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**CATCH LIMITS FOR INDIVIDUAL PURSE-SEINE VESSELS TO REDUCE
FISHING MORTALITY ON BIGEYE TUNA IN THE EASTERN PACIFIC
OCEAN.**

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1. INTRODUCTION

Harley et al. (2004) provided a rationale for individual purse seine vessel catch limits for bigeye tuna (BET) in the eastern Pacific Ocean. We update their analysis using data for 2004 and provide additional information. Readers are directed to [Harley et al. \(2004\)](#) for further discussion.

2. METHODS

The analysis is based on trip records held in the IATTC database. Data for each vessel is summed to provide total catch of bigeye, yellowfin, and skipjack for each year for each vessel. Two analyses are carried out.

The first analysis orders the data by descending catch of bigeye. This is used to determine the number of vessels that capture the majority of bigeye catch.

The second analysis investigates individual vessel catch limits by assuming that catch occurs at a constant rate throughout the year and that fishing stops as soon as the bigeye limit is taken.

3. RESULTS

The majority of bigeye is caught by a small number of vessels (Figure 1). These vessels capture a lesser proportion of the yellowfin and skipjack total catches (Figure 2). During 1999-2004, between 11-15 vessels captured 50% of the bigeye catch. These vessels only captured about 5% of the yellowfin catch and 25% of the skipjack catch (Table 1). Between 23-30 vessels captured 75% of the bigeye catch. These vessels only captured about 10% of the yellowfin catch and 34-50% of the skipjack catch. Many of these vessels frequently caught a large proportion of the bigeye catch (Table 2).

The vessel limits of bigeye catch required to reduce the catch to 50% of the levels in each year were around 350-474 t, except for 2000, which would have required a much higher limit (Table 3). Such vessel limits would have affected 30-40 vessels and would have resulted in a loss of about 15-20% of the total tuna catch if the vessels took no action to reduce the proportion of bigeye in their catches. Figure 3 provides information based on the 2004 data about the predicted effect of the size of the vessel limit on the bigeye catch, the number of vessels that would have been affected and the loss in total tuna catch, again assuming that vessels take no action to reduce the proportion of bigeye in their catches.

