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COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

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EVALUATION OF CONSERVATION PROPOSALS MADE AT THE 75TH MEETING OF THE IATTC

Three conservation proposals for bigeye and yellowfin tunas (Annexes 1a-c) were considered at the 75th meeting of the IATTC in June 2007. This paper evaluates the expected effect of each of these proposals, based on the stock assessments that were presented at the 75th meeting. While the proposals covered different periods (2008-2010, 2008-2011, 2008), this evaluation examines the effect of continuing the application of each proposal until 2013. A different assessment model was used for each species: Stock Synthesis 2 (SS2) for bigeye and A-SCALA for yellowfin. For population projection work, A-SCALA allows the use of quarterly fishing effort rate, whereas SS2 uses only annual fishing mortality rates; accordingly, the proposals had to be evaluated slightly differently for the two species.

Details of the evaluations are provided in Annex 2.

1. PROPOSALS

The three proposals are summarized below. All limits are annual limits, and apply to the purse-seine and longline fisheries for bigeye and yellowfin tunas only.

1.1. Proposal D1

Applies to 2008-2010.

1.1.1. Purse-seine

Yellowfin: Close purse-seine fishery when a total allowable catch (TAC) of 200,000 metric tons (t) of yellowfin is reached; the Director may decrease or increase the TAC by no more than four reductions or increments of 30,000 t each.

Bigeye: Limit catches by each purse-seine vessel to no more than 500 t.

1.1.2. Longline

Bigeye: Fixed catch limits for China, Japan, Korea, and Chinese Taipei; catches by other CPCs not to exceed 500 t or their respective catches of bigeye tuna in 2001, whichever is higher.

1.2. Proposal D2a

Applies to 2008-2011.

1.2.1. Purse seine

Close purse-seine fishery either 1 August-11 September or 20 November-31 December; and:

Yellowfin: Close the directed fishery for yellowfin when a TAC of 290,000 t of yellowfin is reached; after TAC is reached, the landings of fisheries not targeting yellowfin may include a maximum of 15% yellowfin.

Bigeye: Close the area between 94ºW and 110ºW from 3ºN to 5ºS (Figure 1) to purse-seine vessels greater than 363 t, 1 August-31 December.

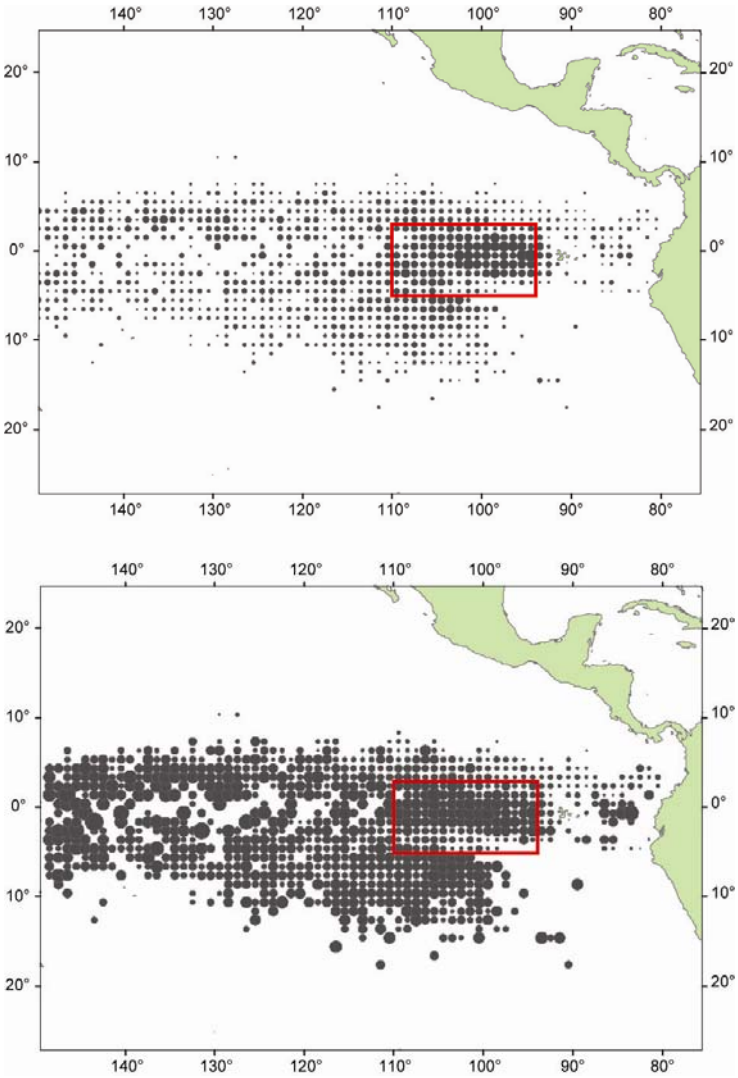

FIGURE 1. Total catch (top) and average catch per set (bottom) of bigeye in the EPO, during the closure period in Proposal D2a (1 August-31 December), 2004-2006.

1.2.2. Longline

Yellowfin and bigeye: Fixed catch limits for China, Japan, Korea, and Chinese Taipei; catches by other CPCs not to exceed 500 t or 83% of their respective catches of bigeye tuna in 2001, whichever is higher.

1.3. Proposal D3

Applies to 2008 only.

1.3.1. Purse seine

Close purse-seine fishery for 73 days, either during August-October or from 20 November 2007 to 2 February 2008; also, no fishing south of 5ºN during the August-October, and no fishing north of 5ºN during the November-February closure.

2. METHODS

Due to uncertainty in the estimates of recent recruitment, the recruitment of yellowfin for quarter 3 of 2006 and later, and of bigeye for quarter 1 of 2007 and later, were set to equal the average recruitment for 1975-2006.

2.1. Proposal D1

2.1.1. Purse seine

For bigeye tuna, the effect of limiting the catch of bigeye by each purse-seine vessel to 500 t was assessed by comparing the catches during 1999-2006 with the catches that would have occurred in those years had each vessel been limited to 500 t. The annual fishing mortality for 2008-2013 for the purse-seine fisheries was then set at the product of the average annual fishing mortality during 2004-2006 and 0.46 (the ratio of catches with the limit to the actual catches.)

For yellowfin tuna, the projections for the purse-seine fisheries assumed the effort level that would produce MSY, while those for the pole-and-line fishery were based on its current level of effort.

It was assumed that the yellowfin catch would not be affected by the bigeye conservation measure, and vice versa.

2.1.2. Longline

For both yellowfin and bigeye, the assumed longline effort during 2008-2013 was the average effort for 2004-2005 multiplied by 0.83.

2.2. Proposal D2a

2.2.1. Purse seine

The average fishing effort during 2004-2006 in the floating-object fisheries (Figure 2) was multiplied by scaling factors to produce the estimated effort corresponding to the spatial closure. Quarterly changes were used for the yellowfin assessment model. The SS2 model used to assess bigeye cannot use quarterly effort data for population projection work. For this reason, the scaling factors for each quarter were converted into annual scaling factors to accommodate the SS2 model (see Annex 2 for a description of the method). Appendix 3 shows an alternative method of calculating the effect of the redistribution of fishing effort away from the closed area.

