



**THE CATCH OF SBT BY THE INDONESIAN LONGLINE FISHERY
OPERATING OUT OF BENOA, BALI IN 2002**

T.L.O. Davis
R. Andamari

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ABSTRACT

This paper provides estimated catches of SBT by the longline fishery operating out of Benoa for the 2002 year and the 2001/2002 SBT spawning season. In 2002 there was a transition from CSIRO/RIMF monitoring which ended in June 2002 and the IOTC protocol monitoring which started in July 2002. Due to low monitoring coverage in February-April 2002, months when SBT are usually caught, there is a risk that the estimated catches may be unreliable. As a consequence we present alternate estimates where we substitute mean catches for these months based on all years of monitoring (1993-2001).

A comparison of IOTC raising based on vessel activity and CSIRO/RIMF raising based on Dinas export data for July-December 2002 indicates that both produce very similar results with vessel activity giving slightly higher estimates in most months. However, there are large differences in December when vessel activity produces an estimate landing 45% higher than that by Dinas export. Estimated annual catches using both raises are presented.

The annual catch of SBT in 2002 was estimated to be 1,631 tonnes when all months were raised by Dinas export data, and 1,730 tonnes if July-December 2002 landings were raised by vessel activity. If we substitute the mean catches for 1993-2001 for those months where monitoring coverage was inadequate (February-April 2002), the adjusted estimated annual catch in 2002 was 1,213 tonnes using Dinas export raising, and 1,312 tonnes using combined Dinas export and vessel activity raising.

In the 2001/2002 spawning season the estimated catch of SBT was 2,126 tonnes, although the same caveats regarding inadequate coverage in February-April 2002 apply. If we substitute the 1993-2001 mean estimates for these months, then the catch for the 2001/2002 spawning season was 1,741 tonnes.

1. Introduction

A collaborative research program between the CSIRO Division of Marine Research and the Research Institute of Marine Fisheries of Indonesia (RIMF) was set up in August 1992 to monitor the catch of southern bluefin (SBT) caught by longline fisheries operating out of Indonesia. SBT spawn in the north-east Indian Ocean, and are caught by Indonesian-based longline boats targeting yellowfin and bigeye tuna south of Java and the Lesser Sunda Islands.

Monitoring of the Benoa longline fishery ran into problems in 1999 because of reduced coverage and the inability to expand monitoring to newly formed processing companies without greatly increasing the number of enumerators employed by the project. In response, an expanded monitoring was developed to address issues of coverage and representativeness of monitored landings. This started in June 2002 with support from ACIAR, AFFA and IOTC (through OFCF). The objective was to obtain 30% coverage of landings processed at all processors. As a consequence 2002 was a transitional year where the CSIRO/RIMF monitoring ended in June 2002 and the IOTC protocol monitoring started in July 2002. This report presents estimated catches of SBT over the 2002 year and the 2001/2002 spawning season. The

monitored landings were raised by the method used in previous years by CSIRO/RIMF to estimate total catch in 2002, and estimates were compared in July to December 2002 with those used by the new IOTC raising method.

2. Data Collected At Processing Rooms

Information on the composition of the tuna catch is obtained from the buyers who are set up in the processing room when the tuna are processed. They weigh each dressed fish (GGT) and record the weight, species and export status of individual fish. This information is obtained by the enumerator. Under the CSIRO/RIMF monitoring scheme these data were aggregated by species (except SBT where data on individuals was retained) and the data was sent to Jakarta and entered on a MS Access database at RIMF.

The IOTC catch monitoring was implemented in 2002 and was fully operational in Benoa by July 2002. At this point in time the CSIRO/RIMF monitoring scheme was abandoned and the six new enumerators followed the IOTC protocols. The site that was continuously monitored at SSU by the “old” system became one of the fourteen processing sites that were monitored. PSB vessels were only monitored as part of the proportional monitoring of vessel landings at all processors. Thus 2002 was a transitional year. The first half of the year (the last half of the 2001-2002 spawning season) was monitored under the CSIRO/RIMF system and the second half (the first half of the 2002-2003 spawning season) was monitored under the IOTC system.

In addition to the IOTC monitoring there was additional targeted monitoring of landings that were known to have SBT in them in order to boost the number of length measurements and opportunities to collect otoliths. These landings were not included in the IOTC WinTuna database, but all length data collected on SBT from the IOTC monitoring and the targeted sampling were added to the CSIRO/RIMF database for biological studies.

3. Raising to the Total Bali Landings

The original raising method based on Dinas export data was used to raise monitored landings to estimated total catch. It has been assumed that the fresh and frozen whole tuna categories aggregated by Dinas, correspond to the export category of tunas recorded at the processing rooms by the enumerators. As all PSB vessel landings were recorded and these caught less SBT than other vessels due to bigeye targeting, these data were excluded from raising and added after the remaining monitored catch was raised. Under the IOTC monitoring protocol, sampled landings were raised by vessel activity. The names of fishing vessels landing tuna for processing were recorded by WASKI and the proportion of these vessels that were sampled during the monitoring were used to raise to the total Bali landings. As the landings of PSB vessels were sampled in proportion to other vessels under the IOTC monitoring protocol, they were not treated separately when raising catches.

