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iotc ctoi Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

Attachment 6

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

A stock assessment and review of fisheries indicators was conducted by the CCSBT Stock Assessment Group during 2004, results of which are summarized below. This report also updates description of fisheries and state of stock, and provides fishery and catch information

1. Biology

Southern bluefin tuna (*Thunnus maccoyii*) are found throughout the southern hemisphere, mainly in waters between 30° and 50° S, but only rarely in the eastern Pacific. The only known breeding 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 extend their distribution over the southern circumpolar area throughout the Pacific, Indian and Atlantic Oceans.

SBT can attain a length of over 2 m and a weight of over 200 kg. Direct ageing using otoliths indicates that a significant number of fish bigger than 160 cm 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). 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

Historically, the SBT stock has been exploited by Australian and Japanese fisheries for more than 50 years, with total catches peaking at 81,605 t in 1961 (Figure 1). The current (2003) total catch is about 14,024 t (preliminary data), continuing a declining trend in total catches from a recent peak of 19,529 t in 1999, 16,026 t in 2001 and 15,212 t in 2002. Over the period 1952 - 2003, 79% of the catch has been made by longline and 21% using surface gears, primarily purse-seine and pole&line (Figure 1). The proportion of 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. (Table 1 and Figure 1). The Japanese longline fishery (taking older fish) recorded its peak catch of 77,927 t in 1961 and the Australian surface fishery catches of young fish peaked at 21,501 t in 1982 (Figure 3). New Zealand, Fishing Entity of Taiwan and Indonesia have also exploited southern bluefin tuna since the 1970s - 1980s, and Korea started a fishery in 1991.

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 Atlantic Ocean catch has varied widely between 400 and 8,200 t since 1968 (Table 1 and Figure 2), averaging about 1,000 t over the past two decades, and 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).

3. Summary of Stock Status

SBT assessments were updated at the 5th meeting of the CCSBT Stock Assessment Group in Korea in 2004. Current assessments suggest the SBT spawning biomass is at a low fraction of its original biomass, and well below the 1980 biomass. The stock is estimated to be well below the level that produces 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 over the period 1950-1980. Assessments estimate stable recruitment in the 1990's but very low recruitments in 1999 or 2000. Analyses of fishery indicators provide evidence of a markedly lower recruitment from 1999-2001. Indicators also show that the Indonesia LL fishery on spawning fish catches fewer older individuals. One plausible interpretation is that the spawning stock has declined in average age and may have declined significantly in abundance. This is in contrast to assessment model results that the spawning stock has been largely stable over the last decade and increased slightly over the last 4 years.

Projections with 15,000 t annual catch provide highly variable results depending upon assessment assumptions and suggest the stock is more likely to decline with the CCSBT MP Conditioning Model (an integrated statistical assessment model used in testing management procedures), while ADAPT shows roughly equal probability of decline or increase. Given all the evidence, the probability of further stock decline under current catch levels is now judged to be greater than in 2001, when an increase or decline under current catches were considered equally likely.

4. Current Management Measures

SBT have been 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 38,650 t for the 1984 - 1985 season. The combined quota for these three countries was maintained at 11,750t from the 1989 -1990 through to 2002-2003. Following increase in membership of the CCSBT (Korea, and the Fishing Entity of Taiwan joined in 2001 and 2002 respectively), the CCSBT agreed to the following national catch limits for 2003-2004:

Japan	6,065 tons
Australia	5,265 tons
Republic of Korea	1,140 tons
Fishing Entity of Taiwan	1,140 tons
New Zealand	420 tons

Total 14,030 tons

An additional catch limit of 900 tonnes has also been implemented for cooperating non-members, including 50 tons for the Philippines (which was recently admitted as a cooperating non-member) and 800 tonnes for Indonesia.

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 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 the member countries. 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 will include vessels from CCSBT members and cooperating non-members. Members and cooperating non-members are required to refuse the import of SBT caught by large scale fishing vessels not on the list.