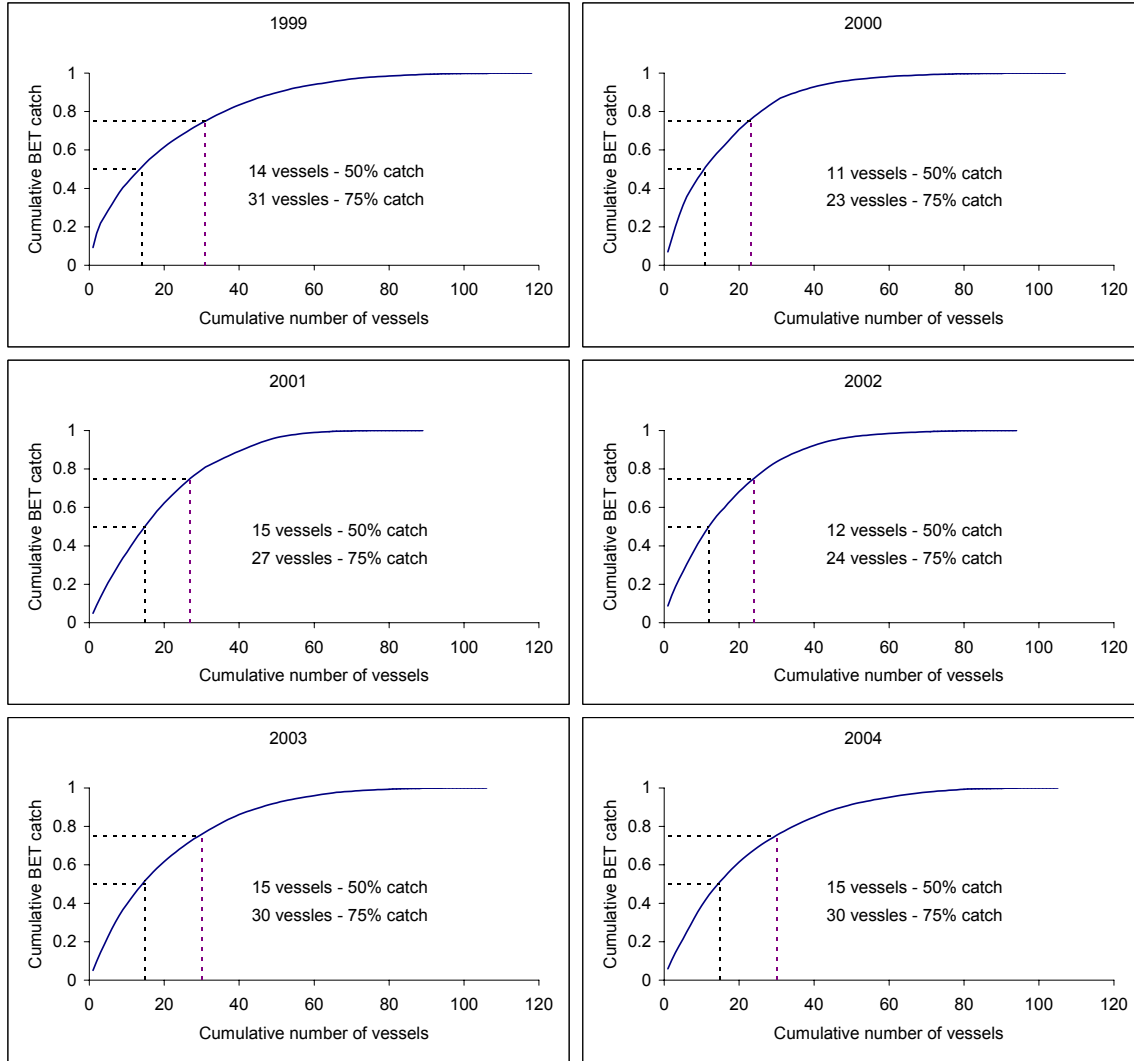


Figure 1. The cumulative catch of bigeye as a proportion of the total catch plotted against the cumulative number of vessels required to produce the catch. The vessels are ordered by decreasing amount of bigeye catch.

