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POTENTIAL IMPACT ON CATCHES OF SKIPJACK BY THE WCPO PURSE-SEINE FISHERY OF VARIOUS WCPFC CONSERVATION AND MANAGEMENT MEASURES CONSIDERED FOR BIGEYE AND YELLOWFIN

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Potential impact on catches of skipjack by the WCPO purse-seine fishery of various WCPFC conservation and management measures considered for bigeye and yellowfin.

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At the second meeting of the WCPFC, the Commissioners agreed to adopt a range of measures directed towards the conservation and management of yellowfin and bigeye tuna. These included the consideration of temporary closures for the purse seine fishery to reduce levels of fishing mortality on both species. This directive was included in Attachment D of summary record of the WCPFC-2 meeting (paragraph 11), as follows.

11. In order to achieve the overall reduction in catch and effort required for bigeye and yellowfin tuna, in accordance with advice and recommendations received from the Scientific Committee, the Executive Director shall work with CCMs during 2006 to develop a proposal for consideration at the Third Session of the Commission that is consistent with the IATTC arrangements that allow for a system of temporary purse seine closures.

For 2006, the yellowfin stock assessment indicates that a moderate (10%) reduction in total effort would be necessary to reduce $F_{current}$ to the F_{MSY} level and maintain the stock above the $\tilde{B}_{MSY}$ level, while a 25% reduction in effort would be necessary to achieve the same objective for bigeye tuna. These reductions in effort would need to be applied across all fisheries that catch a substantial proportion of the species, rather than just the purse seine fishery. Much larger reductions in effort would be required if these reductions were applied solely to the purse seine fishery. However, it may be appropriate to target specific fisheries based on method and time period to minimize the impact of such effort reductions, in terms of total catches, in the overall WCPO tuna fishery.

In this note, we examine purse seine data for 1996-2005 to determine on an empirical basis whether closures in certain months would be more effective than others. Effectiveness is judged by how well a closure in a particular month would satisfy two objectives: (1) to maximize the percentage reduction in yellowfin and bigeye catch; and (2) to minimize the reduction in skipjack catch.

The results of the analysis are summarized in Table 1. The percentage reductions in skipjack and yellowfin + bigeye catches that would have been achieved by closures in each month are shown in the first two substantive columns of the table. In the next two columns, the reductions are ranked, with the month resulting in the smallest skipjack catch reduction having the highest rank (1) for the skipjack objective, and the month resulting in the largest yellowfin + bigeye catch reduction having the highest rank for that objective. For skipjack, January, December and August have the highest ranks (smallest catch reductions) while for yellowfin + bigeye, September, November and October have the highest ranks (largest catch reductions). We have integrated the skipjack and yellowfin + bigeye ranks by combining the two outcomes using several example weighting schemes. These are only examples, but the idea is that the outcomes should be weighted in such a way to reflect our relative priorities for the two objectives (see caption to Table 1). For example, if we weight both objectives equally, the months of September to December (composite ranks 1-4) would have performed best for purse seine closures based on

the historical data. On the other hand, the months of March to May would have performed worst in terms of simultaneously satisfying both objectives (and this is also true for the other weighting schemes in Table 1).

While there is no guarantee that future variation in catch by month would follow the past, the approach outlined above might nevertheless be useful for assisting in the design of purse seine closures. A more detailed analysis would examine the inter-annual variation in catch composition and potentially consider the effect of set type, if appropriate to any particular management proposal.

Note that the data were aggregated over the entire area of the fishery for this analysis. It would be relatively straightforward to stratify the analysis spatially in order to assess the efficacy of closures in particular sub-areas of the fishery. There are apparent temporal and spatial differences in the catch composition (see Figure 1) that may enable a more directed management action that achieves a better outcome for the overall fishery.

Table 1. Percentage catch reductions assuming that various monthly closures had been applied over the period 1996-2005. The rankings for skipjack (SKJ) are numbered 1 through 12 from the lowest to highest percentage reductions. The rankings for yellowfin plus bigeye (YFT+BET) are numbered 1 through 12 from the highest to lowest percentage reductions. Composite catch reduction indices, *CRI*, are derived by subtracting SKJ from YFT+BET weighted catch reductions: $CRI = \left(C_{y+b} w_{y+b} - C_s w_s\right) / \left(w_{y+b} + w_s\right)$, and ordering from highest to lowest. The highest ranks (1 being the highest), which are highlighted in yellow for each set of weightings, are months with low SKJ catch reduction and high YFT+BET catch reduction.

