

Report on Biology, Stock Status and Management of Southern Bluefin Tuna: 2009

The CCSBT Extended Scientific Committee conducted a review of fisheries indicators and updated the estimates of spawning stock biomass using the CCSBT operating model during 2009. In response to indications from a 2006 review of SBT 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 2009. This report updates description of fisheries and the 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, increasing again prior to senescence.

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 the end of 2008 are shown in Figures 1 - 3. However, as a result of indications in SBT 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 was taken 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 35% 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 850t 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 5700t, over the same periods (although SBT farming and market data analyses indicate that these catches may be under-estimated).

3. Summary of Stock Status

The SBT operating model used in 2008 was revised as described in the report of the Extended Scientific Committee (ESC), and then used to project future stock status under different constant annual catches (ESC report, Table 1 and Figures 1 and 3). The base case scenario is considered the most probable, but account should also be taken of results for the six plausible scenarios (ESC report, Tables 2 and 3 and Figures 4 and 5). These scenarios all indicate that the spawning stock biomass remains at a very low level: typically about 5% or less of SSB_0 , which is a little more than 15% of SSB_{MSY} . There is no sign of the spawning stock rebuilding.

Recruitments during the last two decades are estimated to be well below the levels over 1950-1980. Recruitment in the 1990s fluctuated at a low level without any overall trend, but recruitments for 2000 to 2002 were poor. The two following year classes were somewhat stronger, though still below the average 1990s level. Recruitments since 2005 cannot be estimated precisely as yet. Although some data give positive signals, it remains probable that at least some of these year classes were as weak as in 2000-2002. As the weak year classes in 2000-2002 move into the spawning stock over the next few years, there will be a negative impact on the spawning stock biomass.

The median projections under the current TAC (of 11810t) for the base case show a decline in spawning stock biomass in the short term (to 2013), and remain below the current level in the longer term (to at least 2025) (see ESC report, Table 1 and Figures 1 and 3). The same is true for nearly all of the other plausible scenarios considered (see ESC report, Tables 2 and 3 and Figure 4). To rebuild the spawning stock and

thereby also reduce the risk in the short term of further poor recruitments, a reduction to the current TAC is required (see ESC report, paragraph 106). Projection results for alternative future TAC levels, along with associated probabilities, are shown in these Tables and Figures, with further details to be found in **Attachment 10** of the ESC report.

While rebuilding of the spawning stock would almost certainly increase sustainable yield, the risks that this rebuilding might be jeopardised by further poor recruitments have probably increased since the last assessment. Because the spawning stock biomass is very low, it may not provide security against adverse environmental effects leading to a few years of poor recruitment. Short-term projections for the spawning stock biomass are relatively reliable because the year classes that will shortly join the spawning stock have already been observed in the fishery. However, longer term projections are more uncertain as they depend on future recruitments whose levels have to be determined by use of an estimated stock-recruitment relationship, and so should be treated with greater caution in terms of their implications for appropriate future catch limits.

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 was only to 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:-

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
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 a target catch level below 11,530 tonnes.

The Fifteenth annual meeting of the CCSBT reconfirmed CCSBT13's decision on the TAC and its allocation as summarised above.

The CCSBT has 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.

On 1 July 2004, the CCSBT established a list of fishing vessels over 24 metres in length which were approved to fish for SBT. The list was extended to include all vessels, regardless of size, from 1 July 2005. On 31 December 2008, the CCSBT established a list of authorised farms that are approved to operate for farming SBT and on 1 April 2009, the CCSBT established a list of carrier vessels that are authorised to receive SBT at sea from large scale fishing vessels. Members and Cooperating Non-Members will not allow the trade of SBT caught by fishing vessels and farms, or transhipped to carrier vessels that are not on these lists.

The CCSBT has recognised the critical importance of adopting and fully implementing at the earliest possible time an integrated package of compliance measures that would ensure the elimination of unreported catch and provide accurate data as a basis for proper stock assessment. At its Fifteenth annual meeting, the CCSBT adopted resolutions on the following compliance measures, all of which are to be implemented on or before 1 January 2010:

- A vessel monitoring system
- A catch documentation scheme; and
- Monitoring of transhipments by large scale fishing vessels.

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 reduced over recent years;
- indicators and the assessment suggest that the 2003 and 2004 year classes are not as low as the weak 2000, 2001, and 2002 year classes; and
- indicators of age 4+ SBT have exhibited some recent upward trends.

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

- a very low spawning stock (about 5% of SSB_0 and 15% of SSB_{MSY});
- the three poor recruitments from 2000 to 2002, and indications of some further poor recruitments after 2004, 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; and
- Current fishing mortality is nearly double F_{MSY} .

The ESC **recommends** that the Extended Commission effect a meaningful reduction in catch below the current TAC of 11810t.

Noting the Extended Commission's intent to adopt a Management Procedure (MP) at its 2010 annual meeting, and given the high probability that such a MP will require catch and effort data as inputs, the ESC **recommends** that the Extended Commission take steps to ensure accurate future catch and effort reporting.

