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Report on Biology, Stock Status and Management of Southern Bluefin Tuna: 2011

The CCSBT Extended Scientific Committee conducted a review of fisheries indicators and updated the Operating Model results in 2011 to provide information on the stock status. 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 2010 are shown in Figures 1 - 3. However, a 2006 review of SBT data indicated that there may have been substantial under-reporting of SBT catches and surface fishery bias in the previous 10 - 20 year period and 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 817t 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 8000t, averaging about 20,000t, and the reported Pacific Ocean catch has ranged from about 800t to 19,000t, averaging about 5500t, over the same periods (although SBT data analyses indicate that these catches may be under-estimated).

3. Summary of Stock Status

The Extended Scientific Committee (ESC) advised that the current spawning stock biomass (SSB) remains very low (0.03-0.07 SSB_0); however, the outlook for the stock is positive.

However, there have been several positive recent signals about the outlook for the spawning stock. These include:

Stock

- Reduction in the total reported global catch
- Current fishing mortality reduced and now below F_{MSY} (see ESC Report Figure 2, and Figure 5)
- Confirmation of increases in longline CPUE since 2007.

Recruitment

- Increased scientific aerial survey and SAPUE indices (reflective of improved recruitment of recent year classes)
- Increased abundance of 1 year old SBT observed in the scientific aerial survey for the past three years, and the troll survey in the most recent year.

Recent recruitments (2005-2011) are estimated to be higher than previous conditioning and above the estimated stock-recruit curve, in contrast to the weak cohorts of 1999-2002 (see ESC Report Figure 1). These estimates are driven by both the recent increases in CPUE and the scientific aerial survey data. Nevertheless, it will be sometime before the recent stronger recruitments enter the spawning stock. Model results indicate that the SSB is likely to increase after 2012.

Increases in a number of CPUE indices in the most recent years, such as the New Zealand domestic fishery and Japanese longline fishery for age classes 4 and 5, suggest stronger year classes in recent years. Caution should nevertheless continue to be exercised in interpreting the longline CPUE data, where there is underlying uncertainty in the past data and potential changes in fishing operation patterns since 2006, which remains to be resolved.

The median constant catch projection under the current TAC (of 9449 t) for the base case show the interim rebuilding target of 0.2 SSB_0 being reached in 2024, and for the zero TAC case it is reached in 2020 (see ESC Report Figure 7). The faster than previously projected recovery of the future SSB is largely driven by the higher estimates of recruitment, CPUE and steepness. However, constant catch projections make no allowance for future conditions such as poor recruitments, and hence the ESC strongly recommended the adoption of an adaptive MP to properly deal with such circumstances.

The MP catch projections reach the interim rebuilding target of $0.2SSB_0$ with a 70% probability as specified by the tuning year. An earlier tuning year, lower maximum TAC change and no TAC increase in the first TAC setting period leads to faster rebuilding, lower catches and a lower probability of catch decreases in the short-term (see ESC Report Figures 8 & 9). Based on model results there is virtually no possibility of extinction of the stock under the recommended MP.

4. Current Management Measures

At its Seventeenth annual meeting, the CCSBT noted that the advice from the ESC indicated that stocks were still at a very low level (approximately 5% of the unfished spawning biomass) and that taking a precautionary approach was important. The meeting agreed that the current TAC allocation decided at CCSBT 16 was considered a 2 year total TAC, and could be distributed across the two year period, with unused catch from the first year carried forward to the second year The allocation of the TAC amongst Members and Cooperating Non-Members for the 2010 and 2011 fishing seasons is specified below (in tonnes). The meeting also agreed that there would be no carryover of unused quota from 2010/11 to 2012.

<u>Effective Catch Limit for the 2010 and 2011 fishing seasons</u>

<u>Members</u>

The “Nominal Catch” listed below is the catch before any reductions are applied, the “Allocated Catch” is the reduced catch allocated for 2010 and 2011 and the “Effective Catch Limit” is the effective catch after additional agreed voluntary reductions have been applied.

