The potential role of pelagic Marine Protected Areas for tropical tunas in the Indian Ocean

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Background

The potential use of pelagic MPAs as a tool for managing tuna fisheries was briefly explored in information papers IOTC-2009-WPTT-Inf05a-c submitted to the WPTT in Mombassa (and in various other scientific documents such as ICCAT SCRS/2006/049). Key issues include the potential value of MPAs as conservation tools for tuna and how they can be targeted to achieve any conservation aims, and the costs and benefits of MPAs. It should also be noted that closed areas have been already used by various tuna RFMO's but without being based on in-depth scientific studies. Are they a suitable tool within the IOTC convention, i.e. for sustainable use of tuna resources?

MPAs as a conservation tool for tunas

RTTP-IO summarised in IOTC-2009-WPTT-R demonstrates that Indian Ocean tunas are highly migratory and that for each of the key principle species of yellowfin tuna, bigeye tuna and skipjack tuna a single population (stock) is believed to occur throughout the Indian Ocean.

In order to achieve conservation benefits for tunas pelagic MPAs must be 'unrealistically large' (FAO 2007-2009). Stefansson and Rosenberg (2005; 2006) indicate that for migratory species MPAs need to close half the area and half the biomass as a minimum size of closure needed in combination with other management measures (quotas and effort controls) in order to conserve fishery yields. They also showed that having fewer larger areas is more efficient than having a network of smaller areas.

The requirement for a large closed area is dependent among other factors on the species involved (e.g. skipjack and bluefin are totally different and have different stock recruitment relationships), the degree of migration, and may be modified by the type of closed area: e.g. to protect known feeding, spawning or migration aggregations (see next section). However, Stefansson and Rosenberg (2006) explicitly include adult migration and dispersal of reproduction accounting for a spawning migration of 3 months and dispersal during other months to other areas in their evaluation of the requirements for MPAs for migrating fish stocks. The need for fewer larger areas is in order to reduce edge effects and the displacement of fishing activities to the boundaries of the MPA.

Can targeting the location of MPAs provide a solution?

The requirement for very large MPAs suggests that an approach targeting spawning or nursery areas, or targeting areas of known concentrations of protected, endangered or threatened (PET) species, or simply areas selected because of their high biological diversity, may offer an alternative solution.

WPTT04-05 IOTC Proceedings no. 7 (2004) and IOTC-2005-WPTT-14 based on data collected from longliners indicated that in the Indian Ocean the peak spawning period for bigeye tuna and yellowfin tuna was June and December to January, and November to April respectively. Analysis of the IOTC database indicates that longline fishing mainly occurs along the equator and is evenly spread across the ocean from Africa to Indonesia during November and December indicating widespread distribution of spawners. Unpublished data collected through French observer programmes on purse seiners supports the observations from longliners for the period of peak spawning. European purse seining is currently confined to the western Indian Ocean but also confirms a wide distribution of spawners in the west of the Indian Ocean equatorial zone. Skipjack tuna do not exhibit feeding migrations and spawns all year around without showing clear spawning site fidelity (Stequert and Rancharrum, 1996) . In summary, there are neither clearly defined nursery areas nor spawning seasons for any of the principle species in the Indian Ocean.

Areas of particular fishing activity that result in significant bycatch of either juveniles of target species or PET species could potentially be locations where MPAs could be situated. Purse seine fishing with FADs is known to target skipjack, but also removes a significant bycatch of juveniles of yellowfin and bigeye tunas. Whilst fishing with FADs is more concentrated in the western Indian Ocean in the Mozambique Channel and off the east African coast, FADs both natural and artificial, are found and used widely throughout the Indian Ocean, (see IOTC-2009-WPTT-19). FADs have a higher incidence of bycatch than free schools (5% vs 1% respectively, IOTC–2009–WPEB–21) but longlines typically take about 20% non target species (often much more, as in the longline fisheries targeting swordfish). Like purse seines with FADs, longliners operate widely throughout the inter-tropical areas of the Indian Ocean. More research is required to establish if any particular hotspots of bycatch activity or any areas of concentrations of PET species occur. Pelagic oceanic shark species taken as bycatch on longlines are themselves highly migratory species and not considered resident to discrete locations, although more research is required on this. Generally tuna longline (mid water) fisheries are an environmentally friendly fishing method with respect to impact on target species. They do not interact with bottom living resources such as corals and sponges (the same is true for purse seine nets which are set in surface waters).