4. Results

4.1. Monitoring Coverage

The estimated coverage of landings for the 2002 and 2001/2002 spawning season are presented in Table 1. Due to a major reduction in tuna processing at the SSU site monitored by CSIRO/RIMF after January 2002, and prior to the establishment of enumerators to cover all sites in June 2002, there were clearly major problems in coverage during February to April 2002, months when SBT are usually caught. So for those months, it is likely that catches have been very poorly estimated and should be used with caution. It is clear that from July onwards, with the implementation of the IOTC monitoring protocol, there has been adequate coverage of the fishery

A comparison of IOTC raising factors based on vessel activity and CSIRO/RIMF raising factors based on Dinas export data have been presented in Table 2 for July – December 2002, along with total SBT catches estimated using these raising factors. It is apparent that raising by vessel activity gives very similar results to raising by Dinas export. Generally, vessel activity gives slightly higher estimates than raising by Dinas export. However, there are large differences in December when vessel activity gives an estimate landing 45% higher than that by Dinas export.

4.2. Estimated Annual Catches

The estimated monthly catches of tuna and billfish landed in Bena in 2002, raised using Dinas export data, have been presented in Table 3. The estimates were raised by Dinas export to provide continuity in estimation for the time series, and also to use the more conservative estimated catch for December 2002 (113 tonnes rather than 164 tonnes if the IOTC raising were used). This indicated that 1,631 tonnes of SBT were landed in Bali in 2002. Using vessel activity (IOTC method) to raise the catch for July-December 2002 provides an estimated total catch of SBT in 2002 of 1,730 tonnes.

The estimated annual catch for the years 1993-2002 of tunas and billfish are shown in Table 4 and the three main tuna species have been plotted in Figure 1. The annual estimate for SBT is about 200 tonnes higher than in 2001 and the percentage of SBT in catches has risen slightly from the previous year (5.5 to 6.1%). The annual catch of bigeye has also increased whereas the catch of yellowfin tuna has dropped.

Because of the small proportion of landings monitored in February to April (Table 1), it is necessary to question the likelihood of the size of the estimated landings in those months. The mean monthly estimated catch from 1993 to 2001 was 178, 115 and 64 tonnes, whereas the estimates in 2002 were 500, 199 and 76 tonnes, respectively. This would suggest that catches for these months might have been overestimated by about 400 tonnes. If they were, then if we substitute the mean estimates for those months then the adjusted estimated annual catch in 2002 would be closer to about 1,213 tonnes using Dinas export raising, and 1,312 tonnes using combined Dinas export and IOTC raising for the appropriate periods.

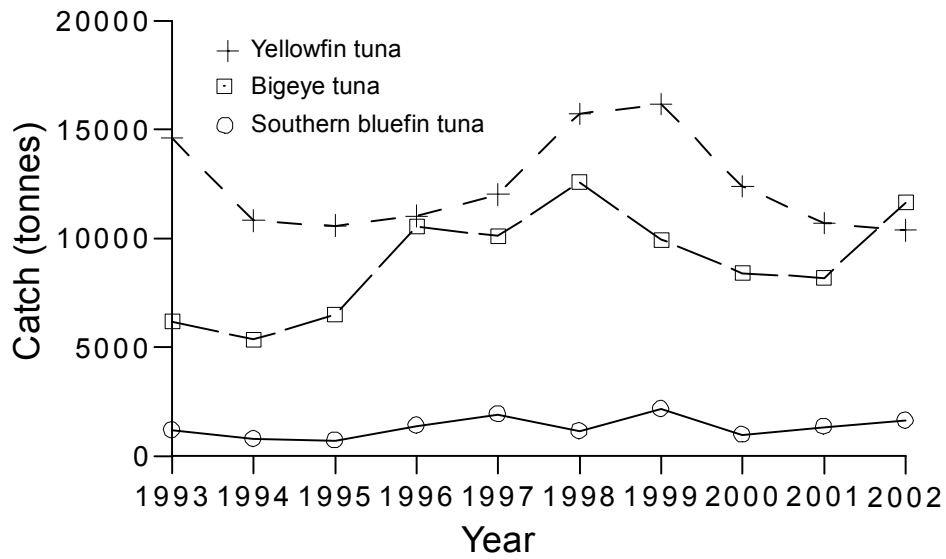


Figure 1. Estimated landings of southern bluefin, bigeye and yellowfin tuna at Bena for the years 1993 to 2002.

4.2. Estimated Catches by Spawning Season

The estimated catches of SBT by spawning season (Table 5) indicate that the 2001/2002 spawning season estimate is much higher than in the previous season (by about 1000 tonnes). The same caveats apply to this estimate as to the 2002 estimate due to very low monitoring coverage in February-April 2002. If we substitute the 1993-2001 mean estimates for the months of February-April 2002, then the catch for the 2001/2002 spawning season is 1,741 tonnes rather than 2,126 tonnes.