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
Reported (2008) Catch	11,369t
Current Replacement Yield	Not estimated
Current Spawner Biomass	44,040 (33,091 – 50,095t) ¹
Current Depletion	SSB ₂₀₀₉ / SSB ₀ : 0.036 - 0.051 ¹
Current Management Measures	Global TAC for Members and Cooperating Non-Members of 11,810t.

¹ These are the ranges in estimates of median spawning biomass obtained from evaluation of the base case and a range of six plausible scenarios during the 2009 Extended Scientific Committee meeting.

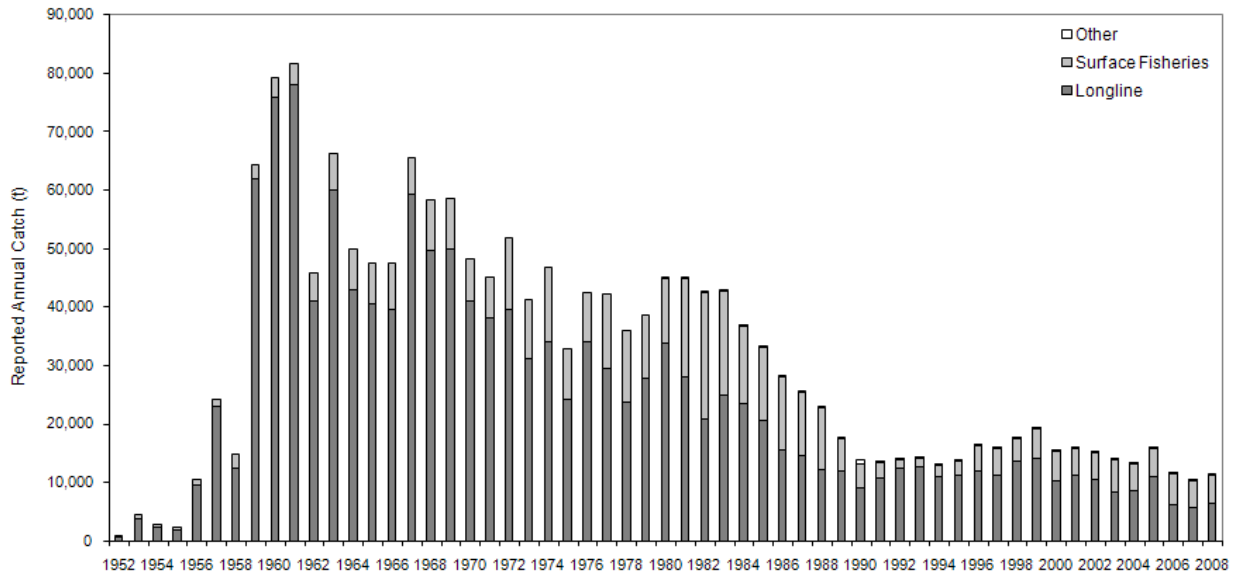


Figure 1: Reported southern bluefin tuna catches by fishing gear, 1952 to 2008. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