	Nominal Catch	Allocated Catch	Effective Catch Limit
Japan	5,665	2,261	2,261
Australia	5,665	4,270	4,015
Republic of Korea	1,140	859	859
Fishing Entity of Taiwan	1,140	859	859
New Zealand	1000	754	709
Indonesia	750	651	651

Cooperating Non-Members (for 2011)	
Philippines	45
South Africa	40
European Community	10

In addition to the reduced TAC, the CCSBT decided that it would work toward implementing a management procedure (MP) in 2011 and that the MP would be the basis for TAC setting in 2012 and beyond. An emergency rule will be developed as part of the MP for exceptional circumstances such as recruitment levels lower than historically low levels. Finally, the CCSBT has agreed to set a TAC of 5,000t-6,000t for the 2012 fishing season in the event that an MP cannot be finalised by 2012, unless the Extended Commission decides otherwise based upon the new stock assessment.

On 1 June 2000, the CCSBT 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 Vessel Monitoring System (VMS) came into effect immediately after the Fifteenth Annual Meeting of the Commission, on 17 October 2008. It requires CCSBT Members and Cooperating Non-Members to adopt and implement satellite-linked VMS for vessels fishing for SBT that complies with the IOTC, WCPFC, CCAMLR, or ICCAT VMS requirements according to the respective convention area in which the SBT fishing is being conducted. For fishing outside of these areas, the IOTC VMS requirements must be followed.

The CCSBT Transhipment monitoring program came into effect on 1 April 2009. The program applies to transhipments at sea from tuna longline fishing vessels with freezing capacity (referred to as “LSTLVs”). It requires, amongst other things, for carrier vessels that receive SBT transhipments at sea from LSTLVs to be authorised

to receive such transhipments and for a CCSBT observer to be on board the carrier vessel during the transhipment. The CCSBT transhipment program is harmonised and operated in conjunction with those of ICCAT and IOTC to avoid duplication of the same measures. ICCAT or IOTC observers on a transhipment vessel that is authorised to receive SBT are deemed to be CCSBT observers provided that the CCSBT standards are met.

The CCSBT Catch Documentation Scheme (CDS) came into effect on 1 January 2010 and replaces the existing TIS system. The CDS provides for tracking and validation of legitimate SBT product flow from catch to the point of first sale on domestic or export markets. As part of the CDS, all transhipments, landings of domestic product, exports, imports and re-exports of SBT must be accompanied by the appropriate CCSBT CDS Document(s), which will include a Catch Monitoring Form and possibly a Re-Export/Export After Landing of Domestic Product Form. Similarly, transfers of SBT into and between farms must be documented on either a Farm Stocking Form or a Farm Transfer Form as appropriate. In addition, each whole SBT that is transhipped, landed as domestic product, exported, imported or re-exported must have a uniquely numbered tag attached to it and the tag numbers of all SBT (together with other details) will be recorded on a Catch Tagging Form. Copies of all documents issued and received will be provided to the CCSBT Secretariat on a quarterly basis for compiling to an electronic database, analysis, identification of discrepancies, reconciliation and reporting.

5. Scientific Advice

The ESC recommended that the Management Procedure (MP) be adopted.

The Extended Commission was referred to Agenda Item 9 of the ESC report to differentiate MP behaviour under alternate MP criteria (tuning year, maximum TAC change and an increase in the initial TAC setting).

Based on the MP selected by the Extended Commission the following TACs were recommended (assuming a 1-year lag):

Tuning year	**Maximum TAC change (t)**	**Increase in initial TAC setting**	**Recommended TAC (t) (2013-2015)**
2035	3000	Yes	12449
2035	3000	No	9449
2035	5000	Yes	13983
2035	5000	No	9449
2040	3000	Yes	12449
2040	3000	No	9449
2030	3000	Yes	12449
2030	3000	No	9449

The ESC strongly advised that any future TAC changes should be considered in the context of an adaptive MP that reacts to the data inputs.

If a zero-lag is selected, the MP should be retuned, though differences in biomass and catch performance will be minor.

If the MP is implemented in 2011 with a 1-year lag, the ESC recommended that the current TAC of 9449 t remains for 2012 prior to implementation.

Under the MP options above there are only three possible TAC changes at the first implementation (0;+3000t;+4534t). The ESC advised the Extended Commission that it could have additional flexibility in the context of an MP by considering a smaller maximum TAC change for the first implementation only. This could be incorporated together with any of the TAC increase options listed in paragraph 128. This would require retuning of the MP prior to the Commission meeting.

