
UPDATE ON ESTIMATES OF THE CATCH REDUCTIONS ACHIEVED THROUGH THE APPLICATION OF THE TIME/AREA CLOSURES PROPOSED IN IOTC RESOLUTION 10/01

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Purpose

To provide an update to the Scientific Committee on the status of catches for the time-area closure in IOTC Resolution 10/01, and assess the impact of the moratorium on total catches of the Indian Ocean.

Background

IOTC Management Resolution 10/01 (FOR THE CONSERVATION AND MANAGEMENT OF TROPICAL TUNAS STOCKS IN THE IOTC AREA OF COMPETENCE) defines a closed area for fishing from 0 ° - 10° North and 40° - 60° East for the month of November for purse seine (PS) and February for longline (LL) fisheries, and which came into effect in 2011.

Effect of moratorium on total catch (all species)

Potential gains of the time-area closure, in terms of the reduction in total catches for the historical time series – had the closure been in force, can be evaluated on the basis of two scenarios:

1. Relocation of effort to areas outside of closure area:

- Effort reported for the closure area is reassigned to areas outside the moratorium, based on the share of total effort across the I.O. The total catch is then recalculated based on the assumption that any effort reallocated achieves the same mean nominal CPUE as fleets operating in each area the effort is assigned to, for the period of closure.
- The scenarios assume, rather simplistically, that the redistribution of effort is reassigned proportionate to the total effort across the Indian Ocean, rather than using a more complex reallocation criterion – mostly due to lack of information on fleet-area dynamics.

2. Elimination of effort within the closure area:

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- Effort (and associated catch) reported for the closure area is deducted from the total for the I.O.
 - The scenario assumes no redistribution of effort – which is highly unlikely, i.e., all effort within the closure area would disappear rather than be completely or partially reallocated to other areas.

The maximum catch reductions for each scenario, for all species, relative to the total catches for historical catch series, are plotted by year in Fig. 1a, where:

- gain is defined as the decrease in total catch that is achieved through the time-area closure of the moratorium (i.e., increase to stocks biomass, either from the elimination of fishing effort in the closed area, or the reallocation of effort to areas with lower mean catch rates outside of the closed area);
- loss is defined as the increase in total catch has the time-closure been in place (i.e., decrease in stocks biomass, which can only occur if fishing effort reallocates to areas with higher mean catch rates).

As the moratorium came into effect in 2011, the elimination or reallocation of effort from closure is essentially zero from 2011 onwards. Positive values indicate that total catches would have decreased as a result of the closure; negative values that total catches would have increased directly as a result from the closure.

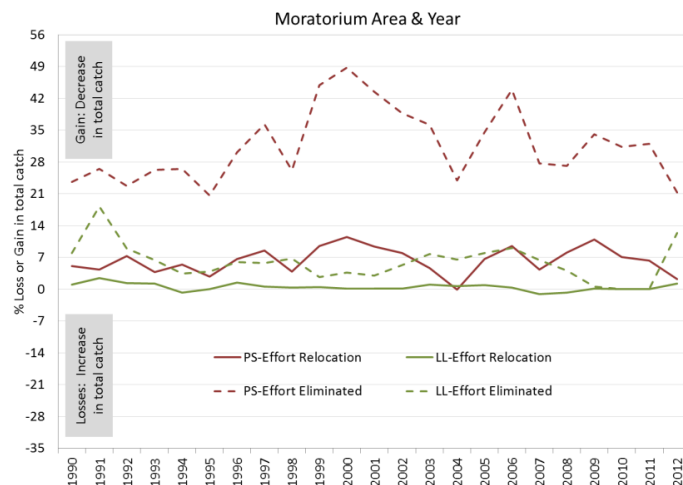
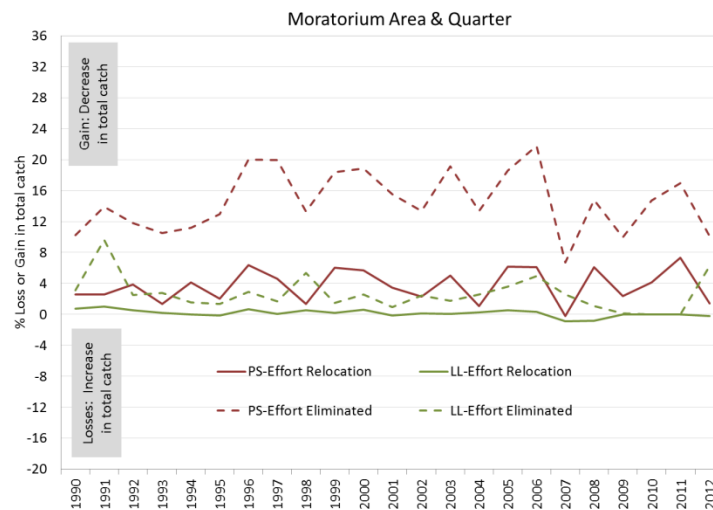
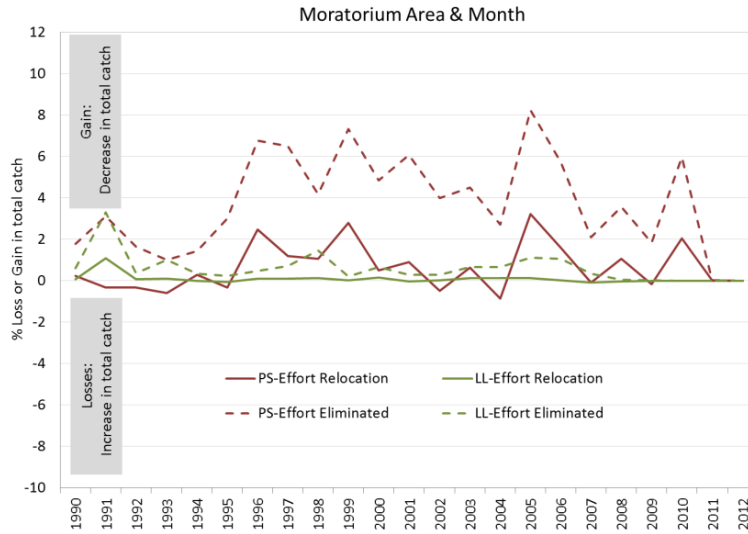
Figs. 1a & 1b also includes equivalent plots showing the effect on total catch assuming the closure was extended to the calendar quarter of the current moratorium (Oct-Dec for PS, and Jan-Mar for LL) (Fig. 2), and for the whole year (Fig. 3).