SOUTHERN BLUEFIN TUNA SUMMARY
(global stock)

Maximum Sustainable Yield	Not estimated
Current (2002) Yield	14,024 t (preliminary)
Current Replacement Yield	Less than 16,000 t
Relative Biomass	SSB_{2004}/SSB_{1980} 0.14 - 0.59
	SSB_{2004} / SSB_{K} 0.03 - 0.14
Current Management Measures	Global quota of 14,030 t (Australia, Chinese-Taipei, Korea, Japan, and New Zealand)
	900 t provision for cooperating non-members

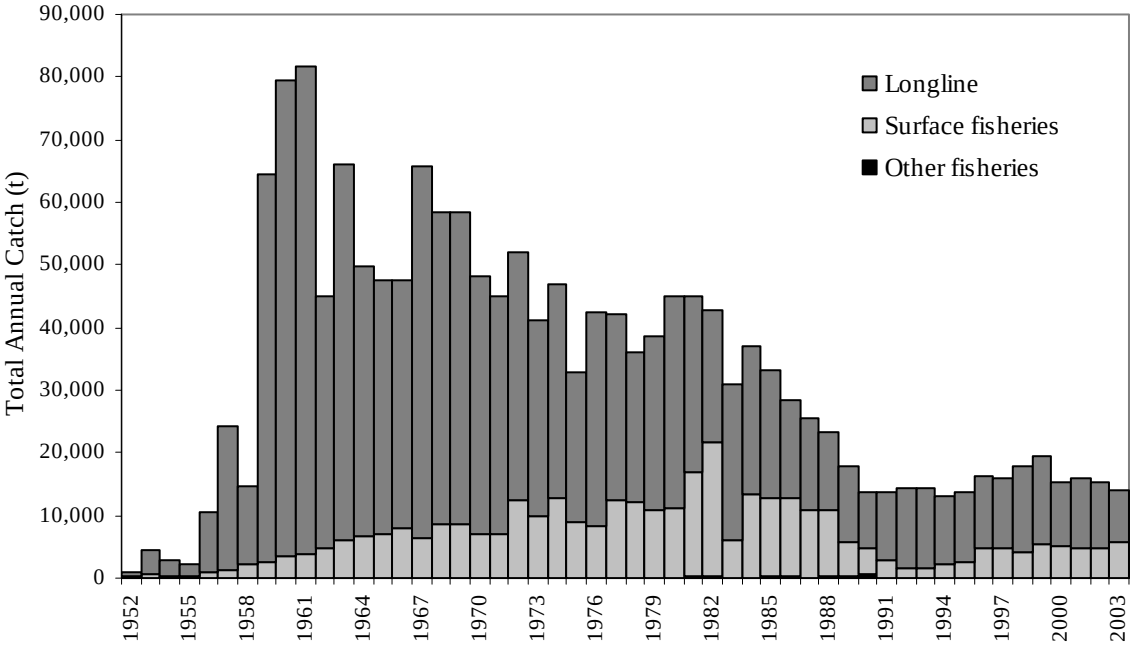

Figure 1. Global southern bluefin tuna catches by fishing gear (t), 1952 to 2003.