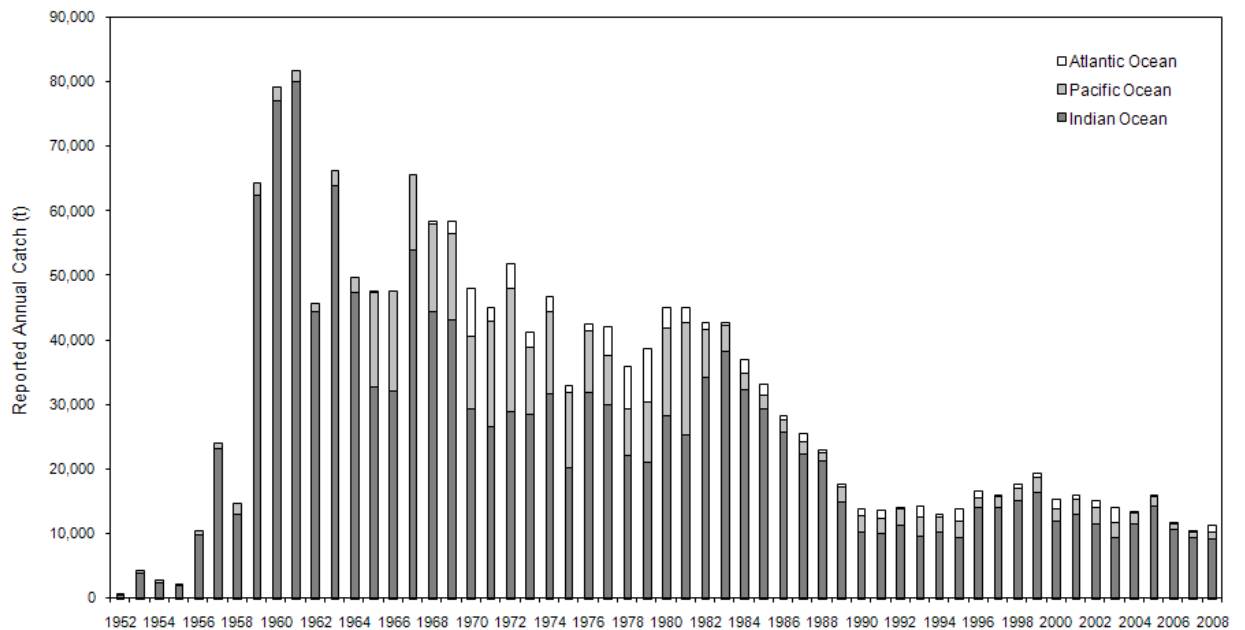


Figure 2: Reported southern bluefin tuna catches by ocean, 1952 to 2008. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

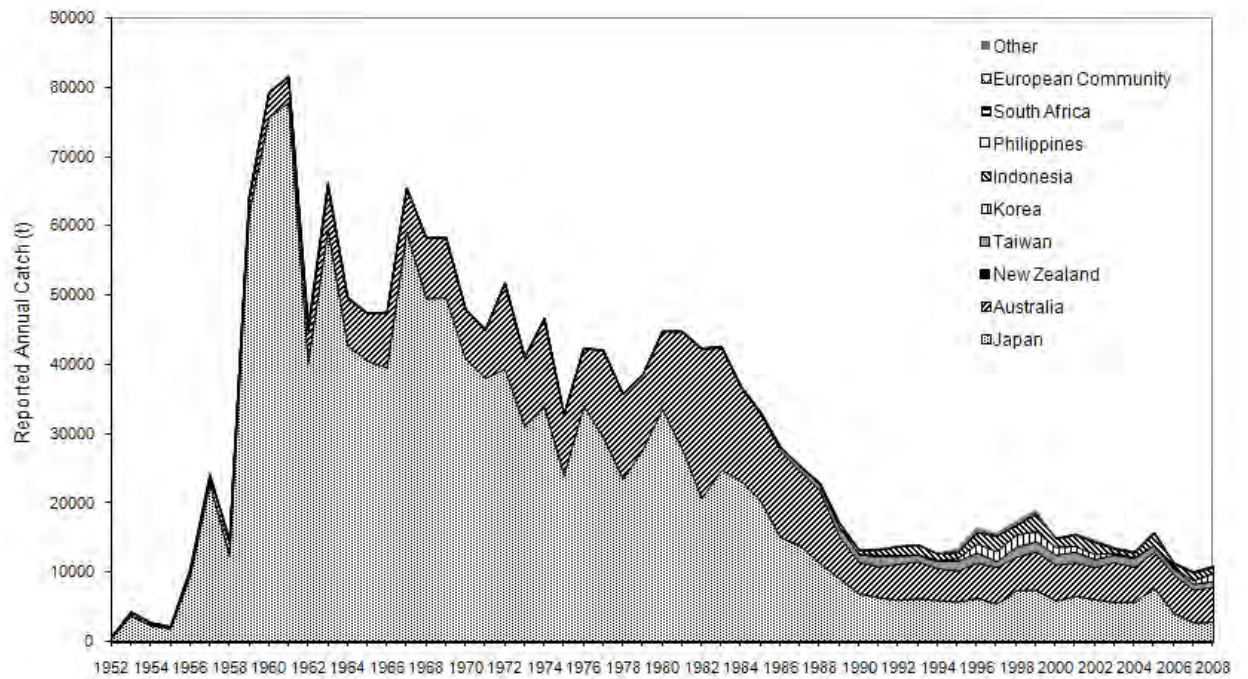


Figure 3: Reported southern bluefin tuna catches by flag, 1952 to 2008. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