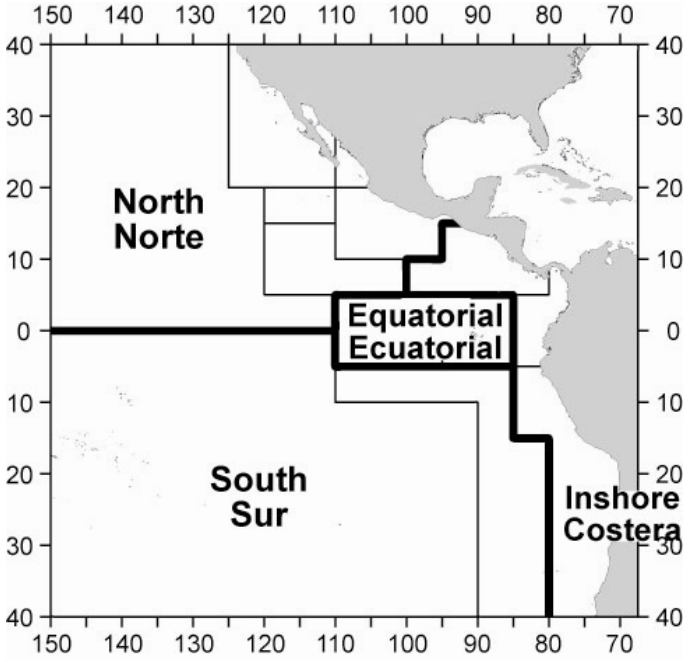

FIGURE 2. The floating-object fishery areas.

The annual scaling factors used for the annual fishing mortality of bigeye during 2008-2013 were:

South	Equatorial	Inshore	North
1.08	0.84	1.08	1.09

The corresponding quarterly scaling factors for fishing effort used for yellowfin were:

	South	Equatorial	Inshore	North
Quarter 1	1	1	1	1
Quarter 2	1	1	1	1
Quarter 3	1.04	0.94	1.04	1.04
Quarter 4	1.31	0.67	1.31	1.31

In addition, the yellowfin catch limit of 290,000 t was implemented by determining the year in which the quota would first be exceeded if there were no other restriction (2008), calculating the proportion of the year during which the purse-seine fisheries on unassociated tunas and tunas associated with dolphins would be closed, and then subtracting this from the purse-seine effort in quarter 4, by fishery. This level of effort was then applied to all years, starting in 2008. During 2004-2006, yellowfin catches on floating objects comprised between 12% and 13% of the total catch on floating objects, and it is likely that reaching the quota would have little effect on vessels fishing on floating objects. It should be noted that, unless all unloadings are scientifically sampled for species composition, the 15% limit, together with the difficulty of distinguishing small yellowfin and bigeye tuna, may lead to underestimation of the catches of yellowfin by individual vessels.

2.2.2. Longline

As for Proposal D1, the assumed longline fishing effort during 2008-2013 was the average effort for 2004-2005 multiplied by 0.83.

2.3. Proposal D3

2.3.1. Purse seine

For bigeye tuna, the annual fishing mortality rate for 2008-2013 is the average annual fishing mortality for 2004-2006 multiplied by (365-73)/(365-42) = 0.90.

For yellowfin tuna, since the projection model works in quarterly time steps, and because most yellowfin fishing during 2004-2006 has been closed during November and December, a closure during the first quarter of the year is used in the projection, reducing the average effort for 2004-2006 by 33/90 starting in 2009.

No attempt was made to simulate the effect of paragraph 3 of the proposal that required that there be no fishing north of 5^{o}N during the November-February closure and none south of 5^{o}N during the August-October closure. During 2004-2006, fewer than 2% of the total number of sets made each year were north of 5^{o}N during the November-December closure and fewer than 10% were south of 5^{o}N during the August-September closure (Annex 4). This suggests that the effect of this part of the proposal would be fairly small.

2.3.2. Longline

The fishing effort rates for 2008-2013 are set at the average for 2004-2005.

3. RESULTS

The results of the evaluations are shown in the plots of fishing mortality rates and spawning stock sizes over time in Figure 4. In each case only the central estimate is shown.

The stock assessments carried out in March 2007 showed that the bigeye stock is currently growing because of good recent recruitment and that, even without any change in the current conservation measures, it would reach the size that will produce the maximum sustainable yield (MSY) in 2008, but

would then decline after 2010. The assessment also indicated a recent increase in yellowfin recruitment, which has a shorter-term effect, but this increase is much less certain.

3.1. Catches

The predicted catches for each proposal, and for the six-week closure established by the current resolution (C-06-02), illustrated in Figure 3, are as follows.

	Bigeye				Yellowfin			
Year	C-06-02	D1	D2a	D3	C-06-02	D1	D2a	D3
2007	83,326	83,326	83,326	83,326	228,857	228,857	228,857	228,857
2008	65,597	31,766	65,673	59,682	302,190	300,394	302,190	296,430
2009	56,111	32,653	56,201	52,792	278,312	278,681	262,161	278,512
2010	53,742	34,598	53,702	51,499	283,018	282,665	279,707	287,759
2011	53,884	36,093	53,650	51,993	282,883	282,164	282,901	288,897
2012	54,100	36,668	53,801	52,301	282,880	282,135	283,111	288,956

Proposal D2a shows a relatively small reduction in bigeye catches compared to the status quo (Resolution C-06-02) because the bigeye catches avoided in the closed area are largely recovered by fishing in other areas. This result depends very much on how the vessels redistribute their effort from the closed area, as further discussed in Annex 3.

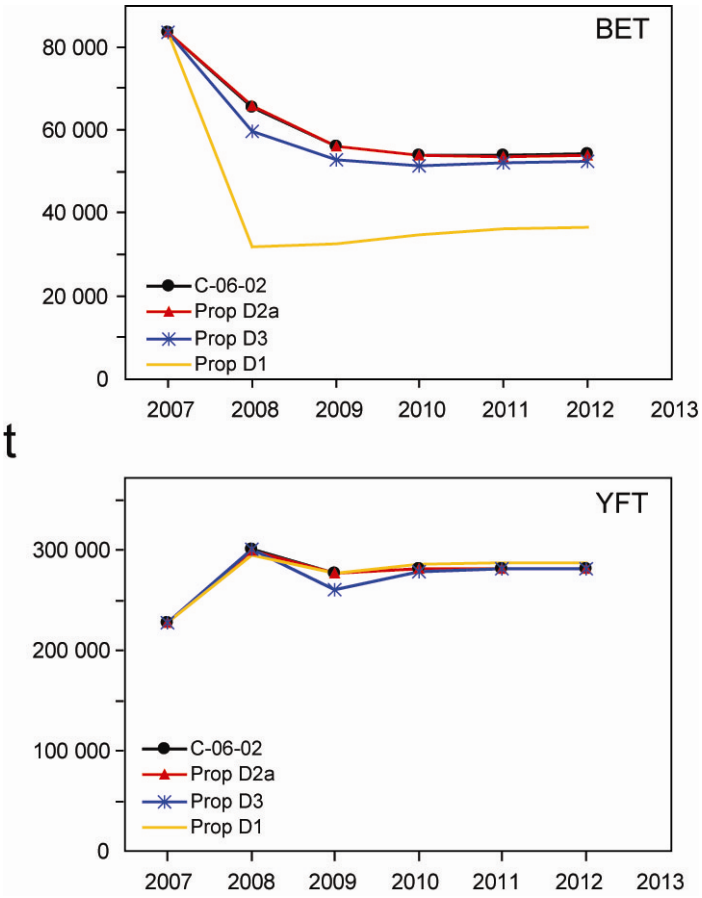

FIGURE 3. Projected catch of bigeye (BET) and yellowfin (YFT) for the current resolution (C-06-02) and Proposals D1, D2a and D3.