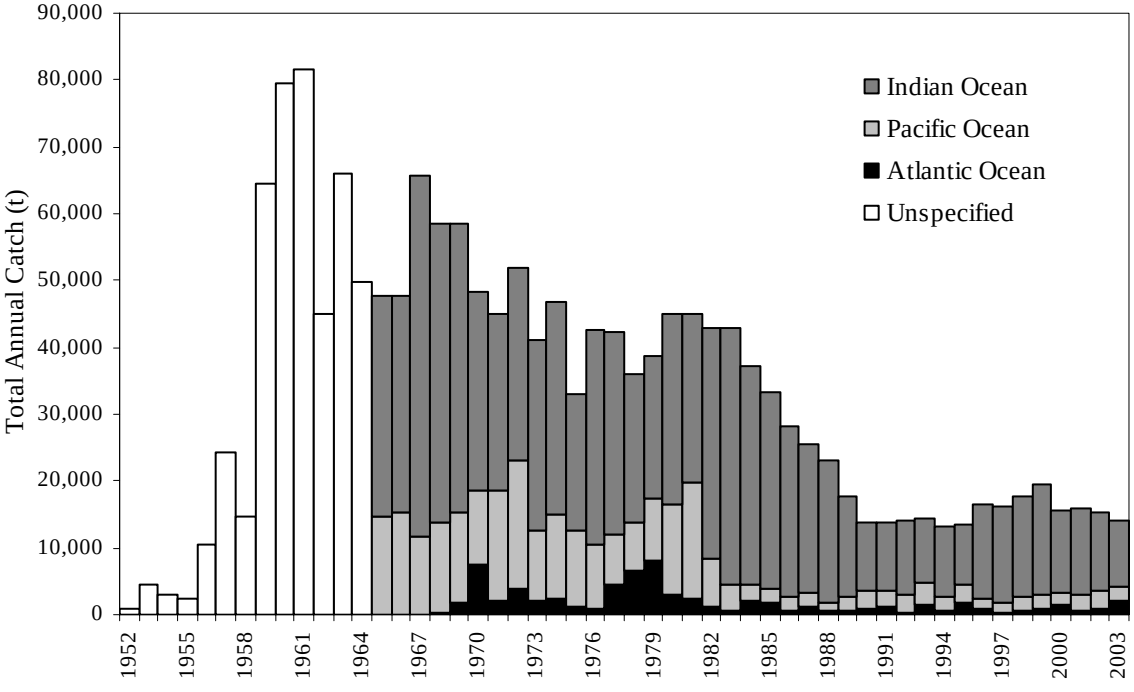

Figure 2. Southern bluefin tuna catches by ocean (t), 1952 to 2003.

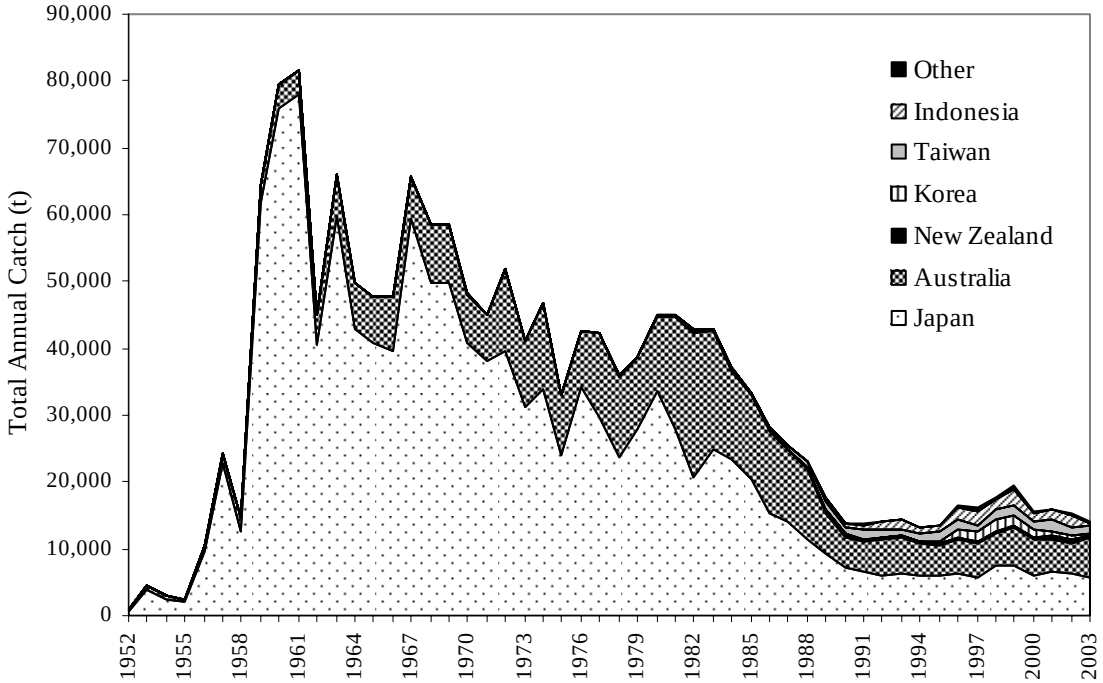

Figure 3. Total annual southern bluefin tuna catch (t) by flag, 1952 - 2003.