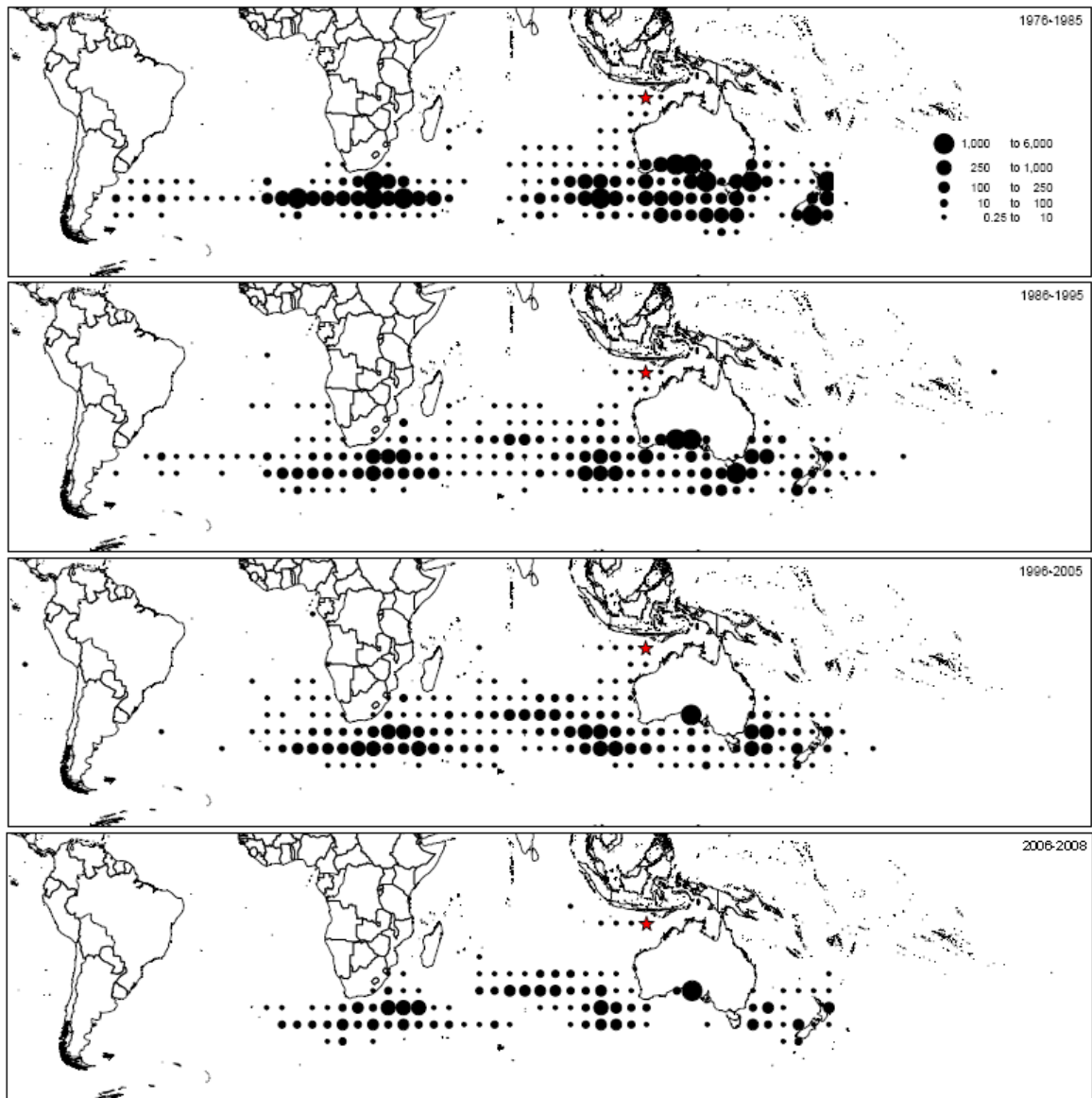


Figure 4: Geographical distribution of average annual southern bluefin tuna catches (t) by CCSBT members and cooperating non-members over the periods 1976-1985, 1986-1995, 1996-2005 and 2006-2008 per 5° block by oceanic region. The area marked with a star is an area of significant catch in the breeding 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.