3.2. Effect on the stocks

The trends (three-year moving averages) in the trajectories of the estimates of spawning stock size and fishing mortality of bigeye and yellowfin, relative to their AMSY reference points, projected under the three proposals are shown in Figure 4.

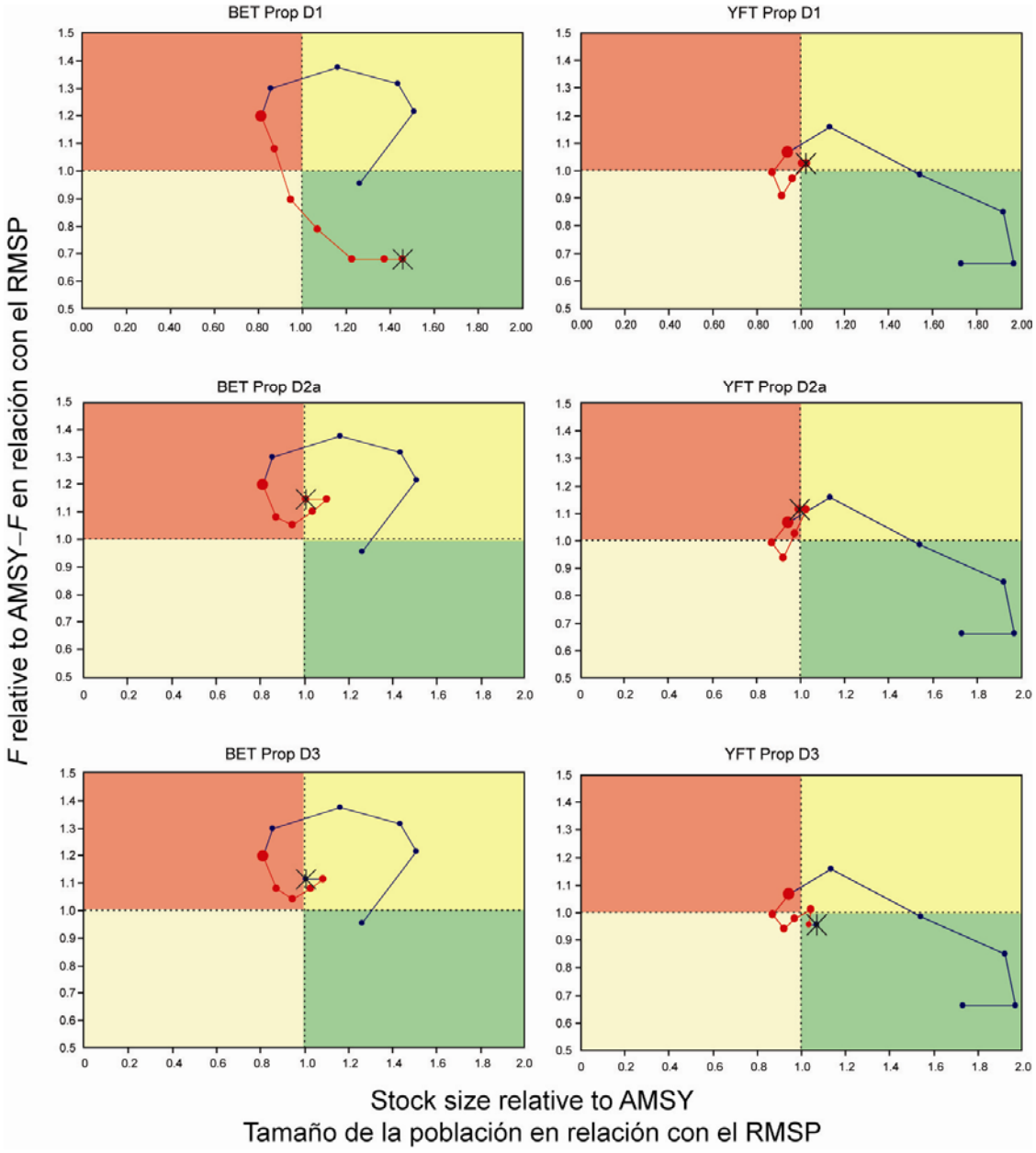

FIGURE 4. Phase plots of the time series of estimates of spawning stock size and fishing mortality (F) relative to their AMSY reference points, projected under proposals D1, D2a and D3 for bigeye (left) and yellowfin (right). The black segments show the past history, and the red the forecast under the three proposals. Each dot represents a running average of three years; the largest red dot represents the most recent estimate (2004-2006), and the black cross the projection for 2010-2012.

3.2.1. Proposal D1

For bigeye, the effect of the proposal would be to rapidly decrease fishing effort to below the level that would produce the MSY and eventually reach 70% of that level. This would allow the stock to increase steadily. In three years it would reach the level that would produce the MSY, and it would grow to nearly 50% more than that level by 2011.

For yellowfin, the fishing mortality rate initially declines for two years, and subsequently increases to about the MSY level. The stock initially declines, but trends towards the level that would produce the MSY during 2007 and 2008.

3.2.2. Proposal D2a

For bigeye, the fishing mortality rate declines during 2008-2009 to about 5% above the MSY level and subsequently increases to about 15% above that level. The stock size increases, reaching the MSY level by about 2008. The stock trend continues upwards for a short time and subsequently declines, due the high fishing mortality rate.

For yellowfin, the fishing mortality rate initially trends below the MSY level, but subsequently increases above than that level. The stock size initially declines, but recovers to the MSY level during 2007 and 2008, and thereafter remains near that level.

3.2.3. Proposal D3

For bigeye, the fishing mortality rate declines over the next two years to about 5% above the MSY level, and subsequently increases to about 10% above that level. The stock size increases, reaching the MSY level by about 2008. The stock continues to trend upwards for a short time and subsequently declines, due to the high fishing mortality rate.

For yellowfin, the full effect of the proposal is not felt until 2009. The average fishing mortality rate

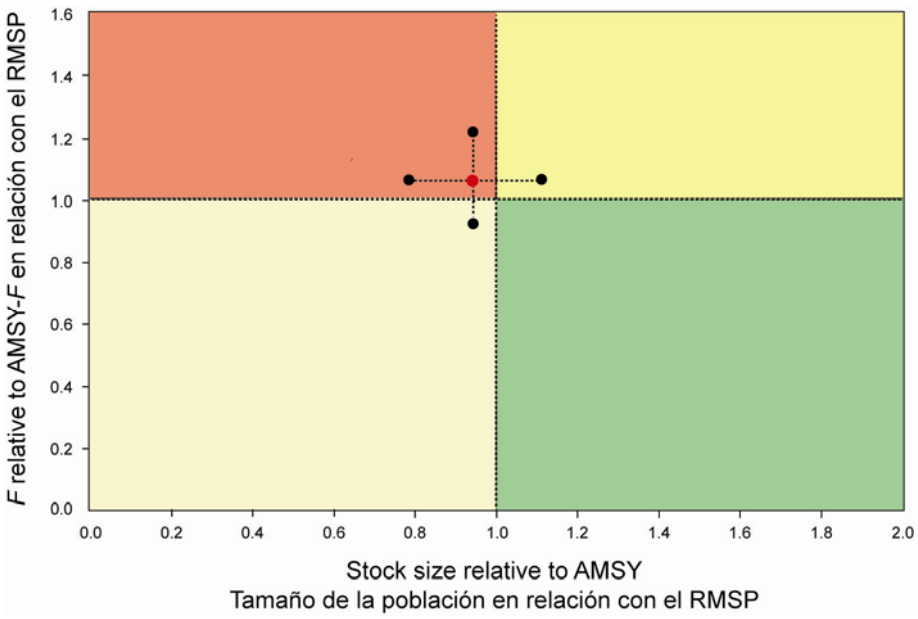

FIGURE 5. Phase plot of estimated fishing mortality (F) and stock size as a ratio of the levels corresponding to AMSY for yellowfin. The values are the averages for 2004-2006, and are based on the recruitment estimated in the stock assessment. The arms of the cross represent approximate 95% confidence intervals.

initially declines below the MSY level but subsequently increases to that level in 2009 and subsequently remains below the MSY level. The stock initially trends downwards but recovers to the level that would produce the MSY during 2007 and 2008 and thereafter remains above that level.