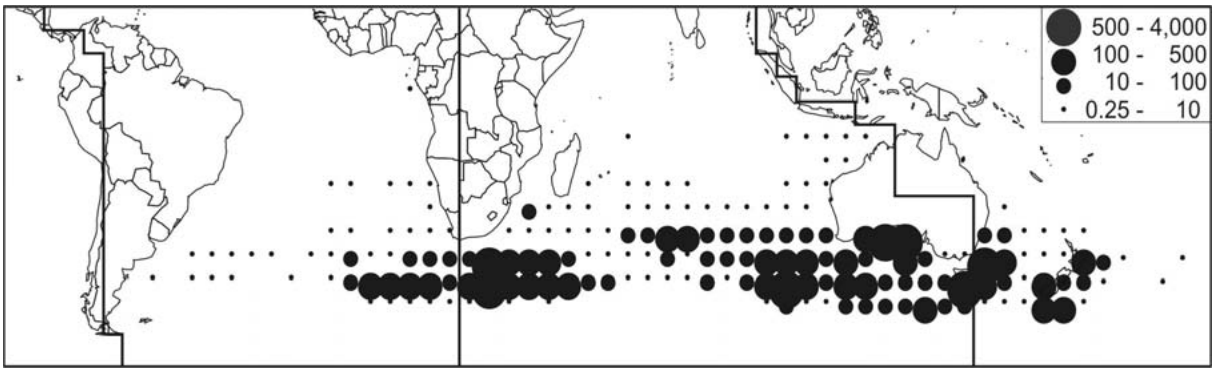

Figure 4. Geographical distribution of average annual southern bluefin tuna catches (t) by CCSBT members from 1983 to 2003 per 5° block by oceanic region. Block catches of less than 0.25 tons are not shown. Oceanic region divisions used in dividing the data for Figure 2 are shown.