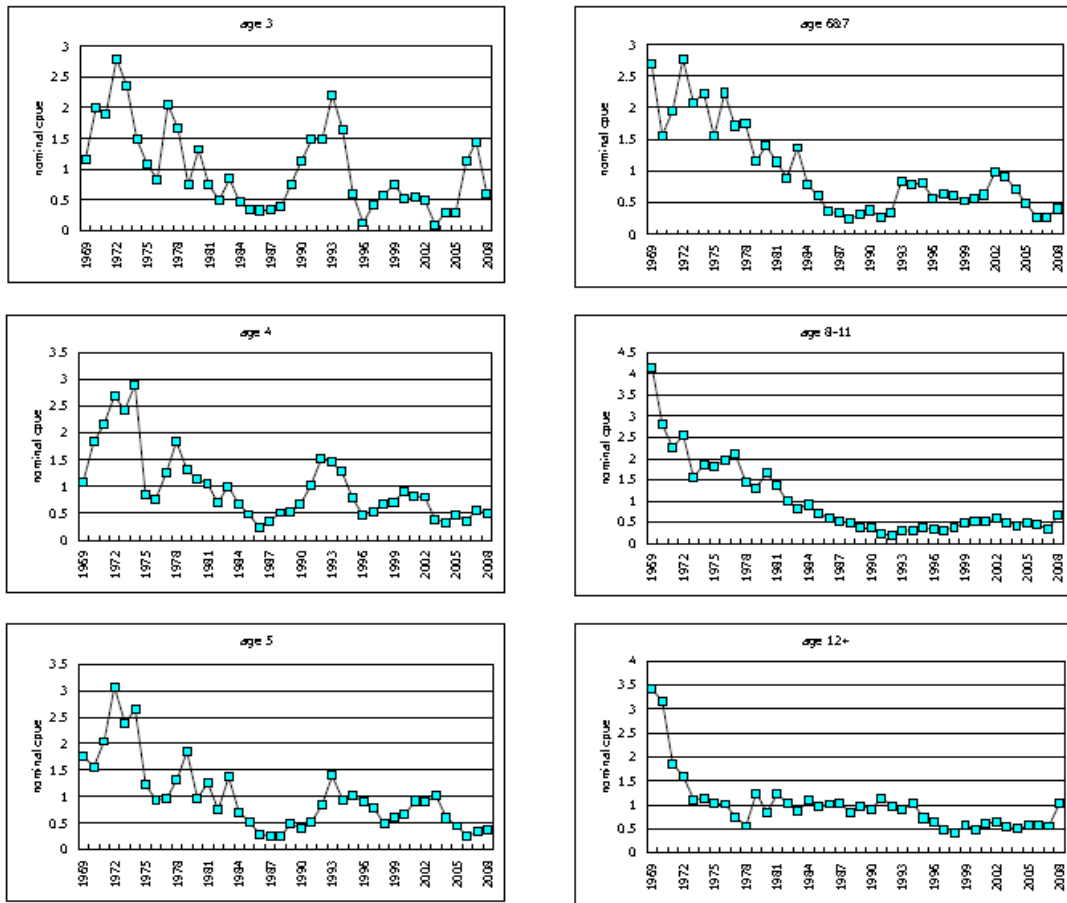


Figure 5: Trends in nominal catch rates (numbers per 1000 hooks) of SBT by age group (ages 3, 4, 5, 6-7, 8-11 and 12+) caught by Japanese longliners operating in CCSBT statistical areas 4-9 in months 4-9. Note: This figure may be affected by past anomalies in catch.

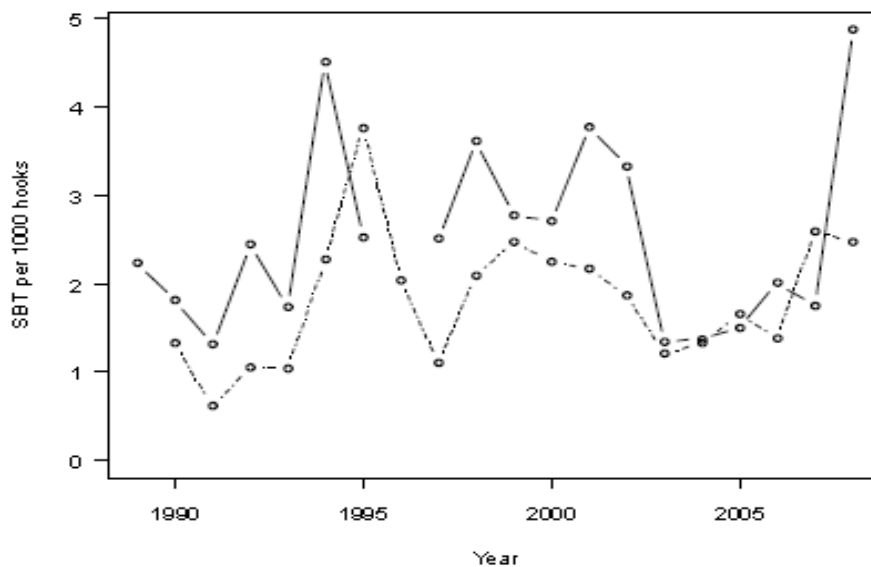


Figure 6: Nominal catch per unit effort (number of SBT per thousand hooks) by calendar year for the New Zealand Charter (solid line) and domestic (dashed line) longline fleets based only on effort from sets that either targeted or caught southern bluefin tuna.