Noting the importance of accurate data inputs for the performance of the MP, the ESC recommended that the Extended Commission continue to take steps to ensure accurate future catch and effort reporting.

6. Biological State and Trends

Analyses suggest the SBT spawning biomass is at a very low fraction of its original biomass 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. Catches at the current TAC are expected to achieve rebuilding.

Exploitation rate: Moderate (Below F_{MSY})
Exploitation state: Overexploited
Abundance level: Low abundance

SOUTHERN BLUEFIN TUNA SUMMARY (global stock)	
Maximum Sustainable Yield	34,500 t (31,100-36,500t)[1]
Reported (2010) Catch	9547 t
Current Replacement Yield	27,200 t (22,200–32,800 t)
Current (2011) Spawner Biomass	45,400 (31,022–72,700 t)
Current (2011) Depletion	0.055 (0.035–0.077)
Spawner Biomass (2011) Relative to SSB_{msy}	0.229 (0.146–0.320)
Fishing Mortality (2010) Relative to F_{msy}	0.76 (0.52–1.07)
Current Management Measures	Effective Catch Limit for Members and Cooperating Non-Members combined averaged 9449 t annually over 2010-2011.

[1]Median and range from lower 5th to upper 95th percentile of 320 models contained in the base case.

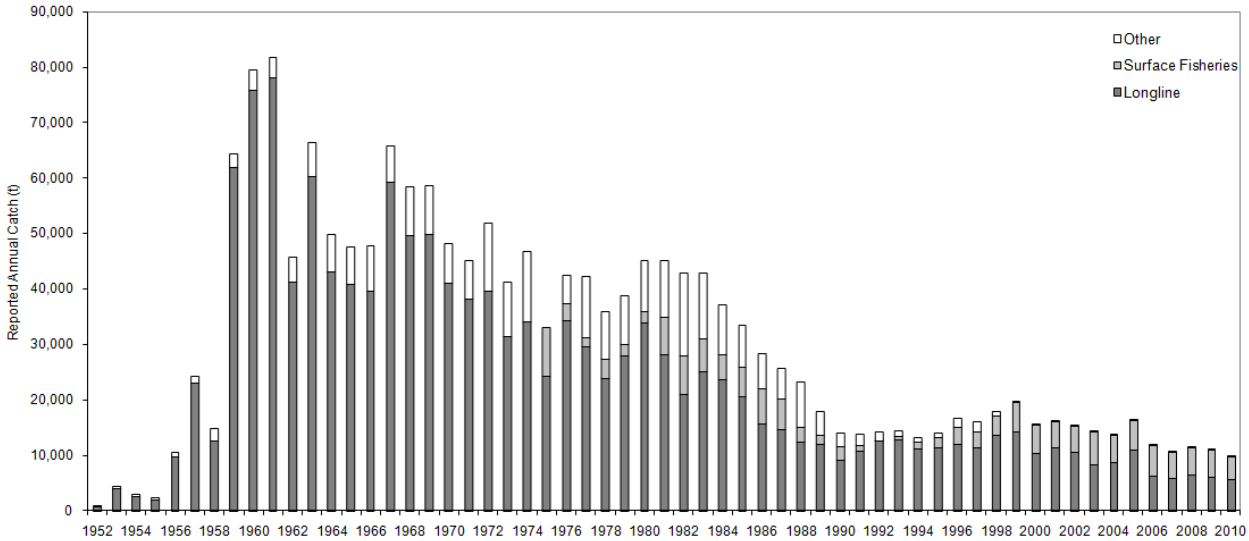

Figure 1: Reported southern bluefin tuna catches by fishing gear, 1952 to 2010. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

