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EVALUATION OF INDIVIDUAL VESSEL CLOSURES FOR THE CONSERVATION OF YELLOWFIN AND BIGEYE TUNA IN THE EASTERN PACIFIC OCEAN

This paper evaluates the effect of a proposal for individual-vessel closures for the conservation of bigeye and yellowfin tunas in the eastern Pacific Ocean (EPO).

A. For the purse-seine fishery, the proposal evaluated in this paper consists of a closure for each vessel. The specifications of the closure consist of the following elements:

1. During 2009-2011, a period of twelve consecutive weeks each year during which the vessel will not fish in the EPO. This period is referred to as an individual vessel closure (IVC) throughout this paper.
2. Each Party with purse-seine vessels flying its flag informs the Director, by January 1 of each year, of the IVC dates for each purse-seine vessel in its fleet during that year. These IVC dates may not subsequently be modified.

B. For the longline fishery, a reduction in catches that produces an equivalent reduction in fishing mortality as the twelve-week purse-seine closure is the basis for the following limits for total annual longline catches of bigeye tuna in the EPO during 2009, 2010, and 2011:

	Metric tons (t)
China	2,354
Japan	30,394
Korea	11,217
Chinese Taipei	7,094

Other CPCs: the greater of 89% of their respective 2001 catches or 500 t. The rationale for the catch levels is explained in section 1.2 below.

1. METHOD

1.1. Purse-seine fishery

The conservation effect of IVCs depends on a number of factors that are beyond the scope of this evaluation. In particular, the dates chosen for the IVCs could influence their effectiveness, as shown in Figure 1. In addition, the effectiveness of a 12-week IVC, as calculated in this paper, does not take into account that some of that closure could be used to carry out regular vessel maintenance. The ability of several vessels to work in concert, particularly in the FAD-associated fishery, could allow some common usage of FADs and thus a faster return to FAD sets by a vessel at the end of its IVC, thereby reducing the effectiveness of the IVCs.

A simple method for calculating the effectiveness of the IVCs is to assume that they will be homogeneously distributed throughout a calendar year. In such a case, the conservation effect of an IVC in terms of reductions in fishing mortality is the same as the percentage of the year in which the vessel is not fishing; for a 12-week IVC, the reduction in fishing mortality is thus 12/52, or 23%. This is less than the 30% reduction in fishing mortality for bigeye tuna in the conservation proposal presented at the

Commission meeting in March 2008 (Document IATTC-77-04) for two reasons: the earlier proposal targeted the closure to occur during a time of year which was, on average, most effective in reducing catches of bigeye, and it included an additional temporal-spatial closure located within the most productive area for FAD catches of bigeye. In order to achieve a 30% reduction in fishing mortality, the IVC period would need to be increased to 30% of the year, or 15.6 weeks. The simple method above coincides well with the results of applying a homogeneous distribution of IVCs to the results of the various 12-week closures given in Document IATTC-77-04. As shown in Figure 1, the 23% reduction is the approximate average of the various 12-week closures in the figure. The effectiveness of a shorter six-week IVC is roughly half that of the 12-week closure.

1.2. Longline fishery

The longline catch quotas specified above in section **B** were calculated to be approximately 89% of the catch quotas specified in Resolution C-06-02 on tuna conservation. The purse-seine analysis was based on data for 1995-2003, prior to the 6-week annual closures implemented during 2004-2007. For the longline analysis, since the catch quotas in Resolution C-06-02 already reflect the 6-week closure, the additional reductions in longline catches resulting from a 12-week closure need to take these existing reductions into account. The 89% estimate is based on the equation 0.89 = [1-.238]/[1-.3]*0.82.

2. DISCUSSION

The IVC proposal has a number of potential positive and negative attributes. The potential benefits include:

1. Flexibility to schedule closures optimally for each vessel, taking into account expected catches, revenue, and maintenance schedules.
2. A more continuous flow of catches to canneries, and a more orderly movement of product through the processing and retail system.
3. More continuous employment, by avoiding the total shutdown of production associated with a fleet-wide closure period.
4. Spreading fishing effort more evenly throughout the year than a fleet-wide closure, thus potentially also exploiting all components of the tuna stocks more evenly, which could be beneficial to the long-term health of the stocks.

The potential drawbacks of this proposal include:

1. Complications in enforcement of closures. Since there would not be a single period during which entire national fleets may not fish, compliance by vessels would have to be monitored on an individual basis. However, IVCs could be verified through the AIDCP On-Board Observer Program for vessels that carry observers.
2. Groups of vessels working together to minimize the impact of an IVC on any of their members, such as by sharing of FADs and fishing grounds.
3. Difficulties in calculating the recommended duration of closures, because the starting date of a vessel's IVC, which likely affects its effectiveness, is not known.
4. Unknown reductions in effectiveness due to vessels carrying out major maintenance during the IVC as compared to the results of the analysis shown in Figure 1, which does not reflect such timed maintenance.