The phase plots in Figure 4 show the best estimates only. Figure 5 shows, for yellowfin, an estimate of uncertainty for the 2004-2006 averages, based on the estimated recruitment in 2006.

4. CONCLUSIONS

For bigeye, the outcome of Proposals D2a and D3 is not substantially different from that of the current conservation measure. The fishing mortality rate will remain above the MSY level (more so in the case of D2a than D3). The stock will continue its short-term increase until about 2010, and then decline. Proposal D1 would reduce the fishing mortality to below the MSY level, and maintain the stock size well above the MSY level.

For yellowfin, the effect of the three proposals on the stock is similar; in each case the stock initially declines and then recovers to the MSY level. After 2008, the fishing mortality rate is maintained near (Proposal D1), above (Proposal D2a), and below (Proposal D3) the MSY level. .

Annex 1a.

PROPOSAL D1

SUBMITTED BY THE UNITED STATES

RESOLUTION ON A MULTI-ANNUAL PROGRAM ON THE CONSERVATION OF TUNA IN THE EASTERN PACIFIC OCEAN FOR 2008, 2009, AND 2010

The Inter-American Tropical Tuna Commission (IATTC), at its 75th Meeting in Cancun, Mexico, in June 2007:

Having responsibility for the scientific study of the tunas and tuna-like species of the eastern Pacific Ocean (EPO), defined as the area bounded by the coastline of the Americas, the 40°N parallel, the 150°W meridian, and the 40°S parallel, and for the formulation of recommendations to Contracting Parties, cooperating non-Parties, fishing entities and regional economic integration organizations (collectively "CPCs") with regard to these tuna resources, and having maintained since 1950 a continuous scientific program directed toward the study of tuna resources;

Recognizes, based on past experience in the fishery, that the potential production from the tuna resource can be reduced by excessive fishing effort;

Being aware with grave concern that, despite the previous conservation and management measures adopted by the Commission, although the catches of bigeye and yellowfin tunas have declined recently, capacity continues to increase and overfishing of bigeye tuna and yellowfin tuna is occurring;

Notes that the tuna resource of the EPO supports one of the most significant surface fisheries for tunas in the world;

Notes the staff's recommendation that the conservation measures for tunas for 2008 should include a closure of the purse-seine fishery of 109 days in order to conserve the stocks of yellowfin and bigeye in the EPO;

Taking into account the best scientific information available, as reflected in the recommendations of the staff and the report of the meeting of the Working Group on Stock Assessments in May 2007; and

Considering that the studies of yellowfin and bigeye tunas presented at this meeting show that the stocks are at a level below that which would produce the average maximum sustainable yield (AMSY);

Resolves as follows:

1. The objective of this Resolution is to reduce fishing levels to levels that will produce the AMSY of yellowfin tuna within three years, and of bigeye tuna within five years.
2. Pole-and-line, troll, and sportfishing vessels are not subject to this resolution.
3. In each one of the years covered by this resolution, the fishery for tunas by purse-seine vessels in the EPO shall be closed for the rest of that year when a total allowable catch (TAC) of 200,000 metric tons of yellowfin tuna is reached. The Director will be authorized to decrease or increase the TAC by no more than four reductions or increments of 30,000 metric tons each, if the Director concludes, from examination of available data, that any such decreases are required to increase the stock to the level producing AMSY or any such increases will pose no significant risk to the stock so as not to fall below the level producing AMSY. Any reduction or increase shall go into effect 30 days after the Director has notified each CPC that the Director has determined such change is appropriate and provided the information upon which the Director's determination was based.
4. In addition, during 2008, 2009, and 2010, each CPC shall limit the annual catch of bigeye tuna by

each one of its purse-seine vessels to no more than 500 metric tons per vessel.

5. Each CPC shall, for purse-seine fisheries:

   a. Before the date of entry into force of the closure, take the legal and administrative measures necessary to implement the closure;

   b. Inform all interested parties in its national tuna industry of the closure;

   c. Inform the Director that these steps have been taken;

   d. Ensure that at the time a closure begins, and for the entire duration of the closure, all purse-seine vessels fishing for yellowfin, bigeye, or skipjack tunas flying its flag, or operating under its jurisdiction, in the EPO are in port, except that vessels carrying an observer from the AIDCP On-Board Observer Program may remain at sea, provided they do not fish in the EPO. The only other exception to this provision shall be that vessels carrying an observer from the AIDCP On-Board Observer Program may leave port during the closure, provided they do not fish in the EPO.

6. Each CPC shall take the measures necessary to control the total annual longline catch of bigeye tuna in the EPO during 2008, 2009, and 2010 by longline vessels fishing under its jurisdiction.

7. China, Japan, Korea, and Chinese Taipei shall take the measures necessary to ensure that their total annual longline catches of bigeye tuna in the EPO during 2008, 2009, and 2010 does not exceed the following levels:

China	2,190 metric tons
Japan	28,283 metric tons
Korea	10,438 metric tons
Chinese Taipei	6,601 metric tons

8. Other CPCs shall take the measures necessary to ensure that their total annual longline catches of bigeye tuna in the EPO during 2008, 2009, and 2010 do not exceed 500 metric tons or their respective catches of bigeye tuna in 2001, whichever is higher.

9. To prohibit landings, transshipments and commercial transactions in tuna or tuna products that have been positively identified as originating from fishing activities that contravene this resolution. The Director shall provide relevant information to the Parties to assist them in this regard. The Commission shall develop transparent and non-discriminatory criteria and procedures to promote compliance in the EPO, consistent with international law, including World Trade Organization agreements and other applicable trade agreements.

10. Catches of bigeye tuna by large-scale longline vessels (> 24 meters in length) that are not landed in ports in the EPO will be verified for the purpose of paragraphs 8-11 through either Commission-approved port sampling programs or at-sea observers. The Director shall determine, and announce to the CPCs, the appropriate level of observer coverage.

11. Each CPC shall, in each of the years covered by this resolution, notify the Director by 15 July of national actions taken to implement this Resolution, including any controls it has imposed on its fleets and any monitoring, control, and compliance measures it has established to ensure compliance with such controls.

12. Each CPC with tuna longline vessels shall provide monthly of reports of longline catches of bigeye tuna to the Director.

13. To evaluate progress towards the objectives of paragraph 2 of this Resolution, in 2008 the IATTC Scientific Working Group will analyze the effects on the stocks of the implementation of Resolution C-06-02, Resolution C-04-09, and previous conservation and management measures, and will

propose to the Commission, if necessary, appropriate measures to be applied in 2009 and thereafter.

14. Each CPC shall comply with this resolution.

Annex 1b.