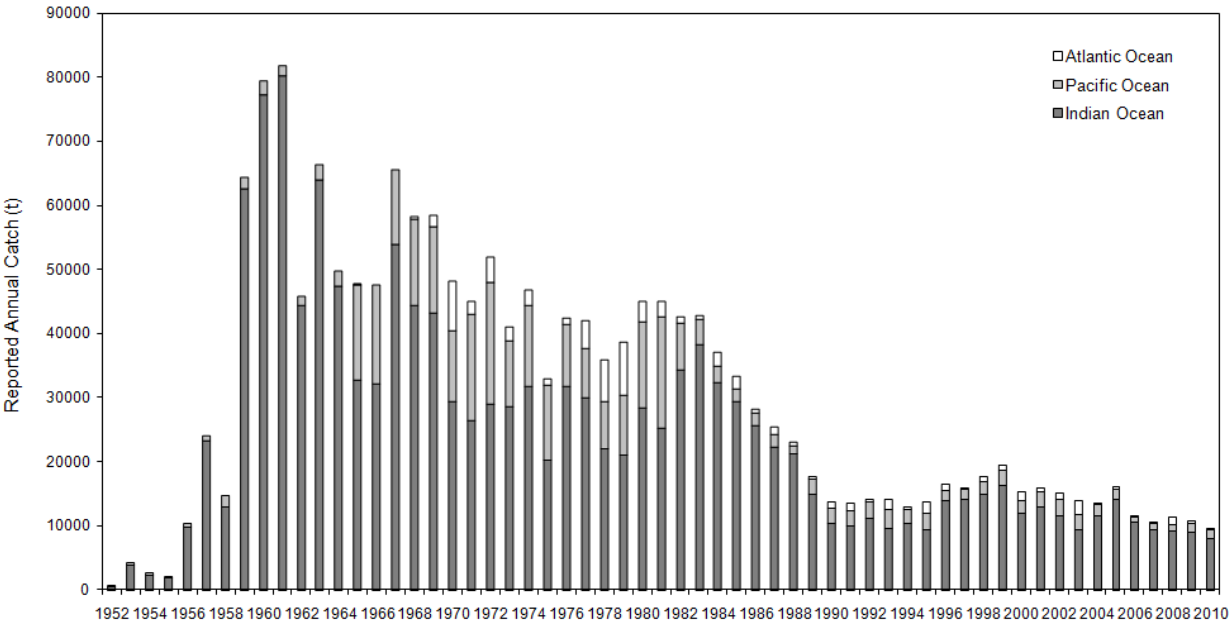

Figure 2: Reported southern bluefin tuna catches by ocean, 1952 to 2010. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

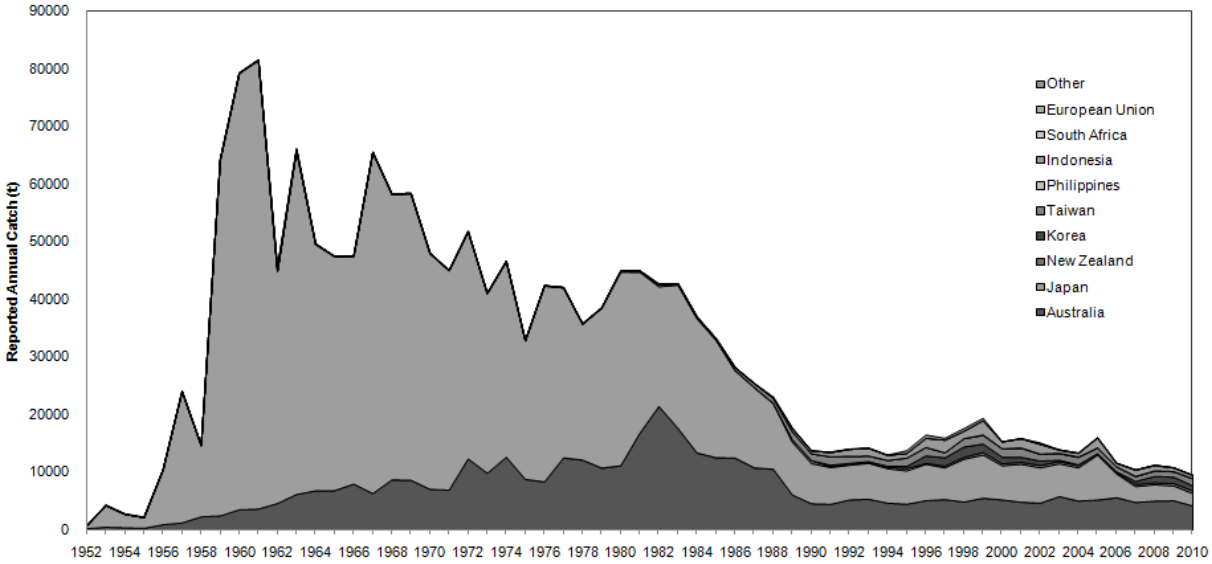

Figure 3: Reported southern bluefin tuna catches by flag, 1952 to 2010. Note: a 2006 review of SBT data indicated that catches over the past 10 to 20 years may have been substantially under-reported.