In order for this approach to work, there must be transparency in the scheduling of IVCs and a system for keeping track of compliance by vessels.

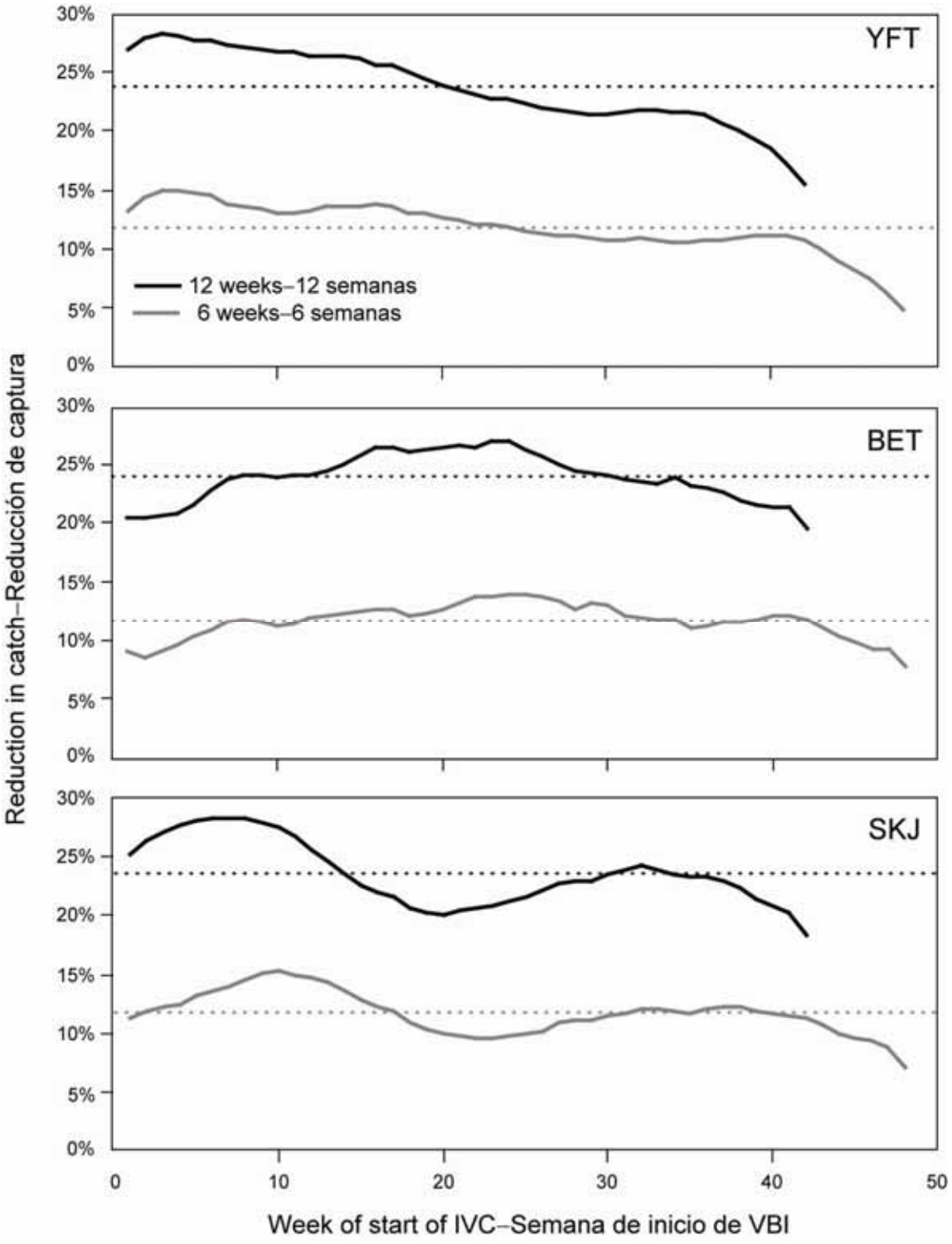

FIGURE 1. Estimated percentage reduction in catches of yellowfin, bigeye, and skipjack tunas resulting from different starting dates for 12- and 6-week closures.

Appendix A: Evaluation of individual vessel area closures (IVAC)

This appendix provides an evaluation of closing the offshore area in Figure A1 (Proposal D2A in Document IATTC-76-04) to each individual vessel for 16 weeks during each year of the 2009-2011

period. The 16 weeks is approximately the length of the closure of this offshore area proposed in IATTC-77-04.

FIGURE A1. Proposed closure area between 94° and 110°W from 3°N to 5°S.

The reduction in catches of bigeye and skipjack resulting from the IVAC was calculated by taking the average of possible starting weeks during a year for a 16-week closure of the area. The reduction in catch for any given starting week was calculated using the same method as in IATTC-77-04. Figure A2 shows the expected percent reduction in catches of bigeye and skipjack for each starting week; the dotted line represents the average. On average, the effect on the annual catch would be a reduction of about 5% for bigeye and about 1% for skipjack, and a slight increase (<1%) for yellowfin..