PROPOSAL D2A

SUBMITTED BY ECUADOR AND SPAIN

RESOLUTION FOR A MULTI-ANNUAL PROGRAM ON THE CONSERVATION OF TUNA IN THE EASTERN PACIFIC OCEAN FOR 2008, 2009, 2010 AND 2011

The Inter-American Tropical Tuna Commission (IATTC):

Recognizing that, based on past experience in the fishery, the potential production from the resource can be reduced by excessive fishing effort;

Recalling that the Resolution on the Conservation of Yellowfin and Bigeye Tuna in the Eastern Pacific Ocean approved by the IATTC at its 69th meeting in Manzanillo, Mexico;

Taking into account the best scientific information available, as reflected in the recommendation of the staff and the report of the meeting of the Working Group on Stock Assessments in May 2004;

Considering that the studies of yellowfin and bigeye tuna presented at this meeting show that both stocks are at a level below that which would produce the average maximum sustainable yield (AMSY);

Considering that for tuna purse-seine vessels smaller than 363 metric tons, the catch level for yellowfin tuna and bigeye tuna are not significant;

Taking into consideration the IATTC staff recommendations in relation to closing areas of high concentrations of juvenile bigeye tuna; and

Recognizing the importance of urging the Western and Central Pacific Fisheries Commission to adopt parallel measures to conserve the tuna stocks in that region;

Resolves as follows:

1. That this resolution is applicable in 2008, 2009, 2010 and 2011 to purse-seine vessels fishing for yellowfin, bigeye, and skipjack tunas, and to longline vessels fishing for yellowfin and bigeye tuna.
2. Pole-and-line and sportfishing vessels, and purse-seine vessels smaller than 363 metric tons are not subject to this resolution.

Purse-seine fishery

3. That the fishery for yellowfin and bigeye tuna by purse-seine vessels in the EPO, defined as the area bounded by the coastline of the Americas, the 40°N parallel, the 150°W meridian, and the 40°S parallel, shall for 2008, 2009, 2010 and 2011 be closed from either (1) 0000 hours on 1 August to 2400 hours on 11 September; or (2) from 0000 hours on 20 November to 2400 hours on 31 December.
4. Each IATTC Party, cooperating non-party, fishing entity or regional economic integration organization (collectively "CPCs") shall for each year concerned, choose which of the two specified periods will be closed to purse-seine fishing by all of its vessels, and notify the Director by 15 July. All the vessels of a national fleet must stop purse-seine fishing in the Convention Area during the period selected.
5. In addition to the closure contained in paragraph 1 of this Resolution, the directed fishery for

yellowfin tuna by purse-seine vessels in the EPO shall be closed for the rest of that year when a total allowable catch (TAC) of 290,000 metric tons of yellowfin tuna is reached. After the TAC has been reached, the landings of fisheries not targeting yellowfin tuna may include a maximum of 15% of yellowfin tuna relative to its total catch for all species caught.

6. Every vessel that fishes in 2008, 2009, 2010 and 2011, regardless of the flag under which it operates or whether it changes flag during the year, must observe the closure period to which it committed on 15 July of each year.

7. To prohibit landings, transshipments and commercial transactions in tuna or tuna products that have been positively identified as originating from fishing activities that contravene this resolution. The Director may provide relevant information to the Parties to assist them in this regard. The Commission shall develop transparent and non-discriminatory criteria and procedures to adopt trade restrictive measures consistent with international law and the provisions of the World Trade Organization to promote compliance in the EPO.

8. Each CPCs shall, for purse-seine fisheries:

   8.1. No later than 45 days before the date of entry into force of a closure:

      8.1.1. take the legal and administrative measures necessary to implement the closure;

      8.1.2. inform all interested parties in its national tuna industry of the closure;

      8.1.3. inform the Director that these steps have been taken.

   8.2. Ensure that at the time the closures begin, and for the entire duration of the closures, all purse-seine vessels fishing for yellowfin, bigeye and skipjack tunas flying its flag in the EPO are in port, except that vessels carrying an observer from the AIDCP On-Board Observer Program may remain at sea provided they do not fish in the EPO. The only other exception to this provision shall be that vessels carrying an observer from the AIDCP On-Board Observer Program may leave port during the closure, provided they do not fish in the EPO.

9. In order to reduce the level of catches of juvenile bigeye tuna, the area bounded by the 94ºW meridian, the 3ºN parallel, the 110ºW meridian, and the 5ºS parallel shall be closed to purse-seine vessels greater than 363 metric tons from 0000 hours on 1 August to 2400 hours on 31 December.

Longline Fishery

10. China, Japan, Korea, and Chinese Taipei, shall take the measures necessary to ensure that their total annual longline catch of yellowfin tuna in the EPO during 2008, 2009 and 2010 will not exceed the following catch levels.

China	1,419 metric tons
Japan	7,297 metric tons
Korea	3,016 metric tons
Chinese Taipei	3,770 metric tons

Other CPCs shall take the measures necessary to ensure that their total annual longline catch of yellowfin tuna in the EPO during 2008, 2009 and 2010 will not exceed 83% of their respective 2001 catch levels or 500 metric tons, whichever is the higher[1]. Each CPC with large-scale tuna longline vessels (LSTLVs)[2] shall provide monthly catch reports to the Director.

[1] The Parties acknowledge that France, as a coastal State, is developing a tuna longline fleet on behalf of its overseas territories situated in the EPO.

[2] Defined as vessels of more than 21 meters length overall.

11. China, Japan, Korea, and Chinese Taipei shall take the measures necessary to ensure that their total annual longline catch of bigeye tuna in the EPO during 2008, 2009 and 2010 will not exceed the following catch levels.

China	2,190 metric tons
Japan	28,283 metric tons
Korea	10,438 metric tons
Chinese Taipei	6,601 metric tons

Other CPCs shall take the measures necessary to ensure that their total annual longline catch of bigeye tuna in the EPO during 2008, 2009 and 2010 will not exceed 83% of their respective 2001 catch levels or 500 metric tons, whichever is the higher. Each CPC with LSTLVs shall provide monthly catch reports to the Director.

12. The IATTC Scientific Working Group will analyze, in 2008 and 2009, the effect of these measures on the stocks, and will propose, if necessary, appropriate measures to the Commission in 2008 and 2009 for its consideration.

13. Each CPC shall comply with this resolution.

14. This resolution replaces Resolution C-06-02.

Annex 1c.

PROPOSAL D3

SUBMITTED BY MEXICO

RESOLUTION ON A MULTI-ANNUAL PROGRAM FOR THE CONSERVATION OF TUNA IN THE EASTERN PACIFIC OCEAN IN 2008

The Inter-American Tropical Tuna Commission (IATTC):

Having responsibility for the scientific study of the tunas and tuna-like species of the eastern Pacific Ocean (EPO), defined as the area bounded by the coastline of the Americas, the 40°N parallel, the 150°W meridian, and the 40°S parallel, and for the formulation of recommendations to Contracting Parties, cooperating non-Parties, fishing entities and regional economic integration organizations (collectively "CPCs") with regard to these tuna resources, and having maintained since 1950 a continuous scientific program directed toward the study of tuna resources;

Recognizes, based on past experience in the fishery, that the potential production from the tuna resource can be reduced by excessive fishing effort;

Notes that the tuna resource of the EPO supports one of the most significant surface fisheries for tunas in the world;

Taking into account the best scientific information available, as reflected in the recommendations of the staff and the report of the meeting of the Working Group on Stock Assessments in May 2007; and

Considering that the studies of yellowfin and bigeye tunas presented at this meeting show that the stocks are at a level below that which would produce the average maximum sustainable yield (AMSY);

Aware that Resolutions C-04-09 and C-06-02 on the conservation of tunas in the EPO, establish conservation measures for the 2004-2007 period and that they expire; and