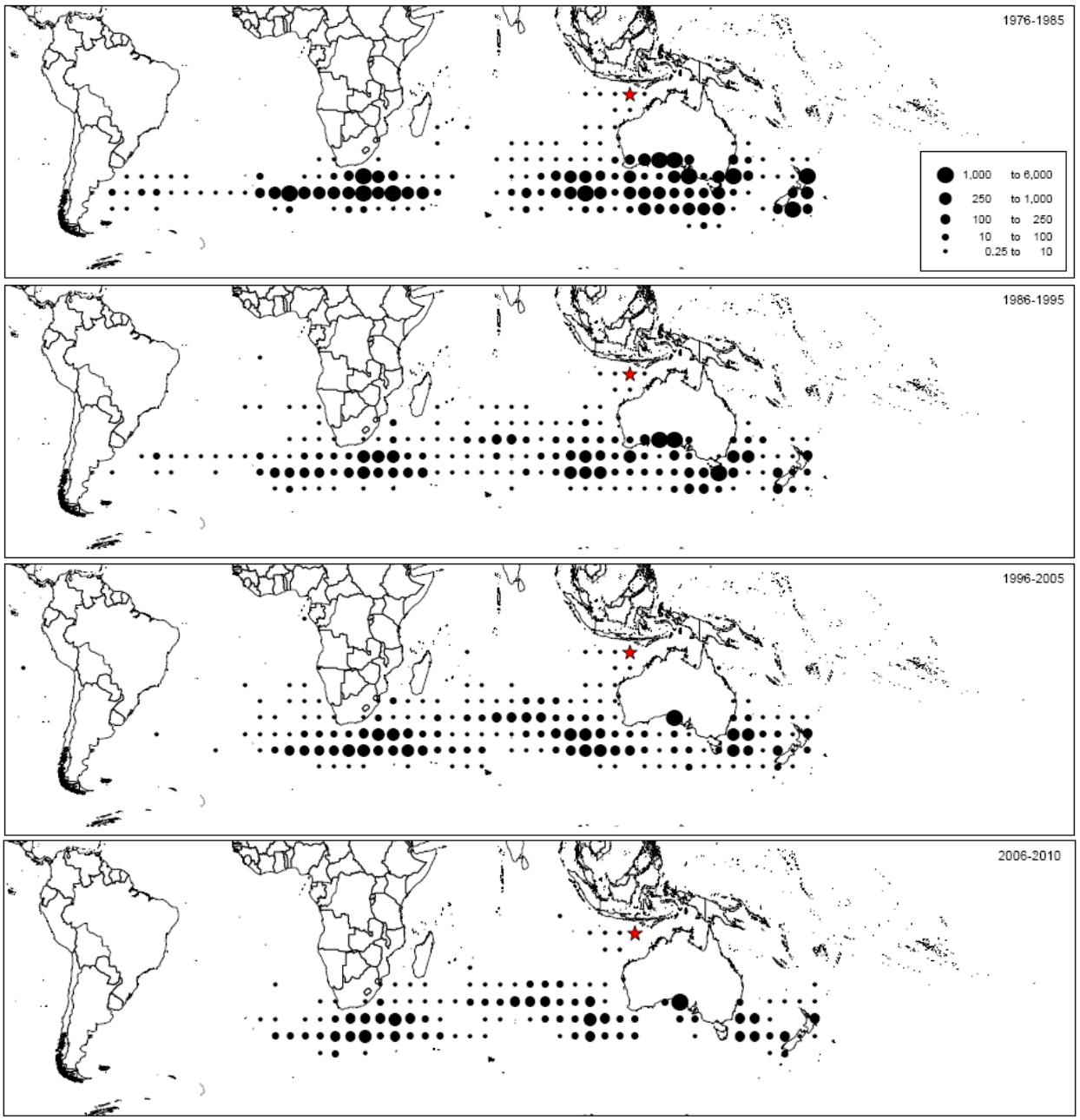

Figure 4: Geographical distribution of average annual southern bluefin tuna catches (t) by CCSBT members and cooperating non-members over the periods 1976-1985, 1986-1995, 1996-2005 and 2006-2010 per 5° block by oceanic region. The area marked with a star is an area of significant catch in the breeding 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.