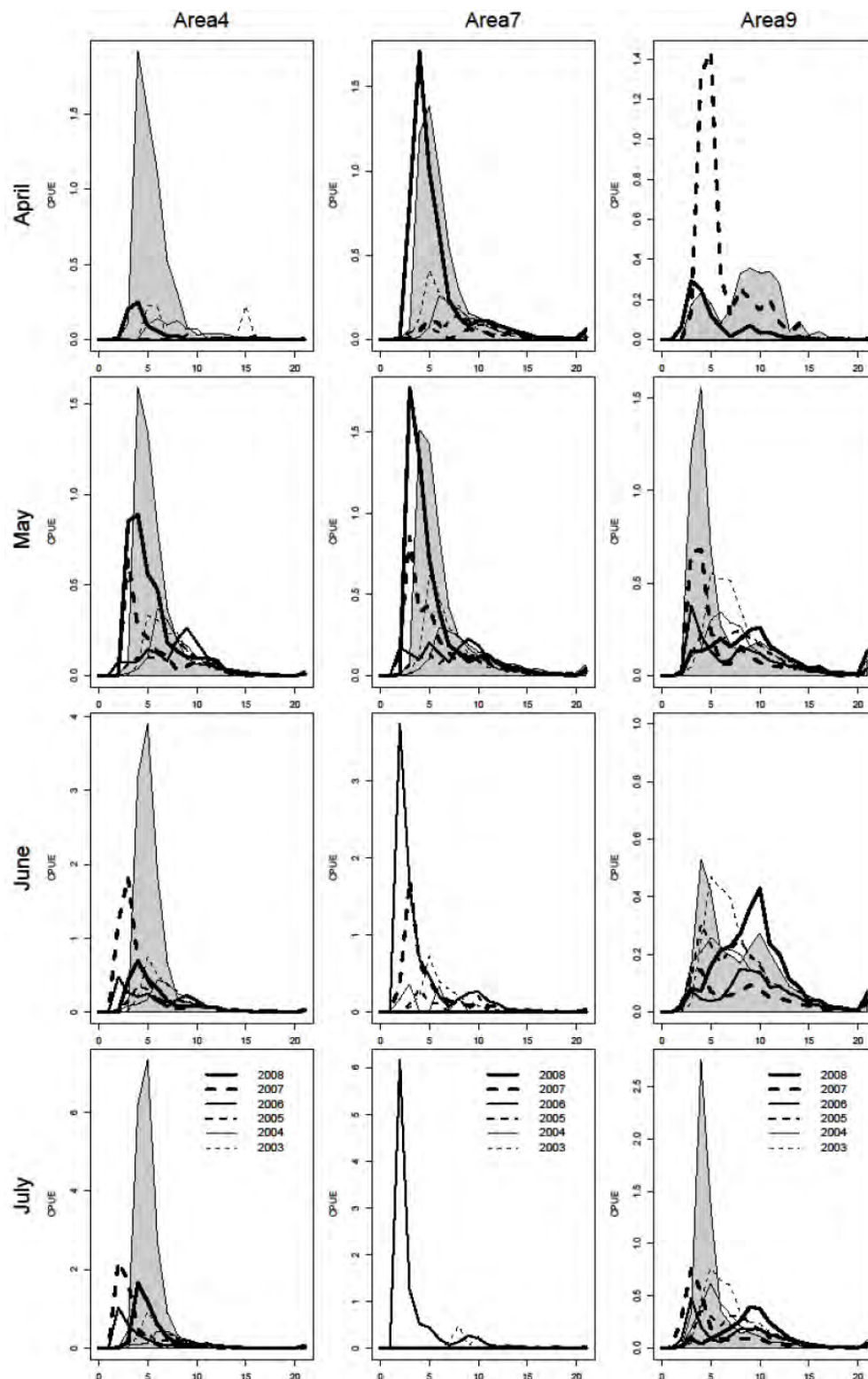


Figure 7: Age composition of nominal CPUE of Real Time Monitoring Program data for the Japanese longline fishery for recent seven years by month and area. Note: This figure may be affected by past anomalies in catch.