Furthermore, that the scientific staff has stated the need to establish management measures that include those applied by the Resolutions cited in the previous paragraph, which included a 6-week closure period in the purse-seine fishery and catch levels that must not exceed those of 2001 for the longline fishery;

Resolves as follows:

1. This resolution is applicable in 2008 to all purse-seine and longline fisheries for tunas in the EPO.
2. The closure period for the purse-seine fishery will be extended in that season by 31 additional days for a total of 73 days, starting on 20 November 2007 and finishing on 2 February 2008.
3. In the event that there are two closure periods in the EPO, to ensure the effectiveness of the closures, those vessels that choose the closure period during August-October of the year shall not be able to fish north of the 5ºN parallel when this area is closed. Reciprocally, vessels that choose the closure in the November-February period will not be able to fish south of that parallel during the time that that area is closed.
4. Each CPC shall, for purse-seine fisheries:
   a. Before the date of entry into force of the closure, take the legal and administrative measures necessary to implement the closure;
   b. Inform all interested parties in its national tuna industry of the closure;
   c. Inform the Director that these steps have been taken;
   d. Ensure that at the time a closure begins, and for the entire duration of the closure, all purse-seine vessels fishing for yellowfin, bigeye, or skipjack tunas flying its flag, or operating under its jurisdiction, in the EPO are in port, except that vessels carrying an observer from the AIDCP On-Board Observer Program may remain at sea, provided they do not fish in the EPO. The only other exception to this provision shall be that vessels carrying an observer from the AIDCP On-Board Observer Program may leave port during the closure, provided they do not fish in the EPO.
5. To prohibit landings, transshipments and commercial transactions in tuna or tuna products that have been positively identified as originating from fishing activities that contravene this resolution. The Director shall provide relevant information to the Parties to assist them in this regard. The Commission shall develop transparent and non-discriminatory criteria and procedures to promote compliance in the EPO, consistent with international law, including World Trade Organization agreements and other applicable trade agreements.
6. Each CPC with tuna longline vessels shall provide monthly of reports of longline catches of bigeye tuna to the Director.
7. All vessels that fish on FADs shall mark (number) these devices and maintain a record of the number of FADs and beepers aboard at the beginning and end of the fishing trip, also information shall be recorded on the position of the FAD at the time it is deployed in the water and if applicable when it is recovered. In every possible case FADs will be recovered.
8. The IATTC staff shall determine the incremental vulnerability that leaving FADs at sea implies and their impact on the yield per recruit, and if applicable recommend appropriate measures.
9. Each CPC shall comply with this resolution.

Annex 2.

METHOD USED TO ESTIMATE THE BIGEYE ANNUAL FISHING MORTALITY SCALING FACTORS TO SIMULATE A SPATIAL CLOSURE (PROPOSAL D2a) IN THE SS2 MODEL

The current effort in the floating-object fisheries (Fisheries 2-5, corresponding to the South, Equatorial, Inshore, and North areas, respectively) and associated discard fisheries (Fisheries 10-13) was multiplied

by scaling factors to produce the new effort corresponding to the spatial closure. The scaling factors for each quarter ($w_{f,q}$) were converted into annual scaling factors (r_f) to accommodate the bigeye assessment model (SS2), which cannot use different effort for different quarters of the year.

$$r_f = \frac{\sum_q w_{f,q}\mu_{f,q}}{\sum_q \mu_{f,q}}$$

where $\mu_{f,q}$ is the average effort during quarter q in fishery f during 2004 to 2006.

The quarterly effort scaling factors ($w_{f,q}$) were calculated by redistributing the effort from inside the closed area to outside the closed area. The quarterly scaling factor is calculated as the undistributed effort in that fishery ($e_{f,q}$) plus the effort redistributed to that area ($x_{f,q}$). The closure occurs in quarters 3 and 4 only.

$$w_{f,q} = \begin{cases} 1 & q = \{1,2\} \\ \dfrac{e_{f,q} + x_{f,q}}{\mu_{f,q}} & q = \{3,4\} \end{cases}$$

The unredistributed effort for each fishery is equal to the effort for that fishery, except for the Equatorial fishery, which contains the proposed closure area; in the Equatorial fishery, the unredistributed effort is equal to the proportion of the effort in this fishery outside the closed area. The proportion of the effort that is redistributed also depends on the fraction of the quarter during which the closure is in force (τ_q).

$$e_{f,q} = \begin{cases} \mu_{f,q} & f = \{2,4,5\} \\ \mu_{f,q}\left(1 - p_{redist}\tau_q\right) & f = \{3\} \end{cases}$$

in which

$$\tau_q = \begin{cases} 0 & q = \{1,2\} \\ 19/92 & q = \{3\} \\ 1 & q = \{4\} \end{cases}$$

and the portion of effort inside the closure area is

$$p_{redist} = \frac{1}{2006 - 1994 + 1} \sum_{t=1994 to 2006} \frac{S_{inside, f=3,t}}{S_{f=3,t}}$$

where $S_{f=3,t}$ is the number of sets in the Equatorial fishery in year t and $S_{inside,\ f=3,t}$ is the number of sets in the Equatorial fishery made inside the closure area in year t, all calculated for the 12 September-31 December period.

The effort redistributed from the Equatorial fishery is equal to the proportion of the total effort in the Equatorial fishery 3 that is made inside the closed area.

$$x_{f,q} = \mu_{f=3,q} p_{redist} \tau_q \frac{e_{f,q}}{\sum_f e_{f,q}}$$

Annex 3.

CHANGE IN ANNUAL CATCHES OF TUNA RESULTING FROMTHE SPATIAL CLOSURE IN PROPOSAL D2a

The change in the annual catch of bigeye associated with the area closure in Proposal D2a (section 2.2) was estimated by incorporating the change in fishing effort resulting from the closure into the SS2 bigeye stock assessment model (Annex 2), and estimating the projected catch. A shortcoming of the SS2-based method is that estimates of the changes in the catches of other tuna species cannot be made.

An alternative method was applied in order to simultaneously evaluate the effect of the spatial closure on the catches of bigeye, yellowfin and skipjack. The method estimates the change in catch of all three species resulting from the reallocation of the fishing effort inside the closed area to outside that area, using catch per unit effort (CPUE) data.

The area closure covers the period from 1 August to 31 December, and overlaps with the two 6-week closures in the current resolution (1 August-11 September and 20 November-31 December); therefore, the closure period that is additional to the resolution closures is 111 days, either from 12 September to 31 December or 1 August to 19 November.

The analysis evaluated the effect of the proposed closure for three different reallocation scenarios of the sets in the closed area:

Scenario 1: All sets affected by the closure are 'lost' fishing effort; these sets are not redistributed outside the closure area.

Scenario 2: All sets in the closed area are redistributed outside this area with no change of set type, with the corresponding average catch per set.

Scenario 3: All sets in the closed area are redistributed outside with no restrictions on set type. The effort in the closed area is transferred outside to different set types (dolphin, floating-object, or unassociated) in proportion to their occurrence.

Figure A3.3. shows the estimated change in the annual catches of bigeye, yellowfin, skipjack and total tuna which result from the spatial closure, for these three scenarios.

This analysis indicates that the proposed spatial closure would not result in a significant reduction in the catch of bigeye; the maximum predicted reduction is around 8,000 t, under scenario 2. Therefore, it is not surprising that the SS2-based evaluation of the closure (Annex 2), which incorporates yield-per-recruit effects, also showed a minor impact when compared to the effect of the current resolution. Previous analyses carried out by Commission staff have also indicated that any spatial closures to meet the management requirements for bigeye tuna would have to cover too large an area or be too long to be practical (Harley *et al.* 2007. Fishery Bulletin 105:49–61).

