INTER-AMERICAN TROPICAL TUNA COMMISSION

WORKING GROUP TO REVIEW STOCK ASSESSMENTS

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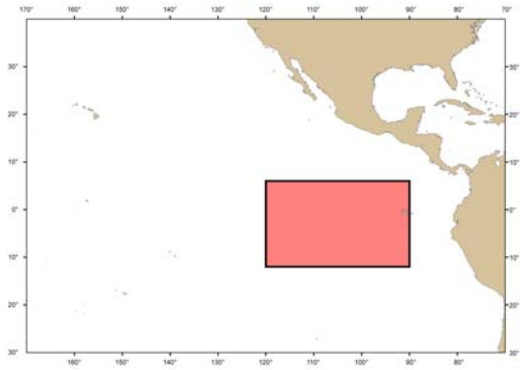
SPATIAL DISTRIBUTION OF SMALL TUNAS AND CATCHES INSIDE AND OUTSIDE THE CLOSED REGION PROPOSED BY THE UNITED STATES

The IATTC *ad hoc* meeting on management of 5-6 February 2007 requested that the staff work to define areas in which juvenile bigeye and juvenile yellowfin tunas are especially abundant, and evaluate the potential effect of closing the area illustrated in the figure to purse-seine fishing, either periodically or permanently throughout the year.



This document is divided into two parts. The first part presents the spatial distribution of tunas caught in the eastern Pacific Ocean (EPO), by 2^o x 2^o stratum, during the 1994-2006 period; the second part presents estimates of total and retained catches of tunas during 1994-2006 inside and outside the area illustrated in the figure (90^oW-120^oW by 6^oN-12^oS), proposed for closure by the United States at the meeting in February 2007. The 1994-2006 period was chosen because it is a period of high coverage by observers of catches by large purse-seine vessels, and also includes the period after the tuna fleet expanded its operations to the equatorial region west of the Galapagos Islands.

1. DISTRIBUTION OF TUNA CATCHES

Estimates of spatial distribution were made based on data collected by observers on purse-seine vessels with fish-carrying capacities greater than 363 metric tons (t). The data displays were restricted to sets made on floating objects (OBJ) and unassociated schools (NOA), because most of the catches of small tunas are taken in those types of set . The observer data set was chosen because it contains the only estimates available of catches of tunas <2.5 kg, which are often discarded at sea. Observers classify the catch (including discards) of yellowfin and bigeye tunas in three size categories: less than 2.5 kg, 2.5–12.5 kg, and greater than 12.5 kg. Distributions of catches of the first two categories of yellowfin and bigeye tunas are presented here because, for both species, fish of that size are well below the critical size, and their catch reduces the yield per recruit available from the fishery. The observer data cover about 83% of sets on floating objects and 44% of sets on unassociated schools.

Figure 1 (upper panel) shows that the annual average catches of yellowfin and bigeye tuna < 2.5 kg are a small fraction of the annual average total catches of all tunas (yellowfin, bigeye, and skipjack combined) in every stratum. The spatial distributions of the catches reflect the spatial distribution of sets (Figure 2, lower panel). Within a given year, there are some strata that contain a substantial proportion of tunas <2.5 kg, but no general separation from the other tuna is evident.

The lower panels of Figure 1 show that almost all catches of bigeye < 2.5 kg are from floating-object sets, whereas yellowfin < 2.5 kg are caught in both floating-object and unassociated sets. Yellowfin < 2.5 kg are caught closer inshore than small bigeye in both northern and southern latitudes. In general, the spatial

distributions of the catches of tunas < 2.5 kg and of all tunas are similar, but with differences among species dependent on location. The overall spatial separation of catches of yellowfin and bigeye < 2.5 kg suggests that there is sno single area whose closure would be optimal for reducing the catches of both yellowfin and bigeye.

The upper panel of Figure 2 shows that the spatial patterns of the catches of 2.5–12.5 kg and < 2.5 kg yellowfin and bigeye are somewhat similar. The main difference is that catches of 2.5–12.5 kg yellowfin are much greater, due to their capture in the fishery for unassociated tunas.