For the longline fishery, an evaluation was made of a reduction in catches that produces an equivalent reduction in fishing mortality as the combination of a 12-week IVC plus a non-overlapping 16-week IVAC. The combination of both those closures would produce a purse-seine catch of approximately 83.6% of what would be obtained with no closure. The 83.6% estimate is based on the equation 0.836 = [1-.238-.048]/[1-.3]*0.82).

Therefore, the equivalent longline catch limits for bigeye during 2009, 2010, and 2011 would be as follows:

	Metric tons (t)
China	2,206
Japan	28,483
Korea	10,512
Chinese Taipei	6,648

For other CPCs, the limit would be the greater of 83.6% of their respective 2001 catches or 500 t.

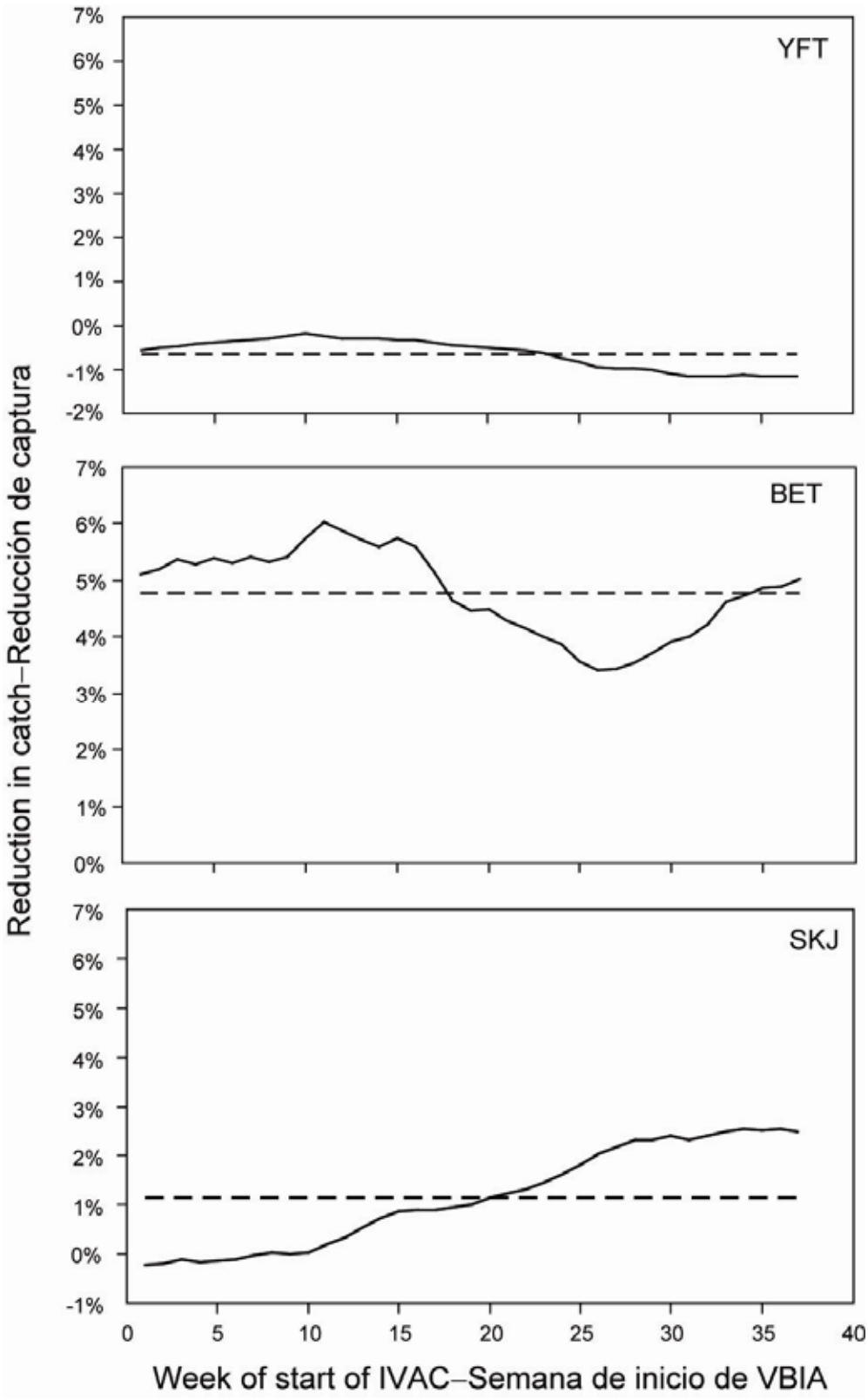

FIGURE A2. Estimated percentage reduction in catches of yellowfin, bigeye and skipjack tunas resulting from different starting dates for 16-week closures of the offshore area in Figure A1.