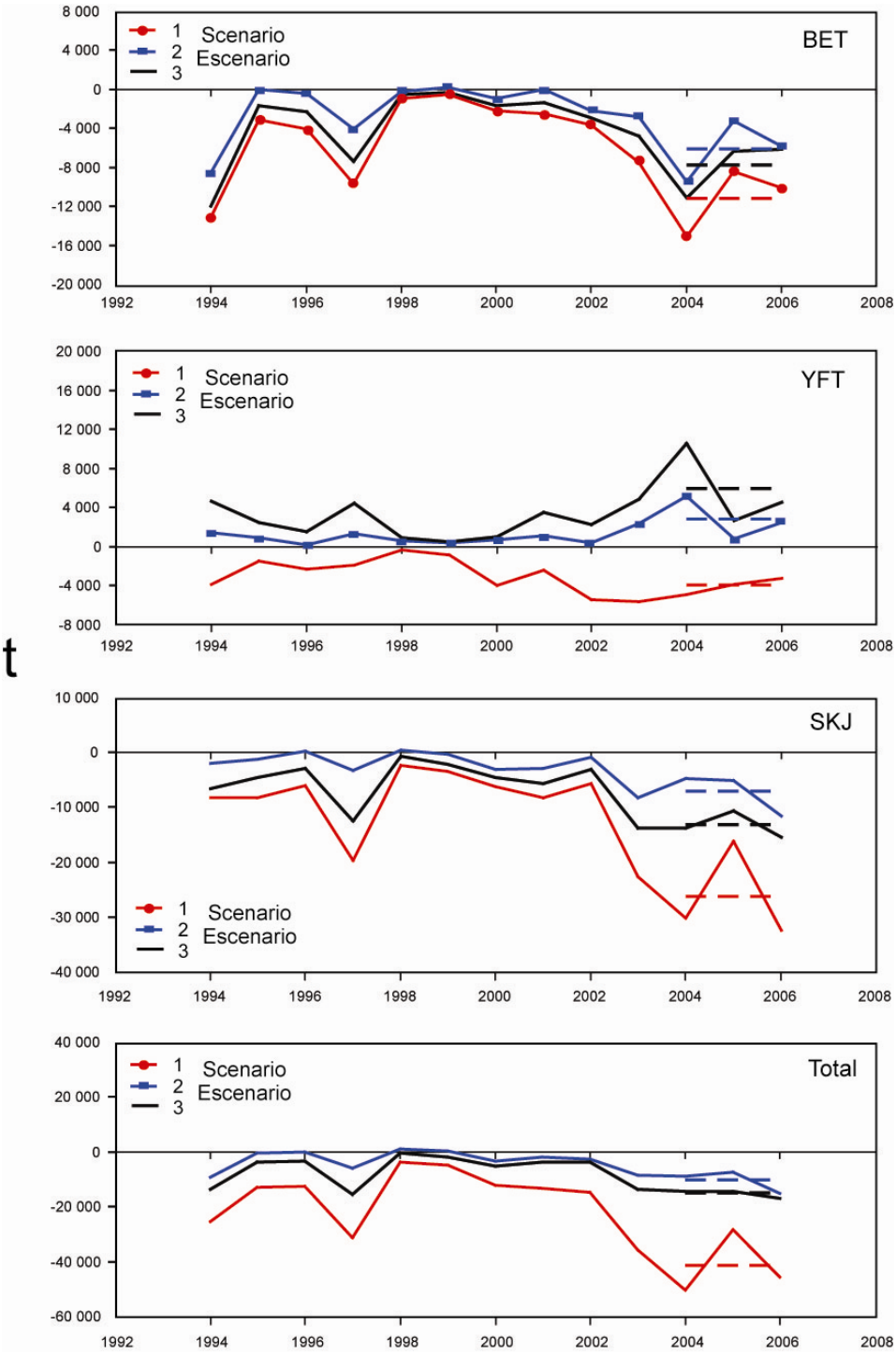

FIGURE A3.3. Change in annual catches of bigeye, yellowfin, skipjack and total tuna resulting from the spatial closure, for the three scenarios. The horizontal dashed lines are the average change in annual catch during 2004-2006 for each scenario.

Figure A.3.4. shows the average impact of the spatial closure during 2004-2006 on the annual catches of bigeye, yellowfin, and skipjack, by size category, when the fishing effort is reallocated to the same set type only outside the closure area (scenario 2) .

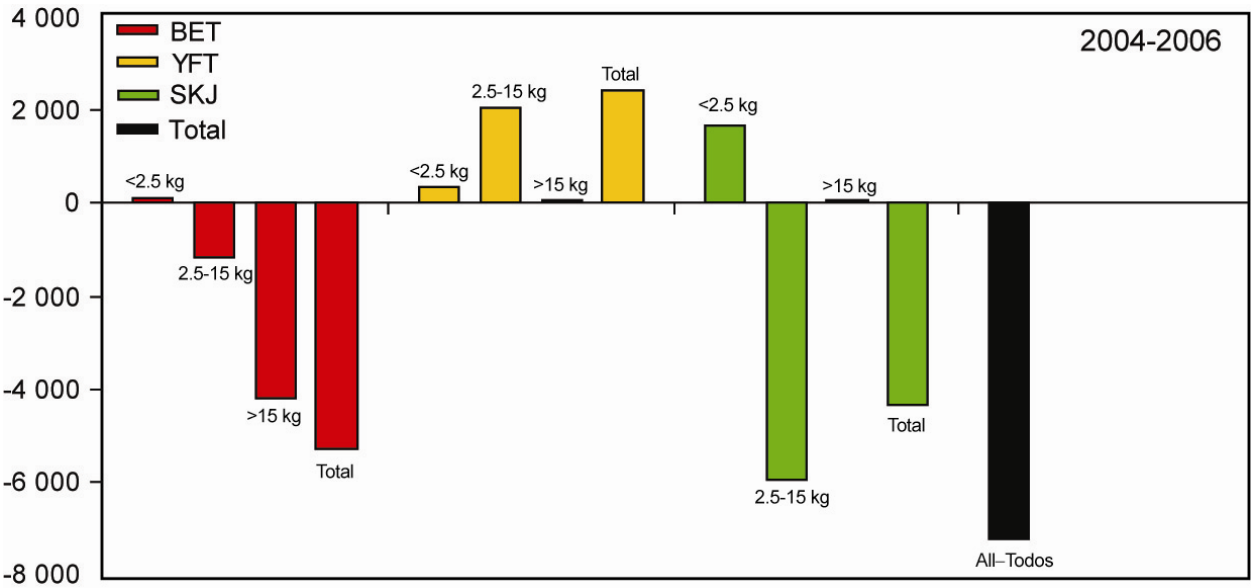

FIGURE A3.4. Average change in annual catch, 2004-2006, by size category, for bigeye, yellowfin, skipjack, when fishing is reallocated to the same set type only outside the closure area (scenario 2).

Annex 4.

ADDITIONAL INFORMATION FOR THE EVALUATION OF PROPOSAL D3

Proposal D3 includes restrictions on fishing north and south of 5ºN. This annex presents the proportions of sets (all types) and yellowfin catches that occur north of 5ºN in different periods of management interest.

Figure A3.1 presents the annual proportions of set numbers (all types combined) north and south of 5ºN in four different periods of the year. The data for the fourth period (20 November–31 December) are shown separately in Figure A3.2.