The upper panels of Figure 3 show quarterly average annual catches of yellowfin and bigeye < 2.5 kg in floating-object and unassociated sets combined. Both graphs show that catches along the Equator occur primarily during the third and fourth quarters of the year, with catches further south more frequent in the first and second quarters. The lower panels show similar plots for 2.5–12.5 kg yellowfin and bigeye. For bigeye, the distribution is similar to that for bigeye < 2.5 kg, whereas 2.5–12.5 kg yellowfin are caught primarily offshore during the third and fourth quarters, but are more frequently caught inshore in the first and second quarters, with some exceptions.

2. CATCHES IN THE PROPOSED CLOSED AREA

During 1994-2006, the average annual purse-seine catches, in metric tons (t), of yellowfin, bigeye, and skipjack tunas in the EPO, by size category, inside and outside the closed area proposed by the United States, were as follows. Catches are based on observer estimates aboard vessels >363 t, and include both retained and discarded catch.

Species	Size	Inside	Outside	% inside
Bigeye	>2.5 kg	2,274	2,203	51%
	2.5 kg–12.5 kg	13,603	10,481	56%
	>12.5 kg	16,251	7,328	69%
	Total	32,435	20,176	62%
Yellowfin	>2.5 kg	2,317	4,189	36%
	2.5 kg–12.5 kg	7,806	64,929	11%
	>12.5 kg	22,890	82,513	22%
	Total	33,212	153,045	18%
Skipjack	>2.5 kg	17,014	30,368	36%
	2.5 kg–12.5 kg	50,953	58,188	47%
	>12.5 kg	770	504	60%
	Total	69,258	89,860	44%
Grand total		**134,907**	**263,089**	**34%**

Overall, 62% of all bigeye catches were made in this in this area, but only about half of the catches of bigeye < 2.5 kg. The majority of both yellowfin and skipjack is caught outside the proposed closed area, with only 18% of yellowfin caught in the area, and 44% of skipjack. Table 1 shows that retained purse-seine catches follow the same general pattern as total catches, but vary substantially among years, ranging from 18% to 43% for all species combined. For all species, retained longline catches are less frequent inside the proposed closed area than outside it.