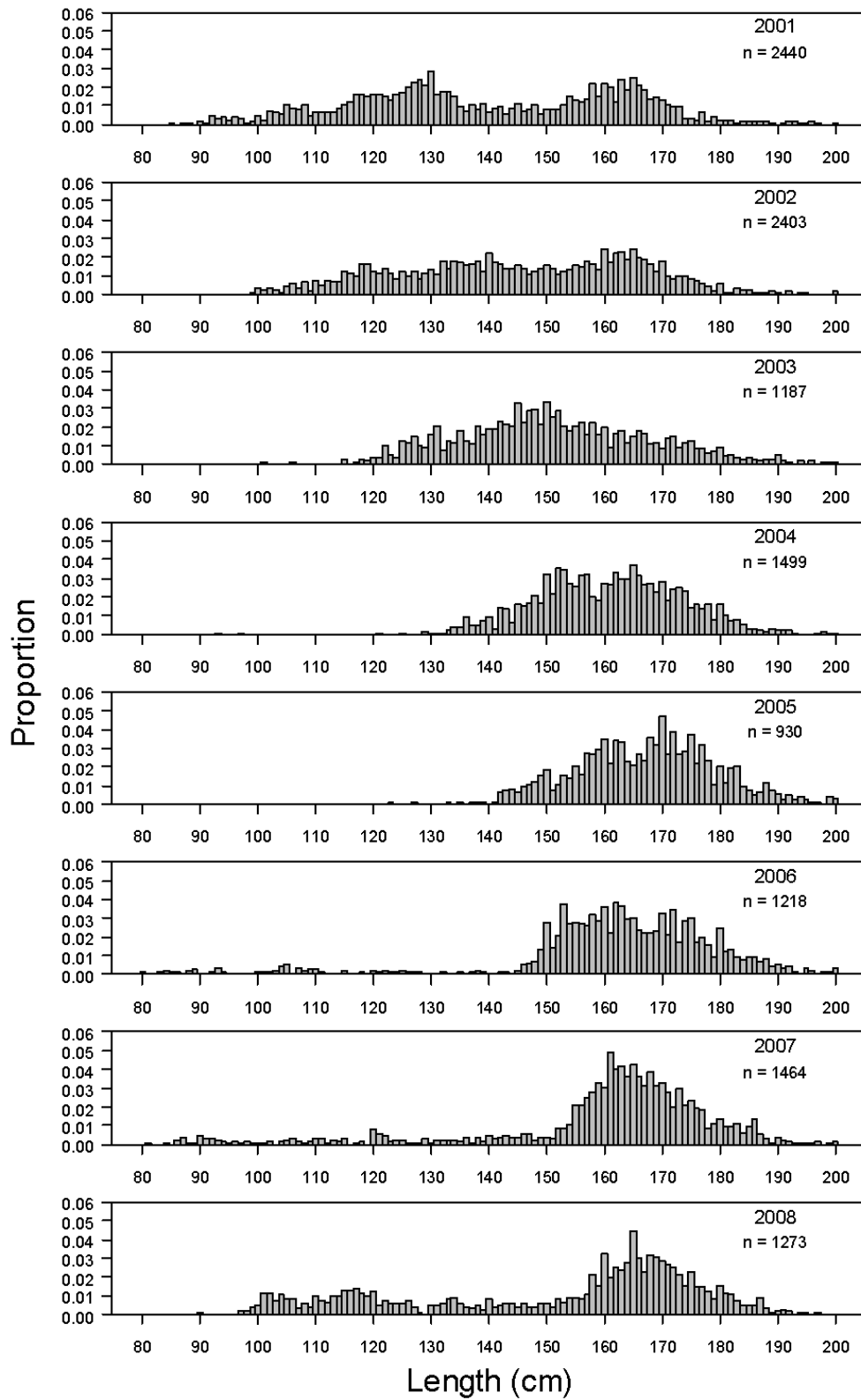


Figure 8: Proportion at length of SBT from the New Zealand charter fleet for 2001 to 2008.