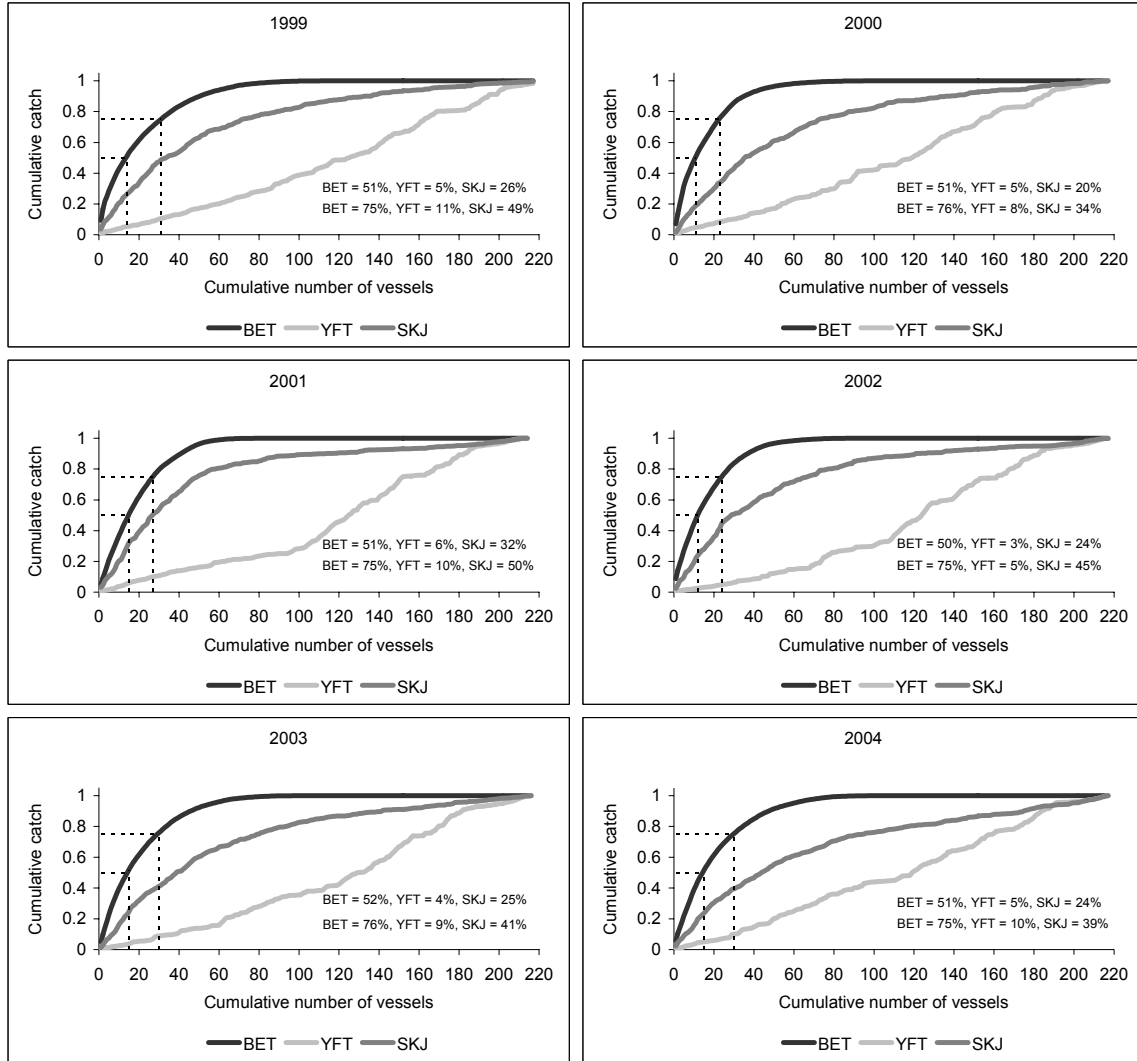


Figure 2. The cumulative catch of bigeye, yellowfin, and skipjack as a proportion of the total catch for that species plotted against the cumulative number of vessels required to produce the catch. The vessels are ordered by decreasing amount of bigeye catch.