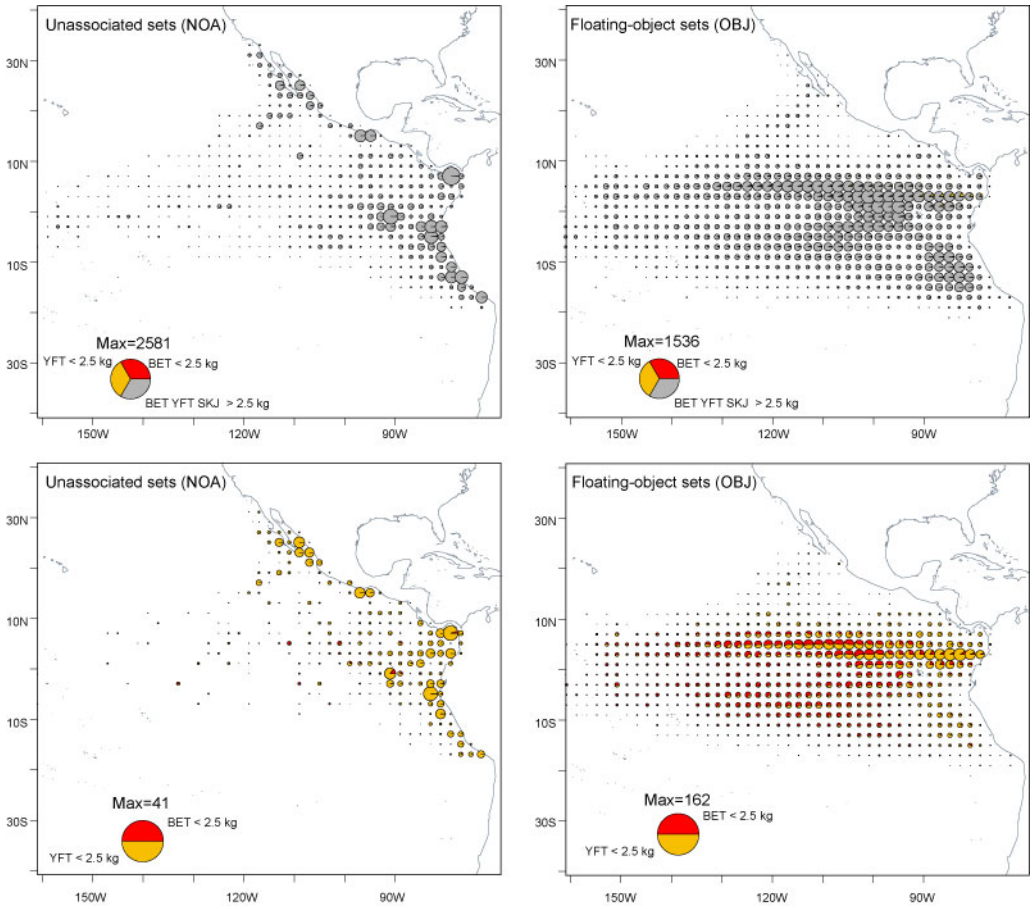


FIGURE 1. Average annual catches in the EPO, in metric tons, of skipjack, yellowfin, and bigeye tunas (top panels), and of yellowfin and bigeye < 2.5 kg (bottom panels), by set type, 1994-2006.

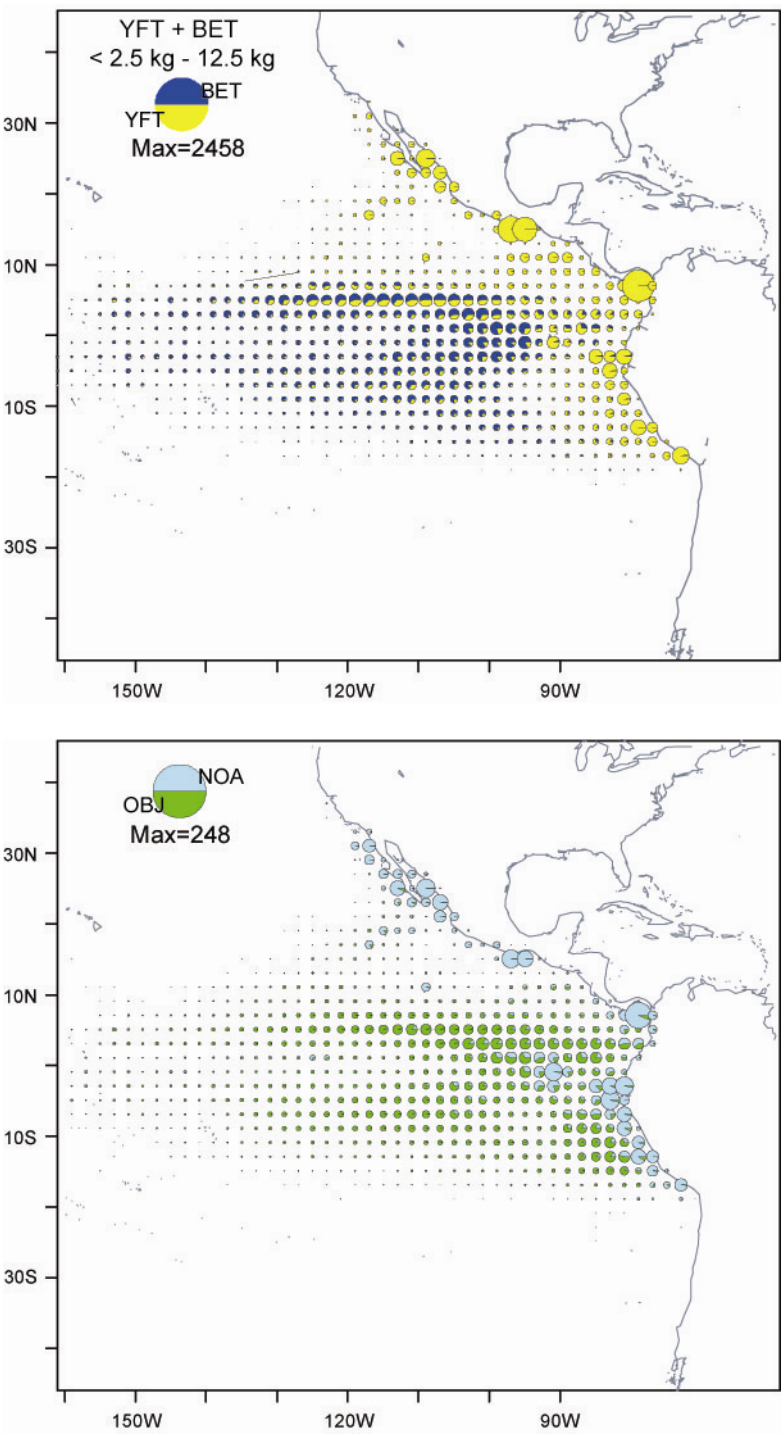


FIGURE 2. Average annual catches, in metric tons, of yellowfin and bigeye 2.5kg-12.5kg in the unassociated and floating object fisheries in the EPO combined (top panel), and average annual number of sets in those fisheries (bottom panel), 1994-2006.