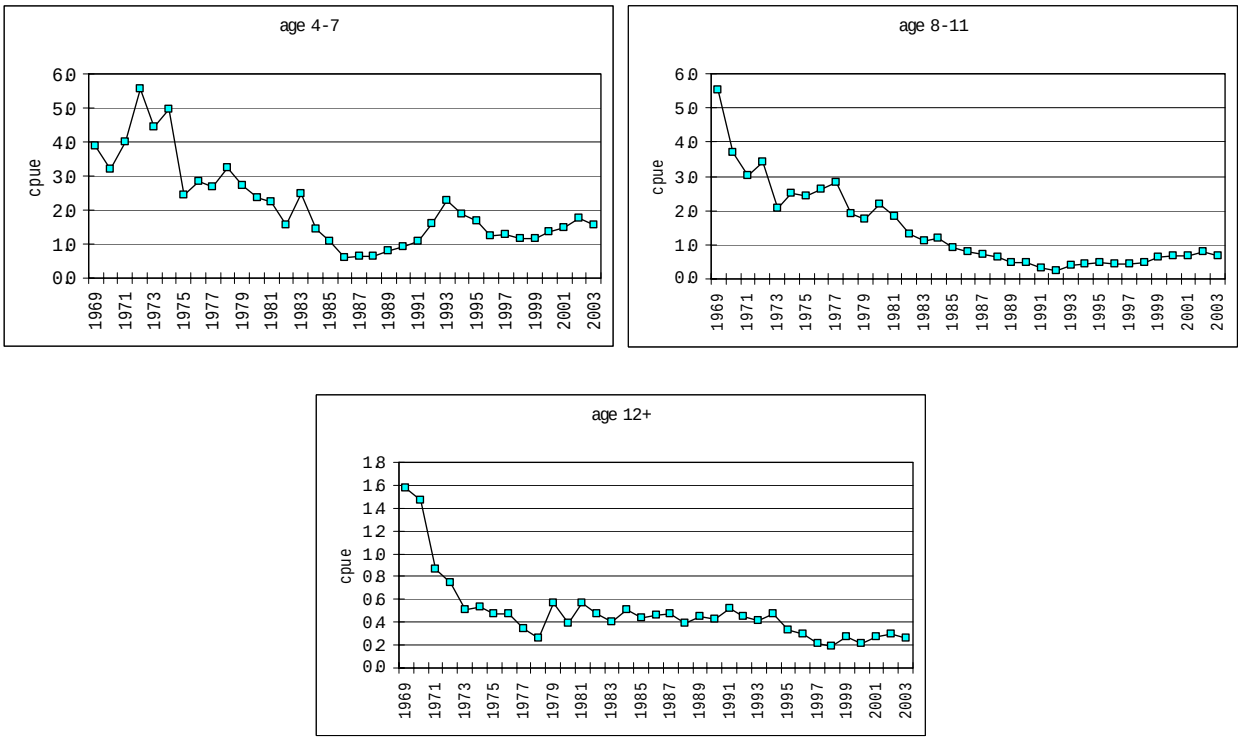

Figure 5. Trends in nominal catch rates of juvenile (age 4-7), maturing (age 8 - 11) and mature (age 12+) SBT (numbers per 1000 hooks) caught by Japanese longliners operating in CCSBT statistical areas 4-9 in months 4-9.

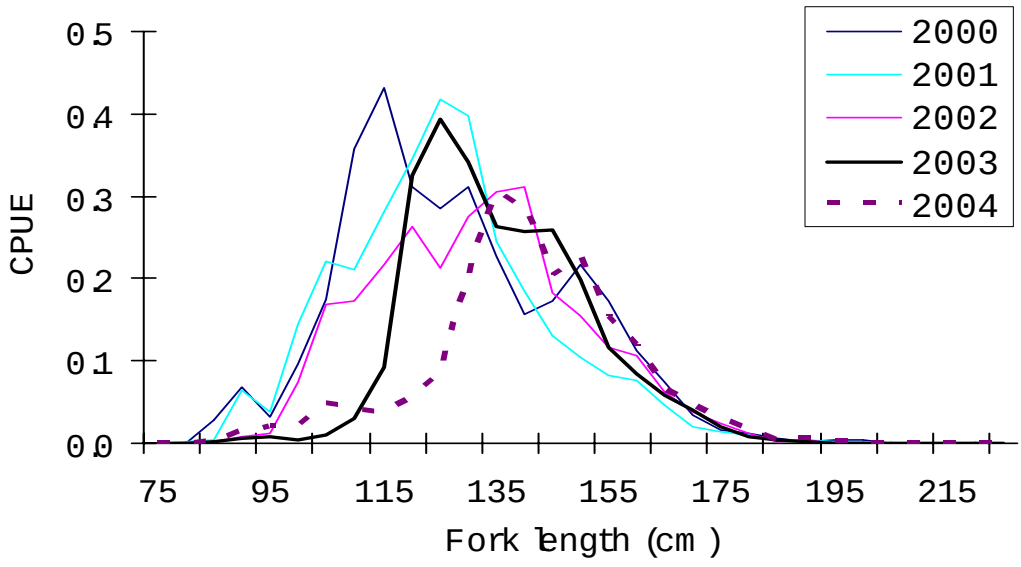

Figure 6. Changes in size composition of nominal CPUE in June in CCSBT Statistical area 4 from Japanese Real Time Monitoring Program data from 2000-2005.