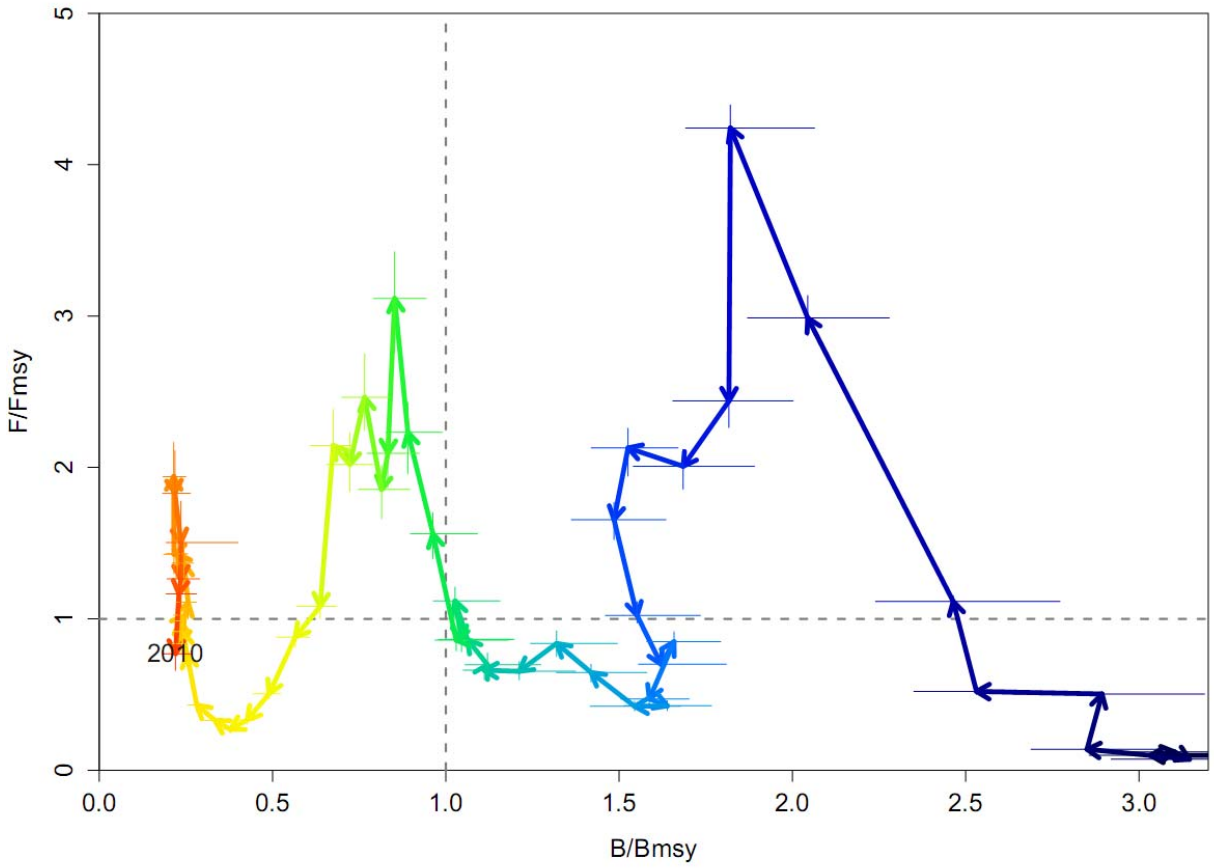

Figure 5. Time trajectory from 1952 to 2010 of median fishing mortality over the F_{msy} (for ages 2-15) versus spawning biomass (B) over B_{msy}. The fishing mortality rates are based on biomass-weighted values and the relative fishery catch composition and mean SBT body weights in each year. Vertical and horizontal lines represent 25^{th}-75^{th} percentiles from the operating model grid.