Results

The overall trends are generally identical for each of the three time periods and fisheries, with the main difference the magnitude of catch which increases relative to the duration under consideration:

- The greatest gains (i.e., decrease in total catch) are associated with the elimination of effort from the closure area, for both the PS and LL fleets. In the case of the quarterly and whole year closure, the potential gain is estimated by as much as 30%-50% of the total catch. However, as already noted, it is highly unlikely that the moratorium would eliminate rather than displace fishing effort.
- In comparison, the relocation of effort from the closed area appears to have close to zero or negligible gains on the reduction of total catches, with very little variance in the loss/gain for each of the time periods considered in contrast to the elimination of effort.

Figs. 1a-1c. Change in total catch for selected PS/LL fleets affected by the moratorium (1 month, 1quarter, whole year), in relation to effort elimination and effort relocation.



Effect of moratorium on main tuna species

The impact of the time-area closure was also assessed for the main tuna species (YFT, BET and SKJ) using the same methods – applying the two scenarios (effort elimination and effort relocation) to the historical time series for the PS fleet (1990-2012), for the one-month period of the moratorium only (Figs. 2a and 2b).

The results are similar to the analysis for all species combined, i.e.:

- the largest gains from the closure are again from the elimination rather reallocation of effort, as compared to the baseline total catch (no moratorium effect);
- although the variance in gain is greater than for all species combined, for most years there is only a relatively small reduction in the total catch for most years – on average between 3% to 5% decrease in total catch for all three tuna species with effort elimination, compared to between -0.3% to 1.4% for effort relocation (Table 1).

Figs. 2a-2b. Change in total catch for main tuna species from moratorium, assuming effort elimination or effort relocation.