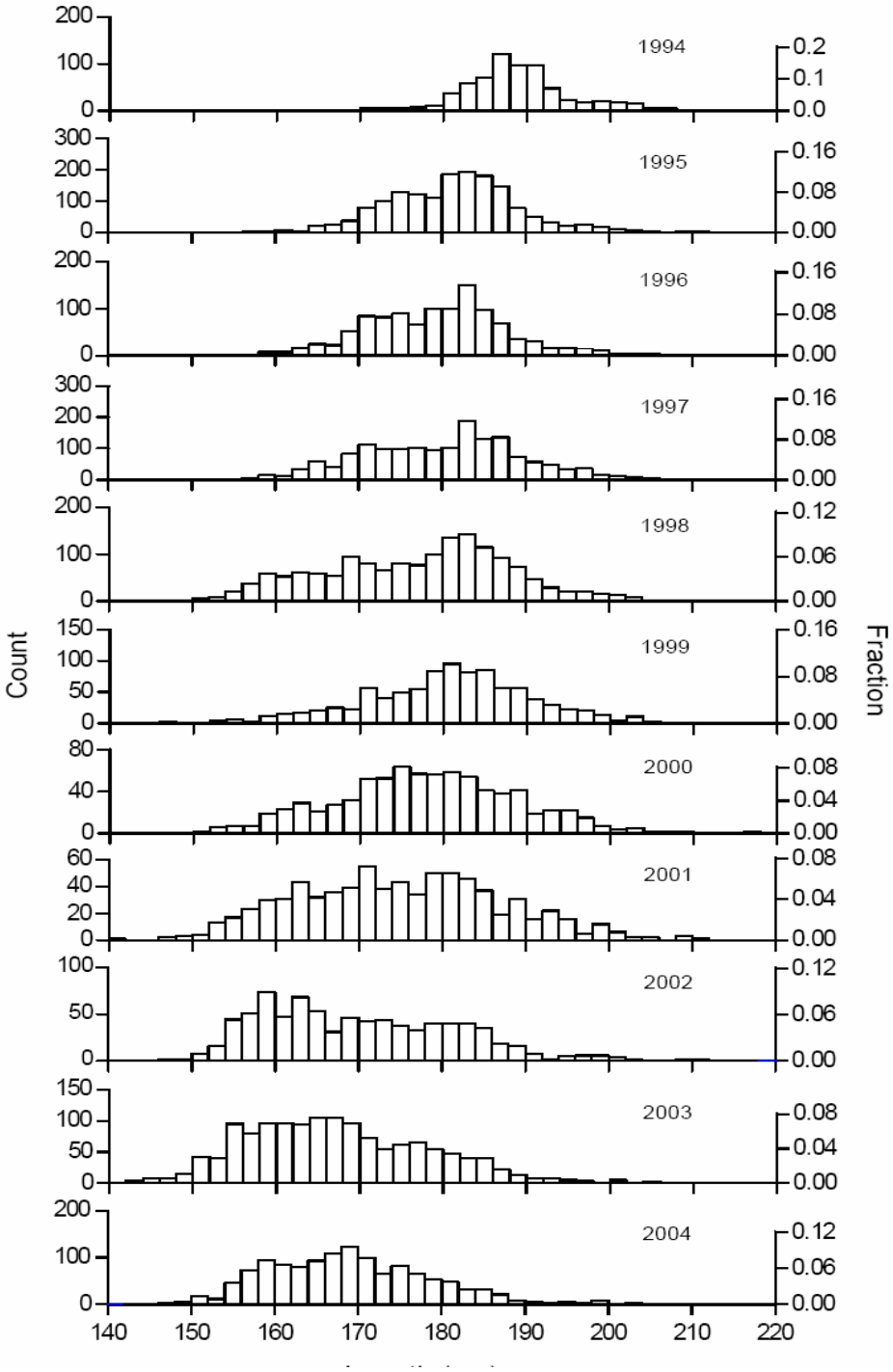

Figure 7. Length frequency (in 2 cm intervals) of Indonesian SBT catches during the spawning season (July 1 of the previous year to June 30 of the given year).