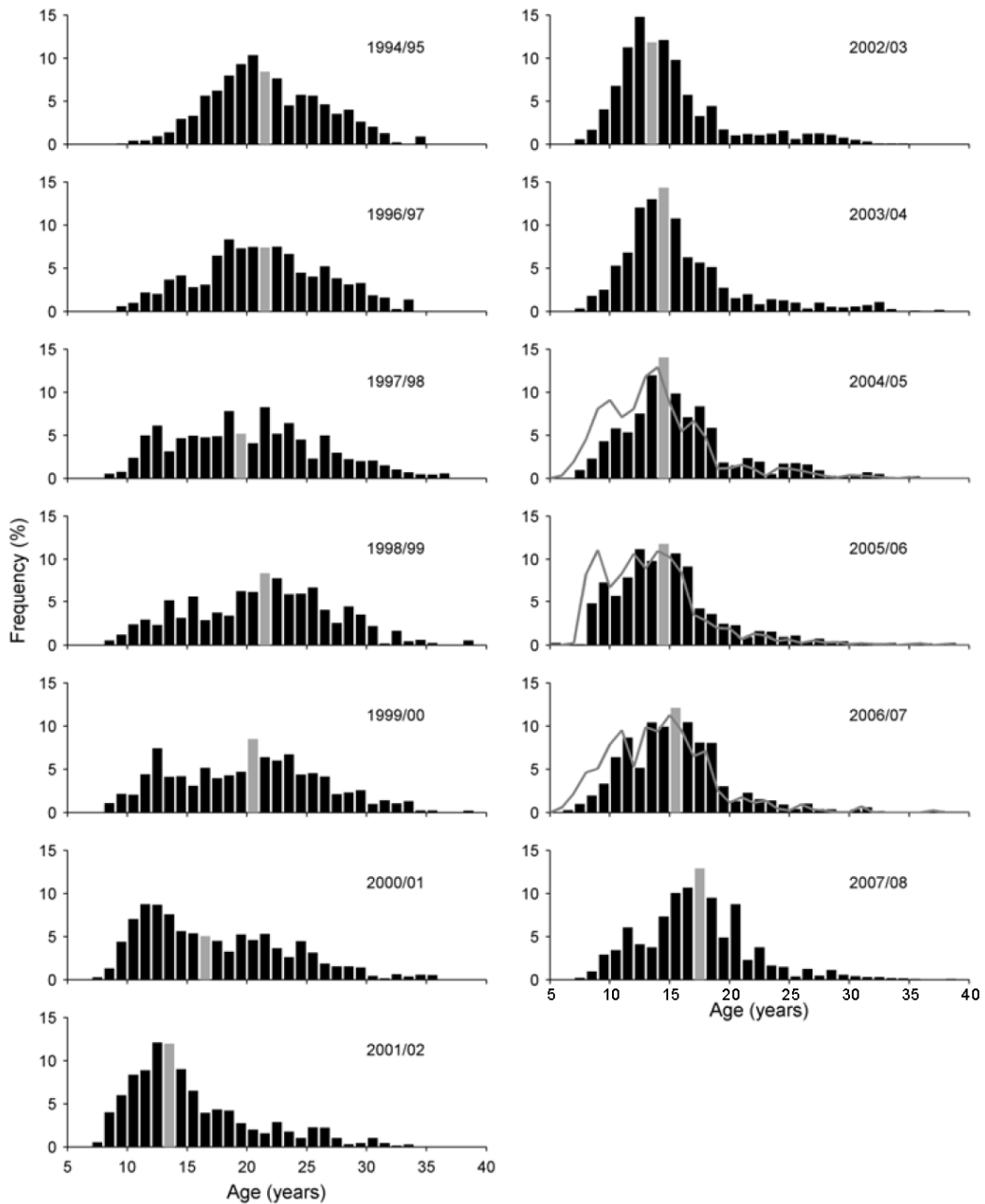


Figure 9: Age frequency distribution of SBT in the Indonesian catch on the spawning ground by spawning season estimated using age-length keys from our subsamples of aged fish and length frequency data obtained through the Indonesian monitoring program. The grey bar shows the median age class. For comparison, the age distribution of SBT caught south of the spawning ground (Processor A) is shown for the 2004/05, 2005/06 and 2006/07 seasons (grey line). Source: Farley et al. (2009).

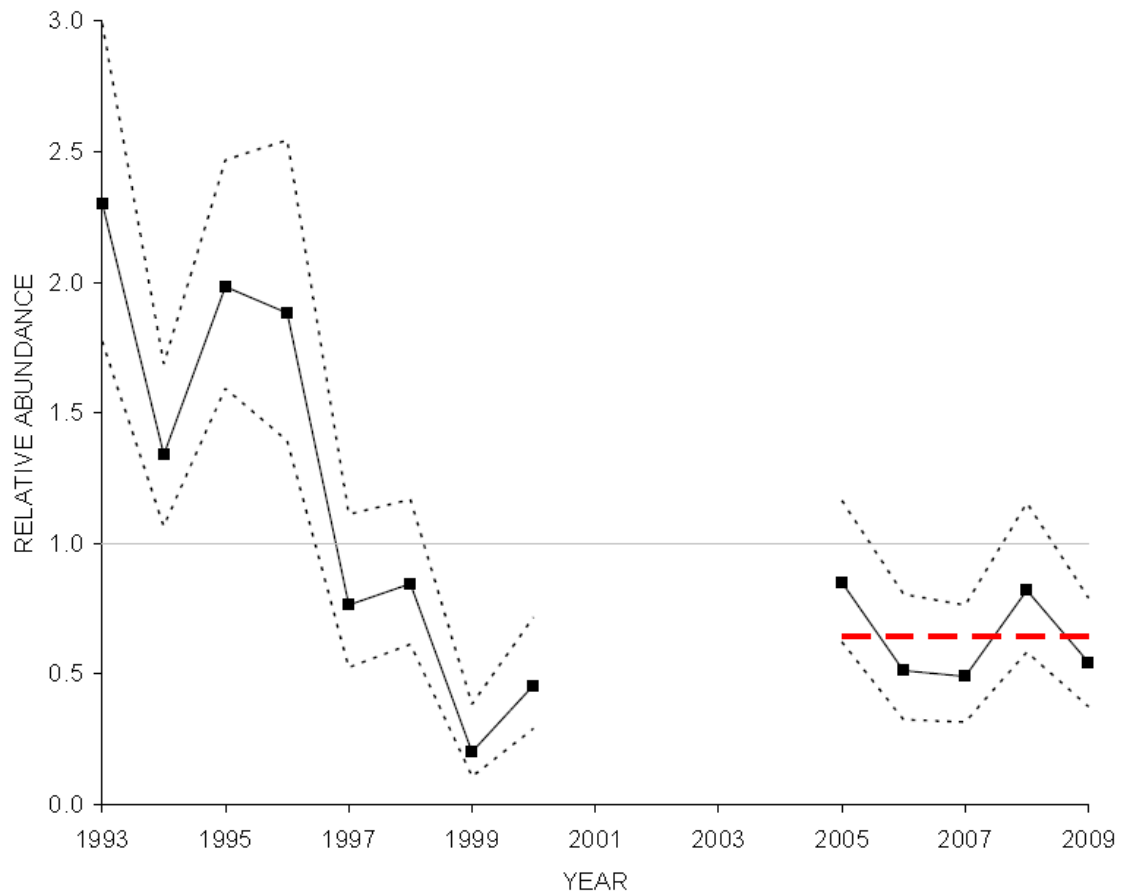


Figure10: Aerial survey index of relative abundance of juvenile SBT in the Great Australian Bight, Jan–Mar (hence the 2009 value represents the 2008–09 fishing season etc). Dotted lines are 90% confidence intervals. The horizontal line represents a relative abundance of 1.0; dashed horizontal line represents the average 2005–09 median value