Table 1. Details of data used to calculate raising factor in 2002. All weights in tonnes dressed. Dinas export includes whole fresh and frozen tuna. Data under old CSIRO/RIMF monitoring not collected at PSB after March. Under IOTC/CSIRO joint monitoring from July onwards, landings by PSB vessels were not treated separately as a representative proportion of their landings were monitored.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dinas export – monitored PSB export	1339.44	1696.72	1580.78	1311.04	734.96	1028.98	1193.17	942.15	904.24	990.51	893.43	923.60
Monitored non-PSB export tuna	106.82	45.26	29.50	18.10	17.37	22.99	204.76	210.42	211.02	233.60	206.99	231.53
Non-PSB export tuna monitored (%)	7.97	2.67	1.87	1.38	2.36	2.23	17.16	22.33	23.34	23.58	23.17	25.07

Table 2. Comparison of estimated coverage of IOTC/CSIRO monitoring during July – December 2002 using estimates based on vessel activity (IOTC/CSIRO) and Dinas export whole tuna (CSIRO/RIMF) and corresponding estimated landings of SBT. Note that the largest difference between the estimated coverages occurs in December.

Month	IOTC/CSIRO		CSIRO/RIMF	
	Estimated coverage %	SBT kg	Estimated coverage %	SBT kg
7	17.5	910	17.2	938
8	20.4	7,012	22.3	6,600
9	21.4	87,943	23.3	73,021
10	21.0	241,982	23.6	214,671
11	20.0	67,664	23.2	62,929
12	15.4	164,619	25.1	113,199
Total		570,130		471,358

Table 3. Estimated total landings (tonnes dressed weight) at Bena by species and month in 2002. January – June based on old CSIRO/RIMF monitoring protocol. July – December based on IOTC/CSIRO joint monitoring protocol. Raising factor for whole of year based on monthly aggregated Dinas whole fresh and frozen export data (does not include loin, fillet etc.).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Export grade bluefin	97.42	112.00	25.45	9.78	6.56	0.00	0.94	1.90	21.84	44.53	12.02	39.96	372.40
Total bluefin	354.77	499.85	199.48	75.71	20.78	9.00	0.94	6.60	73.02	214.67	62.93	113.20	1,630.94
Total bigeye	816.44	1,448.60	989.18	1,571.14	746.76	1,425.31	955.19	763.27	724.36	818.26	726.89	660.49	11,645.89
Total yellowfin	849.86	911.03	1,307.59	1,113.53	621.93	1,060.94	1,151.76	637.80	626.01	701.40	694.87	703.44	10,380.15
Total albacore	25.26	334.46	282.20	1,046.37	187.42	370.82	3.18	5.03	1.98	0.00	0.78	0.00	2,257.49
Total billfish	14.20	67.50	77.95	60.06	42.91	161.78	90.56	66.37	66.50	69.94	71.40	44.13	833.30
Total tuna and billfish	2,060.53	3,261.44	2,856.39	3,866.82	1,619.80	3,027.83	2,201.63	1,479.06	1,491.87	1,804.28	1,556.86	1,521.26	26,747.77

Table 4. Estimated total landings (tonnes dressed weight) at Bena by species and year and percentage species composition.

	1993		1994		1995		1996		1997		1998		1999		2000		2001		2002	
	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%
Export bluefin	812		439		361		613		781		381		867		415		438		372	
Total bluefin	1191	5.1	786	4.4	721	3.8	1404	5.5	1922	6.8	1151	3.6	2178	6.6	1046	4.1	1419	5.5	1631	6.1
Total bigeye	6192	26.3	5360	30.0	6543	34.4	10536	41.3	10115	35.8	12611	39.0	9945	30.2	8676	34.3	9362	36.2	11646	43.5
Total yellowfin	14596	62.0	10815	60.6	10590	55.6	11061	43.4	12047	42.6	15735	48.7	16128	48.9	12596	49.8	12165	47.1	10380	38.8
Total albacore	716	3.0	338	1.9	463	2.4	1035	4.1	2372	8.4	905	2.8	1687	5.1	2238	8.8	2461	9.5	2257	8.4
Total billfish	850	3.6	542	3.0	723	3.8	1467	5.8	1813	6.4	1934	6.0	3016	9.2	752	3.0	425	1.6	833	3.1
Total	23545		17841		19039		25503		28269	100.0	32336	100.0	32954	100.0	25307	100.0	25832	100.0	26748	100.0

Table 5. Estimated catch of SBT and all tuna and billfish based on CSIRO/RIMF catch monitoring and Dinas export whole tuna as raising factor aggregated by spawning season. The large estimate for 2001/2002 and the relatively small percentage of the landings monitored during this time (especially Feb – Apr 2002) would suggest that this estimate be used with caution.

Spawning season	SBT	Total tuna and billfish	% SBT
1993/94	589.1	19,918.0	3.0
1994/95	787.9	19,341.3	4.1
1995/96	1,098.9	21,310.0	5.2
1996/97	1,361.9	28,233.7	4.8
1997/98	1,815.1	26,888.4	6.8
1998/99	1,722.9	36,438.5	4.7
1999/2000	1,337.4	29,186.2	4.6
2000/2001	1,154.1	22,295.2	5.2
2001/2002	2,125.9	31,077.3	6.8