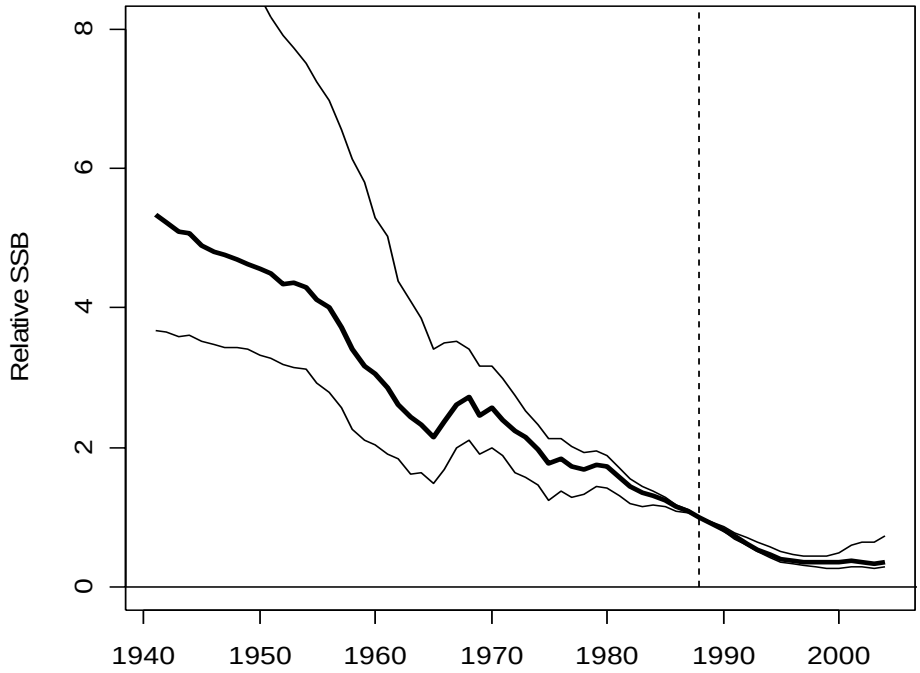

Figure 8. SBT biomass trends (5th, Median and 95th percentiles) from one of the assessments presented at the CCSBT 5th Stock Assessment Group meeting (based on the CCSBT MP Conditioning Model), expressed relative to 1988 (indicated by the dashed line).

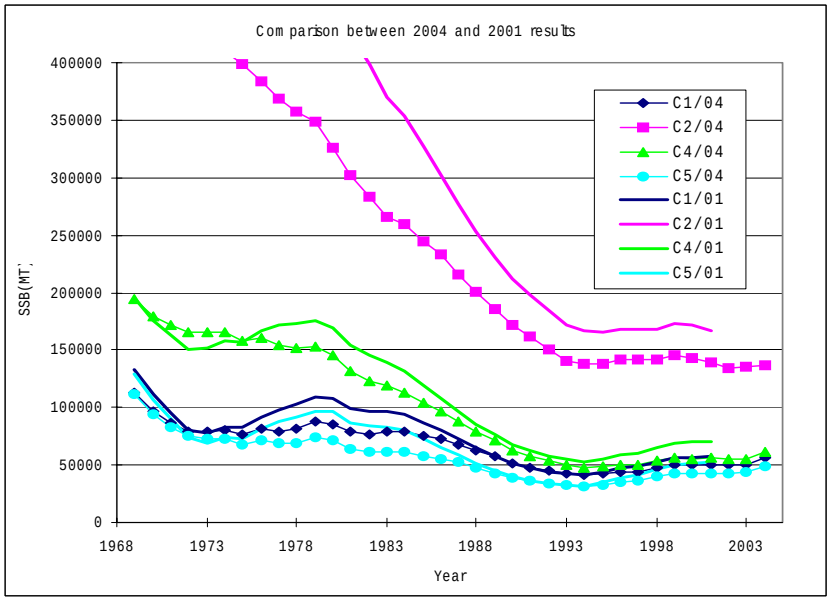

Figure 9: SBT spawner biomass trajectories from another of the assessments presented at the CCSBT 5th Stock Assessment Group meeting (ADAPT VPA) estimates of SSB for different assessment year (2004 and 2001) and plus group options (C1, C2, C4, and C5). (2004 results with markers and 2001 results without markers.)

Table 1. Atlantic Ocean, Indian Ocean, Pacific Ocean and global southern bluefin tuna catch (t) by gear, area and flag.