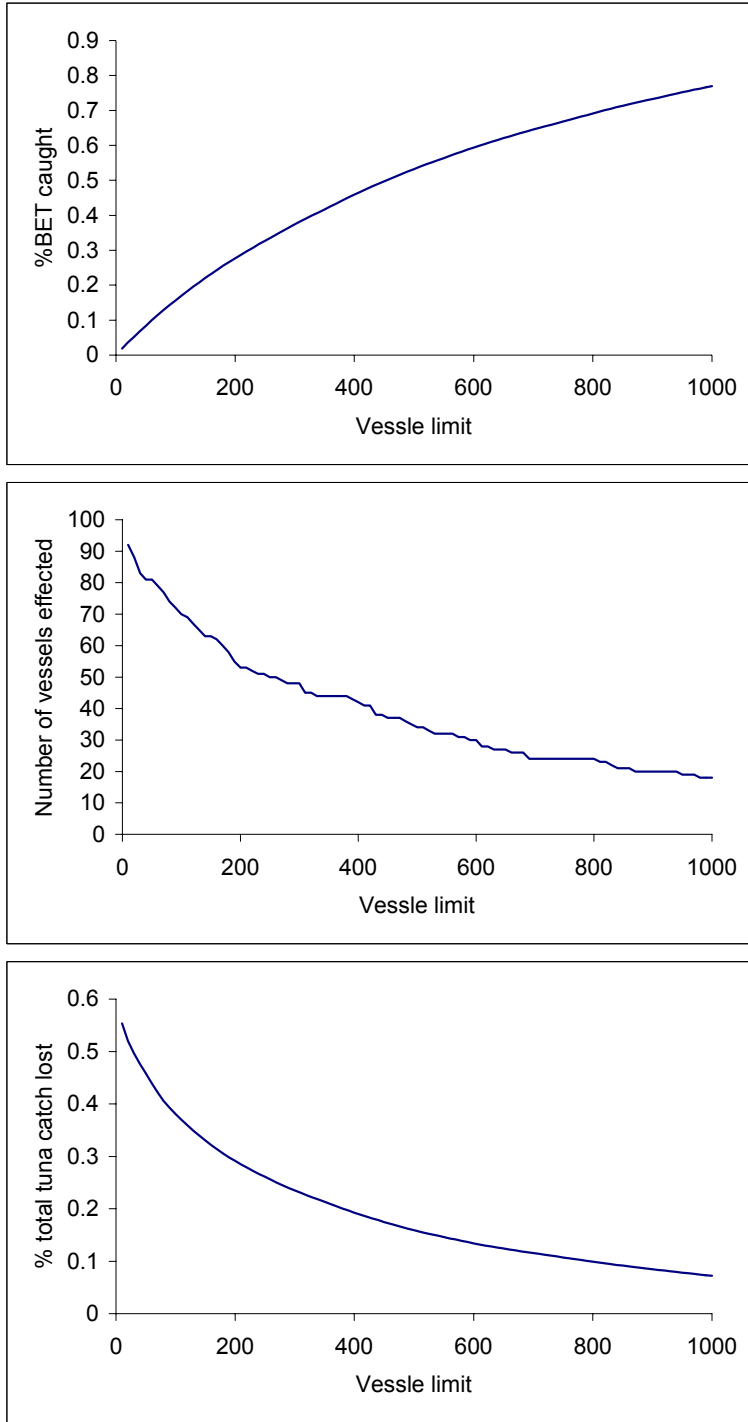


Figure 3. Percentage of bigeye caught, number of vessels affected, and percentage total tuna catch lost based on different bigeye vessel limits using the 2004 data.

Table 1. Number of vessels that take 50% and 75% of the bigeye catch based on the top bigeye catching vessels in each year. %BET, %YFT, and %SKJ, indicate the percentage of the total catch for that species caught by those vessels.

	50% of the BET catch				75% of the BET catch			
	Vessels	%BET	%YFT	%SKJ	Vessels	%BET	%YFT	%SKJ
1999	14	51	5	26	31	75	11	49
2000	11	51	5	20	23	76	8	34
2001	15	51	6	32	27	75	10	50
2002	12	50	3	24	24	75	5	45
2003	15	52	4	25	30	76	9	41
2004	15	51	5	24	30	75	10	39

Table 2. The rank by bigeye catch of the vessels that were among the vessels that comprised 50% of the bigeye catch. A blank may mean either the vessel did not operate in that year or it was not one of the vessels that took the 50% of the bigeye catch.

Vessel	Rank within vessels that took 50% of the catch of BET						Number of years	Average annual total tuna catch	Average annual % BET
	1999	2000	2001	2002	2003	2004			
1						13	1	3913	0.22
2	10						1	3537	0.22
3	6						1	3711	0.16
4				5			1	4714	0.23
5					15		1	4491	0.18
6	7	9		7			3	6658	0.19
7						4	1	4959	0.20
8	8				11	8	3	5168	0.25
9	4	10	5	2	9		5	5710	0.30
10			8		13	11	3	5634	0.18
11			11	4	5	7	4	3044	0.47
12	14						1	3310	0.15
13	12		12	8	7	3	5	6280	0.25
14			7		1	15	3	4861	0.30
15					14		1	3097	0.24
16	5				12		2	3934	0.26
17	3	6	13				3	7280	0.17
18			10	9			2	5757	0.22
19	1	1	9	11	10	2	6	9843	0.26
20	9	7	15		6	12	5	7216	0.21
21	2	3					2	7944	0.24
22			6				1	4839	0.17
23		11	14	10		6	4	5596	0.22
24	11	5		12	4	9	5	5554	0.31
25		8	2				2	3620	0.24
26		2					1	4959	0.21
27	13	4	1	6	2	1	6	8505	0.27
28						14	1	3665	0.23
29			3	3	3	10	4	7531	0.25
30			4	1			2	7280	0.22
31					8	5	2	6283	0.27

Table 3. Individual vessel limits required to reduce the bigeye catch to 50% of the catch in that year. The limit is based on bigeye only. “Vessels” is the number of vessels affected by the limit. “Lost catch %” is the percentage of total catch of tuna (bigeye, yellowfin, and skipjack) if the vessel was to stop all fishing immediately the vessel limit was reached.

	Limit	Vessels	Lost catch %
1999	350	39	0.19
2000	889	30	0.17
2001	474	31	0.16
2002	459	30	0.12
2003	416	38	0.16
2004	454	37	0.17