Closure month	% Catch reductions		Rank		Composite rank					
					$w_{y+b} = 50$ $w_s = 50$		$w_{y+b} = 25$ $w_s = 75$		$w_{y+b} = 75$ $w_s = 25$	
	SKJ	YFT+BET	SKJ	YFT+BET	*CRI*	Rank	*CRI*	Rank	CRI	Rank
1	7.7	8.5	1	7	0.83	5	-3.64	3	4.46	6
2	8.0	7.7	6	8	-0.30	8	-4.06	8	3.76	8
3	9.4	6.4	11	12	-2.95	12	-5.43	11	2.48	12
4	9.1	6.7	10	11	-2.39	10	-5.16	10	2.76	11
5	9.6	7.0	12	10	-2.62	11	-5.44	12	2.82	10
6	7.9	7.3	4	9	-0.62	9	-4.10	9	3.48	9
7	7.9	8.7	5	5	0.82	6	-3.74	4	4.56	5
8	7.9	8.6	3	6	0.70	7	-3.76	5	4.46	6
9	8.0	10.4	7	1	2.34	1	-3.44	1	5.77	1
10	8.5	9.5	9	3	0.99	4	-3.99	7	4.98	4
11	8.4	9.9	8	2	1.51	3	-3.80	6	5.31	2
12	7.8	9.4	2	4	1.69	2	-3.46	2	5.14	3

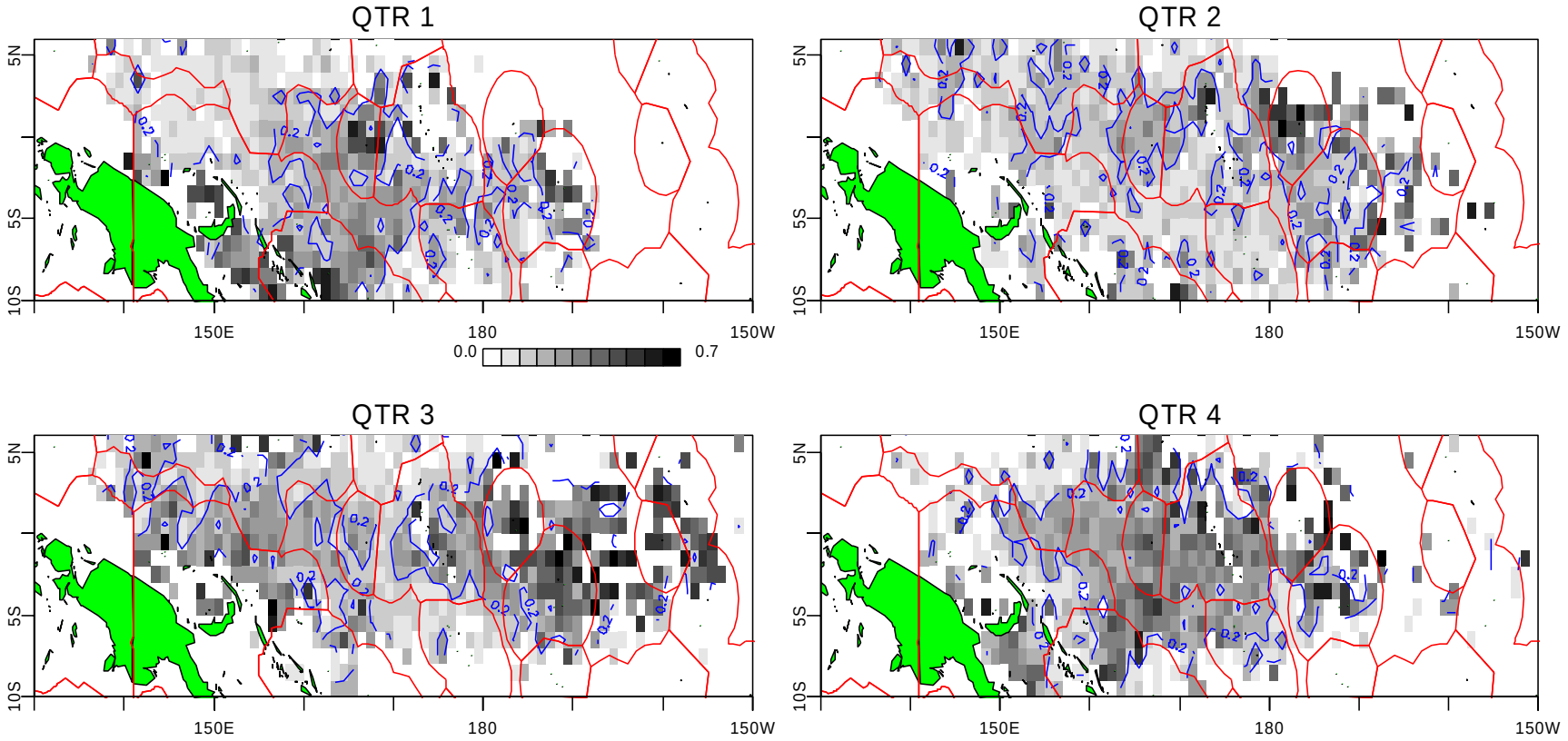

Figure 1. Proportion of yellowfin+bigeye in the total (yellowfin+bigeye+skipjack) purse seine catch by quarter and degree of latitude and longitude from the main purse seine fleets (all set types combined) during 1996-2005. Catch proportions range from zero (light grey) to 0.7 (black). The blue lines represent the contour lines for 20% yellowfin+bigeye in the catch. Blank cells represent no data. The red lines represent EEZ boundaries. All figures are plotted with a common scale (see legend).