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
ATLANTIC TOTAL	604	2082	1828	650	1330	602	513	1004	1313	300	1612	483	1845	1040	278	738	819	1470	640	1041	2078
- CATCH BY GEAR																					
Longline	604	2082	1828	650	1330	602	513	1004	1313	300	1612	483	1845	1040	278	738	819	1470	640	1041	2078
- CATCH BY FLAG																					
Japan	573	2082	1733	434	1228	573	493	987	1080	253	1425	420	1237	1015	189	649	689	1203	327	909	1992
Korea	0	0	0	0	0	0	0	0	0	0	80	7	24	0	0	47	100	242	90	116	0
Taiwan	30	1	95	216	102	28	19	17	233	46	108	56	584	24	89	42	30	24	223	16	86
INDIAN TOTAL	38315	32492	29520	25735	22379	21354	15020	10400	10109	11329	9631	10430	9264	13812	14160	15137	16405	12084	13072	11571	9717
- CATCH BY GEAR																					
Longline	21522	19192	16864	13165	11489	10530	9281	5781	7146	9664	8077	8319	6629	9064	9343	10942	11059	6953	8304	6887	3931
Purse Seine	5083	4339	5179	6342	5411	2820	1626	2511	1034	22	536	1269	1840	3099	2991	3555	5325	5132	4767	4683	5787
Pole and Line	11698	8960	7410	6147	5393	7770	3794	1803	1823	1639	1018	841	795	1649	1826	640	22	0	0	0	0
Gill Net	12	0	67	81	87	234	319	305	107	3	0	0	0	0	0	0	0	0	0	0	0
- CATCH BY FLAG																					
Australia	16781	13299	12589	12489	10805	10590	5438	4335	3876	4568	4513	4246	3362	4893	4910	4353	5448	5147	4792	4693	5808
Japan	21391	18935	16780	12938	10946	9754	7536	4383	4137	4238	2869	4132	3684	4248	4500	5838	5126	3370	4453	3153	1949
Korea	0	0	0	0	0	0	0	0	15	41	12	130	341	1320	1424	1749	1361	893	754	630	254
Taiwan	131	243	146	298	608	828	1376	1160	1227	1176	850	963	848	1442	783	1397	1483	1424	1357	1121	1041
Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	80	17	43	79	65
Indonesia	5	11	3	7	14	180	568	517	759	1232	1370	904	829	1614	2210	1324	2504	1203	1632	1691	555
Other	7	3	2	3	7	2	103	4	97	73	17	54	201	295	333	471	403	31	41	203	45
PACIFIC TOTAL	3963	2516	1977	1934	1866	1189	2310	2466	2269	2588	3101	2241	2528	1504	1638	1901	2304	1917	2314	2601	2229
- CATCH BY GEAR																					
Longline	2916	2312	1883	1810	1791	1095	2157	2183	2233	2503	3082	2234	2505	1460	1579	1857	2300	1917	2314	2601	2228
Purse Seine	790	105	0	34	0	0	0	0	0	0	0	0	0	22	7	29	0	0	0	0	0
Pole and Line	125	6	0	8	16	0	13	0	0	33	0	3	0	10	16	0	0	0	0	0	0
Troll	0	0	0	0	0	0	31	21	1	4	0	0	8	3	31	13	3	1	0	1	0
Handline	132	93	94	82	59	94	109	263	35	48	20	4	15	8	5	2	2	0	0	0	0
- CATCH BY FLAG																					
Australia	914	112	0	42	16	1	680	251	613	680	860	454	1145	236	406	543	104	110	61	19	14
Japan	2916	2312	1883	1810	1791	1095	1193	1686	1260	1630	2024	1510	946	1129	898	1013	1740	1427	1894	2130	1821
New Zealand	132	93	94	82	59	94	437	529	164	279	217	277	436	139	334	337	461	380	358	450	389
Korea	0	0	0	0	0	0	0	0	232	0	0	0	0	0	0	0	0	0	1	0	0
Taiwan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	2
Philippines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3
GLOBAL TOTAL	42881	37090	33325	28319	25575	23145	17843	13870	13691	14217	14344	13154	13637	16356	16076	17776	19529	15472	16026	15212	14024

Catches for 2002 and 2003 are preliminary. Catches for Indonesia, the "other" flags, and for gear not listed below (e.g. minor line) have been assigned to the longline category.

Catches have been assigned to the Indian Ocean where location information was not available. This includes catches from Indonesia, Other, Philippines (pre-2000 only), Taiwan (pre-1981 only).

Source: CCSBT Database and Report of the Ninth Meeting of the CCSBT Scientific Committee.