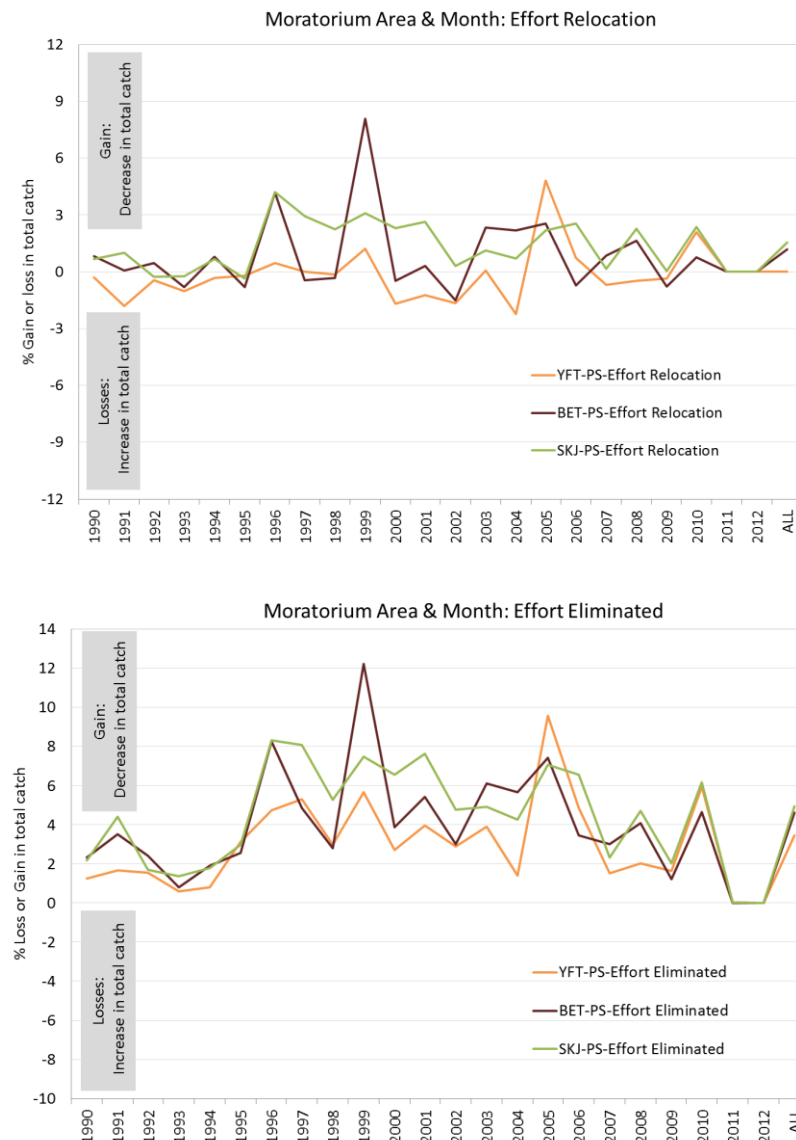


Table 1. Change in total catch for main tuna species as a result of the moratorium. Positive values indicate the maximum catch reduction if the closure had been applied historically; negative values indicate catches would have increased if the closure had been in place.

	Effort relocated			Effort eliminated		
	YFT-PS	BET-PS	SKJ-PS	YFT-PS	BET-PS	SKJ-PS
1990	-0.3	0.8	0.7	1.3	2.3	2.2
1991	-1.8	0.1	1.0	1.7	3.5	4.4
1992	-0.4	0.5	-0.3	1.5	2.4	1.7
1993	-1.0	-0.8	-0.2	0.6	0.8	1.4
1994	-0.3	0.8	0.7	0.8	1.9	1.8
1995	-0.2	-0.8	-0.4	3.1	2.6	3.0
1996	0.5	4.2	4.2	4.7	8.3	8.3
1997	0.0	-0.5	2.9	5.3	4.9	8.1
1998	-0.1	-0.3	2.2	3.0	2.8	5.3
1999	1.2	8.1	3.1	5.7	12.2	7.5
2000	-1.7	-0.5	2.3	2.7	3.9	6.6
2001	-1.2	0.3	2.6	4.0	5.4	7.6
2002	-1.7	-1.5	0.3	2.9	3.0	4.8
2003	0.1	2.3	1.1	3.9	6.1	4.9
2004	-2.2	2.2	0.7	1.4	5.7	4.3
2005	4.8	2.5	2.2	9.6	7.4	7.1
2006	0.7	-0.7	2.5	4.9	3.5	6.6
2007	-0.7	0.8	0.1	1.5	3.0	2.3
2008	-0.5	1.6	2.3	2.0	4.1	4.7
2009	-0.3	-0.8	0.0	1.6	1.2	2.0
Average % (1990-2009)	-0.3	0.9	1.4	3.1	4.3	4.7
Max %	4.8	8.1	4.2	9.6	12.2	8.3
Min %	-2.2	-1.5	-0.4	0.6	0.8	1.4

Conclusion

As with previous assessments of the closure area presented to Scientific Commission, it is difficult to accurately evaluate the effects of the moratorium due to a limited understanding of fleet movements and the response to a time-area closure (i.e., why do the vessels operate where they do, and what would they do differently if there was a closed area), as well as the dynamics of the fish population given that tuna species migrate long distances very quickly.

However the analyses presented here confirms the advice by the SC in 2012 to the Commission (SC15, paras. 224-225) that the current closure area, as defined in Resolution 10/11, is likely to be ineffective. There appears to be little evidence that the closure is enabling a spatial refuge and helping creating a positive gain in fish stocks; also that any positive impacts of the moratorium within the closed area are mostly likely offset by effort reallocation to other fishing grounds in the Indian Ocean.

There is mixed evidence between species that extending the duration of the moratorium, e.g., to a quarterly basis each year or for a whole year, would deliver any additional benefits in terms of the proportion of total catch reduction. While the catches of tropical tunas inside the moratorium area increase significantly when closure is extended beyond one month, the increase to stocks biomass is based on the assumption of effort elimination in the closure area, while the majority of effort will most likely be redistributed to other areas and result in zero gain in catches. The reality is that extending the period of closure is unlikely to provide any benefit to the stocks of tropical tunas.

To develop a general tool for more accurately evaluating the effect of time/area closures – specifically, the impact of the reallocation of fishing effort – requires an improved understanding of the fleet and fish dynamics. The movement rates of the fish would become increasingly important if larger times and areas were considered. Fleet behaviour and oceanographic effects on the fish distribution will probably not be easy to predict accurately, even if historical observations can be explained. In addition, it is important to note the effects that piracy in the area off Somalia has had on the dynamics of both purse seine and longline fleets since 2007. They include a marked reduction of fishing effort from both fleets, in particular the longline fleet, in the entire western tropical Indian Ocean, and overall in the entire Indian Ocean region, due to the movement of many vessels to other oceans².

² The effects of piracy are reported in a separate document: IOTC-2013-SC16-13