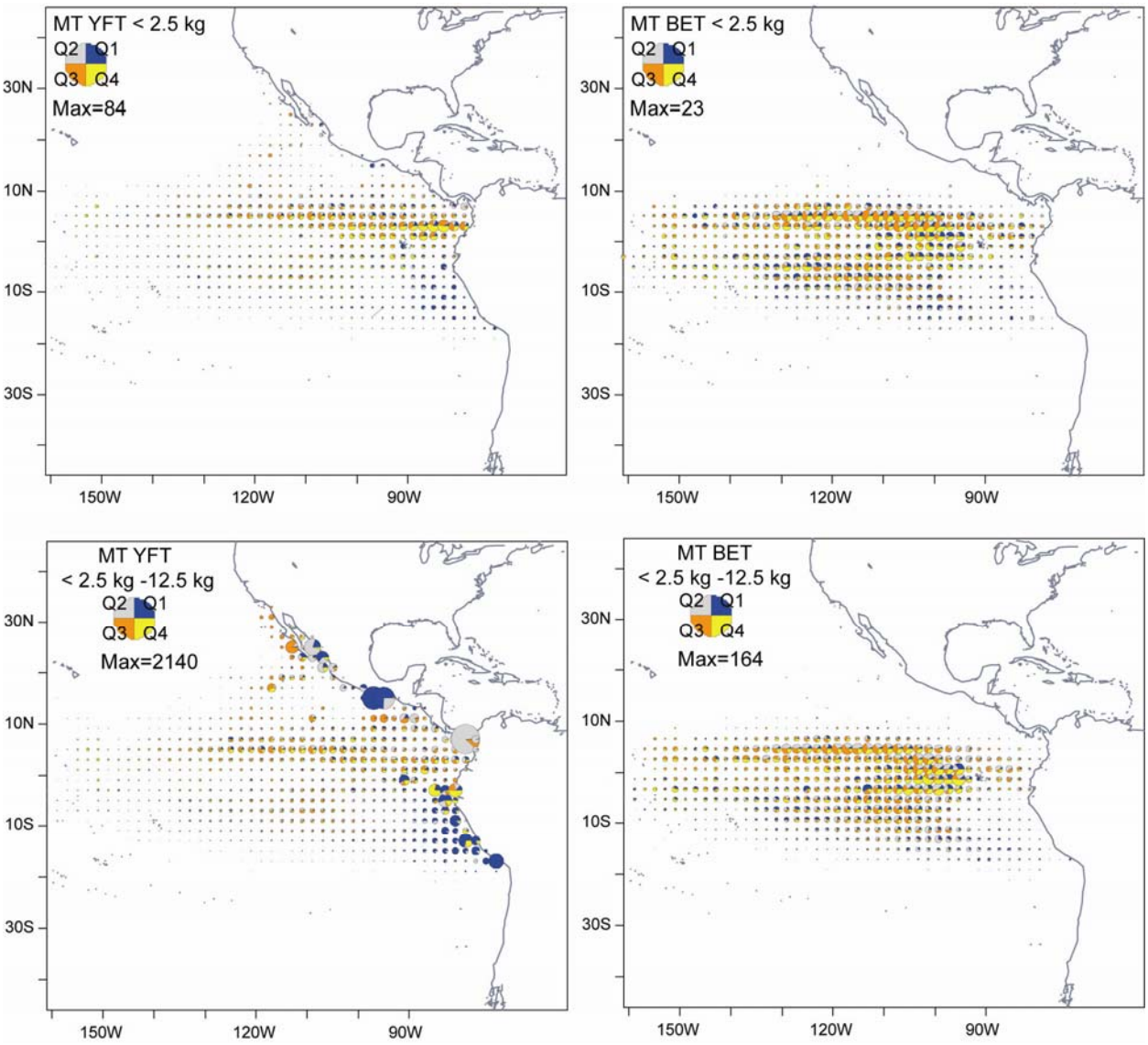


FIGURE 3. Average annual catches, in metric tons, of yellowfin and bigeye < 2.5 kg (top panel) and 2.5 kg – 12.5 kg (bottom panel) in unassociated and floating object sets combined, by quarter, 1994-2006.