It is expected that ongoing research programmes in the Indian Ocean, namely MADE (Mitigating ADverse Ecological impacts of open ocean fisheries) and BIOPS (BIOdiversité Pélagique: Suivi par indicateurs écosystémiques), will provide further information on bycatch of PET species, areas of high juvenile retention and biodiversity hotspots. Among the various mitigation measures investigated by the EU-funded MADE project, MPAs to reduce bycatch (e.g. sharks) will be investigated. A French-funded project (AMPED) will also investigate the potential of closed areas for highly migratory species including tuna in the Indian Ocean.

Some possible negative consequences

The costs of enforcement will increase due to the greater risk of IUU and difficulties in detecting IUU activity. IOTC-2009-WPTT-Inf05b provides examples of the voluntary closed area in the Atlantic, and the *defacto* closed area in the Indian Ocean due to Piracy, and indicates the difficulties of monitoring and protecting these zones. Agnew and Kirkwood (2005) present a method for determining the efficiency of detecting and combating IUU (detected and presumed activity) and similar approaches will be relevant for application to Indian Ocean tuna fisheries. A particular feature of fishing in the Indian Ocean is that very large numbers of small fishing vessels (without log books or VMS) are active in most areas, including in offshore zones (Sri Lanka, Indonesia, Iran, etc).

Where MPAs encompass the EEZs of existing well managed coastal states displacement of fishing to the edges and to the high seas can have negative consequences. Data reporting to the coastal state and to IOTC will be less well regulated; the ability to enforce IOTC resolutions will be diminished.

IOTC-2009-SC-10 indicated that the problem of Somali Piracy since 2007 has resulted in displacement of fishing vessels. The same would apply to any MPA and, unless the area closed was large enough, that displacement of activity would not result in a reduction of catches, but could nevertheless have negative operational effects on fishing fleet economics and dynamics. For example the Somali piracy has resulted in eastward displacement of fishing activity but it has not affected the catch rates of purse seiners. The situation is different for longliners with Japanese fleets showing no change in cpue whilst that for vessels from Taiwan.China has fallen, but this is considered to be an operational effect. However, it is to be hoped that the problem of piracy is a short term one, although the Science Committee notes with concern that the phenomenon is in fact spreading beyond the Indian Ocean.

Conclusions

Establishing the size of a potential fixed Marine Protected Area that would be effective in conservation terms for tunas would need an in depth scientific analysis. Moreover, even very large closures cannot ensure persistence or benefit fisheries yields in the absence of effort or quota controls, measures which are not yet fully implemented and are a priority for management. Poorly informed closures can have negative consequences. Furthermore, it is not yet clear that there are discrete spawning or nursery areas that could be the subject of targeted MPAs. The type of MPA study by Stefansson and Rosenberg (2006) should be developed for the particular circumstances of Indian Ocean tuna resources, taking into account the behaviour and biology (including stock recruitment relationship) of Indian Ocean tunas and the potential freedom for the tuna fleets to adjust their fishing pattern following any MPA implementation. Additional research is thus required, and it would be valuable to model more explicitly the spatial distribution and biology of Indian Ocean tunas taking into account potential spawning seasons and juvenile catches and any trade-off between them in order to better determine the size of closure required and to identify areas that may be suitable for closure. Spatio temporal closures are considered to be a more appropriate option than fixed permanent closures. It can be noted that the IRD launched the AMPED[1] research program in January 2009 that is mainly targeting this goal, and that other regional projects such as MADE and BIOPS will also provide information that will help inform the most appropriate locations for any closure in the Indian Ocean.

[1] AMPED: « Aires Marines Protégées pour Espèces qui se Déplacent beaucoup », targeting and Evaluation of Marine Protected Areas as a management strategy for valuable migratory marine resources in the Indian Ocean (program leader: david.kaplan@ird.fr)

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