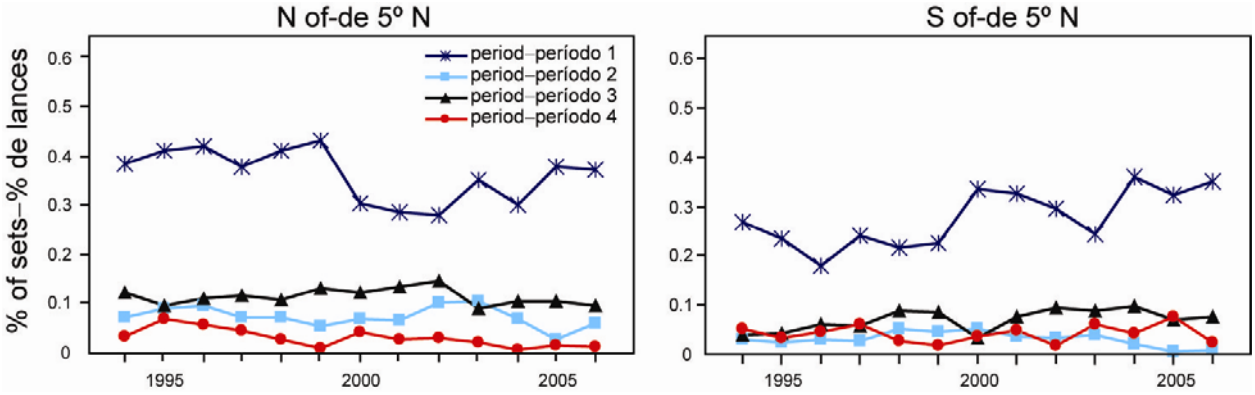

FIGURE A3.1. Annual proportions of set numbers (all types combined) north and south of 5ºN during different periods of management interest: (1) 1 January–31 July; (2) 1 August–11 September; (3) 12 September–19 November; (4) 20 November– 31 December.

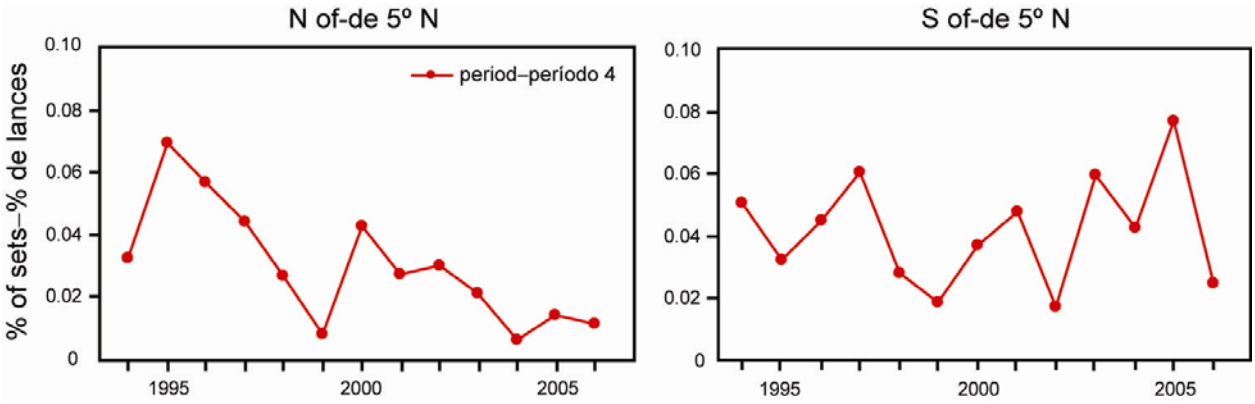

FIGURE A3.2. Annual proportions of set numbers (all types combined) taking place during period 4 (20 November–31 December), north and south of 5ºN.

The annual proportions of the yellowfin catch (all set types combined) north and south of 5ºN in the four periods of management interest are shown in Figure A3.3. The data for period 4 (20 November–31 December) are shown separately in Figure A3.4.

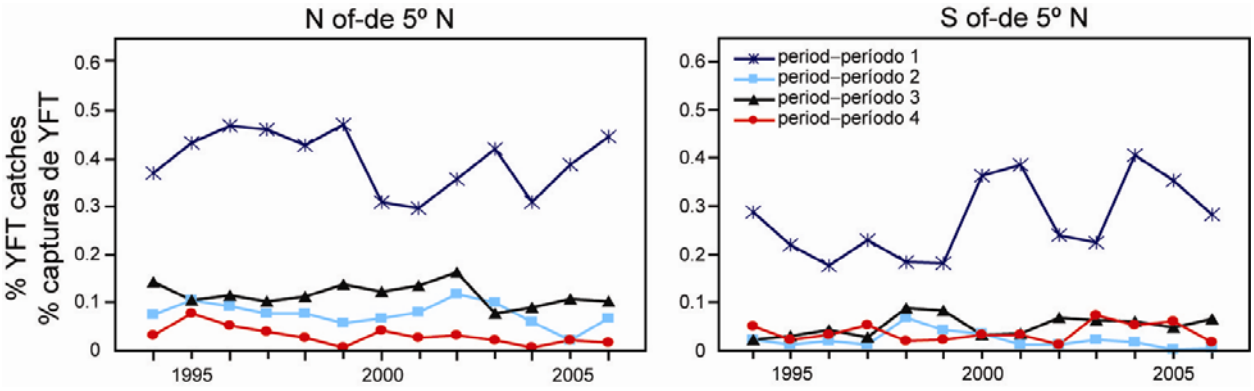

FIGURE A3.3. Annual proportions of yellowfin catch (all set types combined) north and south of 5ºN in four periods: (1) 1 January–31 July; (2) 1 August–11 September; (3) 12 September–19 November; (4) 20 November– 31 December.

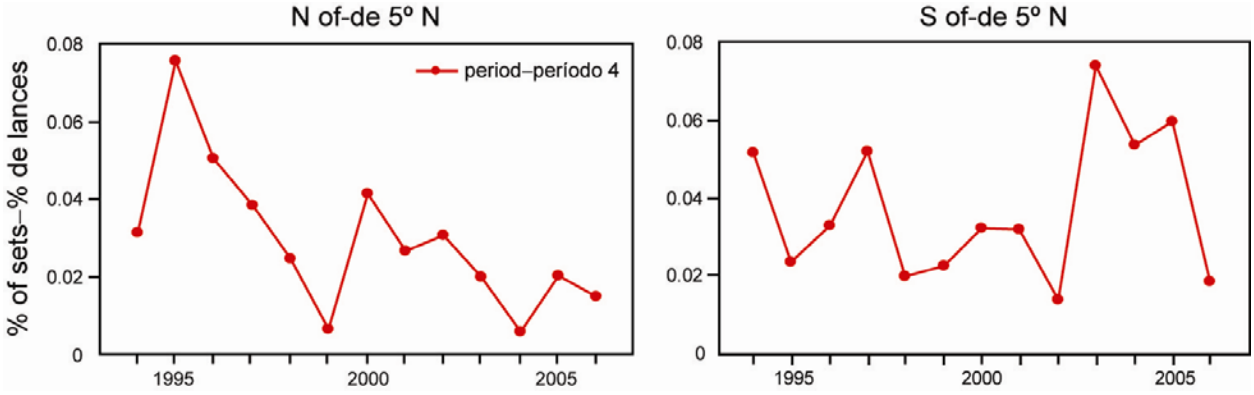

FIGURE A3.4. Annual proportions of yellowfin catch (all set types combined) taken during period 4 (20 November–31 December) north and south of 5ºN.