TABLE 1. Annual retained purse-seine and longline catches of yellowfin, bigeye, and skipjack tunas in the EPO, inside and outside the proposed closed area, in metric tons, 1994-2006. n.a.: not available

		Longline				Purse Seine			
	Area	**Bigeye**	**Skipjack**	**Yellowfin**	**Total**	**Bigeye**	**Skipjack**	**Yellowfin**	**Total**
1994	Inside	13,464	3	3,859	17,326	24,983	19,005	22,666	66,653
	Outside	57,895	70	25,686	83,651	3,250	46,358	174,473	224,082
	% inside	19%	4%	13%	17%	88%	29%	11%	23%
1995	Inside	12,461	2	3,271	15,734	26,818	50,398	28,482	105,698
	Outside	45,795	74	16,783	62,653	8,287	64,793	182,248	255,328
	% inside	21%	3%	16%	20%	76%	44%	14%	29%
1996	Inside	6,531	1	1,571	8,103	40,633	44,810	27,840	113,283
	Outside	40,427	50	14,855	55,332	11,147	53,038	196,852	261,036
	% inside	14%	3%	10%	13%	78%	46%	12%	30%
1997	Inside	12,263	2	3,011	15,277	37,104	58,266	26,961	122,331
	Outside	40,307	133	18,437	58,877	15,925	82,741	210,497	309,162
	% inside	23%	1%	14%	21%	70%	41%	11%	28%
1998	Inside	6,061	2	1,035	7,098	15,865	42,522	14,648	73,035
	Outside	40,286	291	13,177	53,755	23,226	85,600	227,896	336,722
	% inside	13%	1%	7%	12%	41%	33%	6%	18%
1999	Inside	3,342	0	378	3,720	33,969	129,009	36,968	199,946
	Outside	33,083	199	10,274	43,556	15,326	108,723	232,691	356,741
	% inside	9%	0%	4%	8%	69%	54%	14%	36%
2000	Inside	5,371	3	2,000	7,374	61,352	118,912	51,535	231,799
	Outside	42,207	66	20,771	63,045	19,125	74,824	211,083	305,032
	% inside	11%	4%	9%	10%	76%	61%	20%	43%
2001	Inside	11,097	59	1,876	13,032	28,112	62,136	70,230	160,478
	Outside	57,629	1,156	26,599	85,384	24,757	73,622	307,868	406,246
	% inside	16%	5%	7%	13%	53%	46%	19%	28%
2002	Inside	5,776	7	1,900	7,683	23,566	37,535	57,189	118,291
	Outside	68,629	254	22,103	90,985	20,280	115,810	353,828	489,918
	% inside	8%	3%	8%	8%	54%	24%	14%	19%
2003	Inside	6,805	37	1,639	8,481	25,261	78,469	55,138	158,869
	Outside	52,861	598	22,124	75,583	23,482	169,851	336,256	529,590
	% inside	11%	6%	7%	10%	52%	32%	14%	23%
2004	Inside	2,601	55	770	3,427	35,148	71,684	60,977	167,809
	Outside	40,753	657	16,200	57,610	19,436	119,542	211,750	350,728
	% inside	6%	8%	5%	6%	64%	37%	22%	32%
2005	Inside	n.a.	n.a.	n.a.	n.a.	32,916	67,603	37,757	138,276
	Outside	n.a.	n.a.	n.a.	n.a.	18,525	193,773	220,676	432,973
	% inside	n.a.	n.a.	n.a.	n.a.	64%	26%	15%	24%
2006	Inside	n.a.	n.a.	n.a.	n.a.	31,727	96,745	25,193	153,666
	Outside	n.a.	n.a.	n.a.	n.a.	25,585	173,161	138,983	337,729
	% inside	n.a.	n.a.	n.a.	n.a.	55%	36%	15%	31%
Avge	Inside	7,798	16	1,937	9,750	32,112	67,469	39,660	139,241
	Outside	47,261	323	18,819	66,403	17,565	104,756	231,162	353,484
	% inside	14%	5%	9%	13%	65%	39%	15%	28%