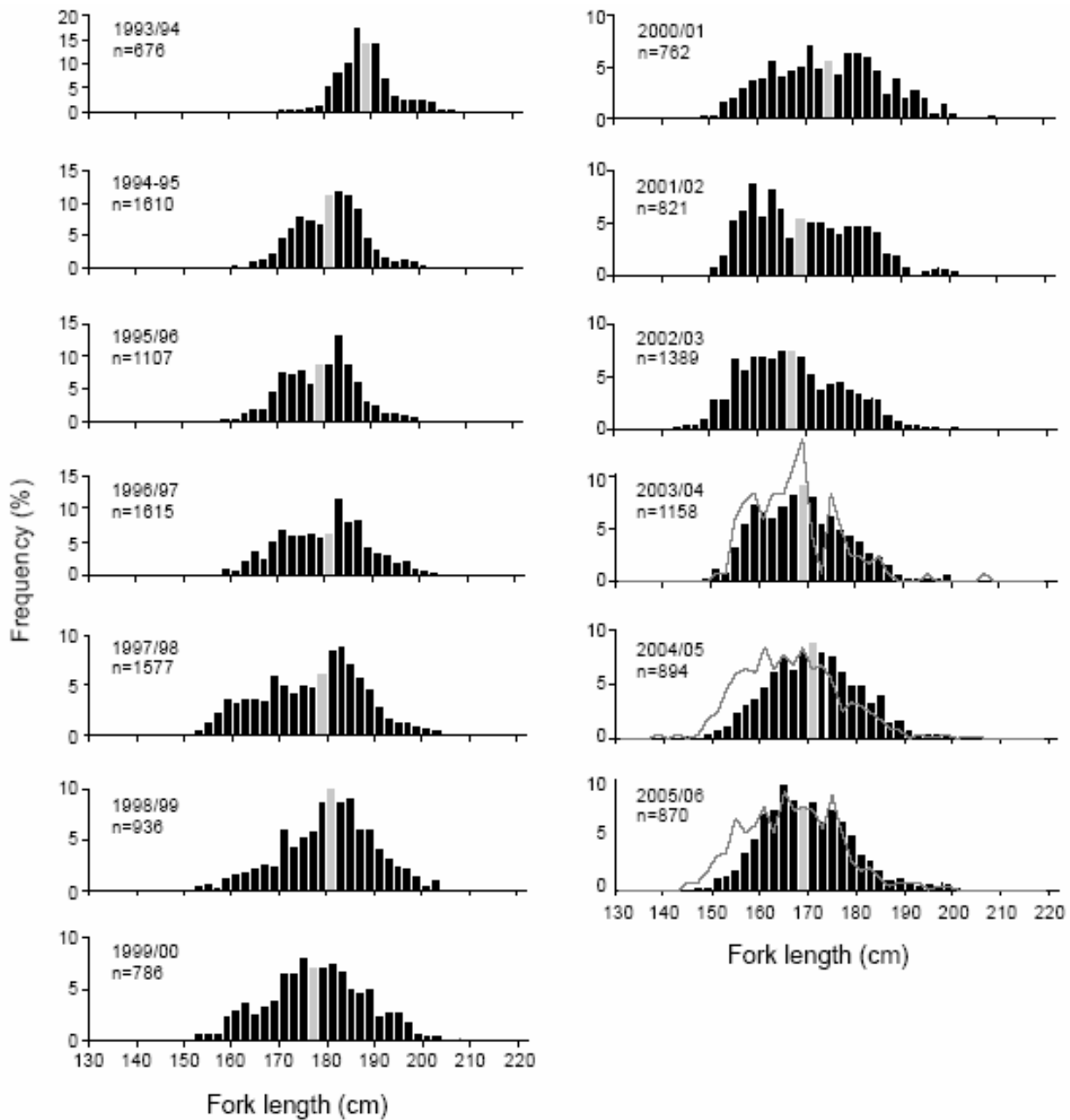


**Figure 7<sup>3</sup>.** Size composition of nominal CPUE of Real Time Monitoring Program data for the Japanese longline fishery for recent seven years by month and area.





**Figure 8.** Proportion at length of SBT from the New Zealand charter fleet for 2001 to 2006. (Data for 2006 is preliminary.)



**Figure 9.** Length frequency (2cm intervals) of SBT by spawning season from the Indonesian spawning ground longline fishery from 1993/94 to 2005/06. 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) and 2005/06 (n=311) seasons (grey line). A spawning season is defined as July 1 of the previous year to June 30 of the given year.