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LESSONS LEARNT FROM THE INITIATIVES TO REDUCE THE IMPACT OF FAD STRUCTURE ON THE ECOSYSTEM

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The present document aims at summarizing ongoing research on the reduction of impacts of FAD structure on the ecosystem, with special emphasis on the use of biodegradable FADs. This document represents task 2.3 of the FAD WG to inform Annex II of Resolution C-18-05.

1. IMPACTS OF FAD STRUCTURE

There are 2 main impacts related to the FAD structure (i) ghost fishing by entanglement of animals in the net used to build FADs, especially sharks and sea turtles and (ii) marine debris created by lost and abandoned FADs, which may impact vulnerable ecosystems such as coral reefs or interferes with other economic activities such as tourism, other fisheries, etc.

Few studies have quantified the impact of FADs that are lost or abandoned, showing data on FAD loss and stranding events (Maufroy *et al.* 2015; Escalle *et al*. 2018; Zudaire *et al*. 2018). Fishers usually deactivate FADs that are drifting out of the fishing grounds in order to avoid paying communication fees for FADs that are not productive but also to activate a new FAD within the fishing ground due to FAD limitation resolutions. These deactivations make it difficult to know the fate and quantify loss and abandoned FADs and thus their impacts.

We can describe the structure of a FAD as two components: one is the raft or floatation component, and the other is the tail, submerged under the raft. In some fleets, the FAD tail has been increasing in length, mainly to slow down the drift, which fishers believe is better to aggregate tuna and to keep FADs within

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the fishing grounds. FAD structure impact is mainly a function of its size (volume and length) and mostly produced by the tail.

2. SOLUTIONS TO REDUCE THE IMPACTS OF FAD STRUCTURE

2.1. Ghost fishing

All RFMOs have now adopted measures to promote the use of non-entangling (NE) FADs. The adoption of FADs that reduce ghost fishing is high in the EPO based on responses from ISSF skipper workshops. Most of the fleets are using Low Risk Entanglement (LER) FADs which means that if mesh net is used for the tail, it must be tied as tightly as practicable in the form of sausages or have a stretched mesh size less than 7 cm in a panel with weight at the end (Res C-18-05; ISSF, 2015; Murua *et al*. 2016). However, only FADs constructed without netting can completely eliminate the unintentional entanglement of turtles, sharks and finfish species.

2.2. Marine debris

There are 3 main actions that will reduce the impact of loss and abandoned FADs: (1) the priority to mitigate impacts should probably be to reduce the overall number of FADs deployed and to enforce existing limits. However, even if FAD numbers are reduced, they will continue to be lost, so that other solutions are needed as (2) the use of biodegradable FADs and (3) minimize the abandonment and loss of FADs, through recovery (Moreno *et al*. 2018).

One of the primary research area in recent years has been to develop biodegradable FADs. Several tests are ongoing or have been done using natural materials or fibers to build the rafts and tails of FADs (coconut fiber, cotton, manila hemp, yute, sisal, bamboo, balsa wood, etc.) (Delgado de Molina *et al.*, 2004; Delgado de Molina *et al.*, 2007; Franco et al., 2009, 2012;Lopez et al., 2016; Moreno *et al*. 2017a,b) but still none have yielded a conclusive solution, either because the number of FADs deployed was not enough to get significant results or because research has not finalized yet. However, there is no solution that fits all circumstances, as the type of biodegradable FAD structure will depend on the fishing master´s tactics when building FADs (e.g. the expected duration of the FAD), the environmental conditions in the fishing ground, season and the type of biodegradable material available in the region.

Some fleets are testing biodegradable FADs on their own by deploying a limited number of biodegradable FADs. It is difficult to learn from those small-scale trials because most of the experimental FADs end up lost or appropriated by other fleets (Moreno *et al*. 2016). However valuable information can be obtained by monitoring the results of these tests. Did the FADs last? Were they encountered in good condition? Did they attract tunas? It would be good if these initiatives joined forces in some coordinated way that would allow obtaining significant results on the performance of biodegradable FADs tested.

In order to get results on the performance of biodegradable FADs and their lifetime, a large-scale deployment of experimental FADs is necessary. Ongoing projects that will deploy large numbers of biodegradable and traditional FADs at sea (1000 FADs in the IO, 600 FADs in the AO, and 800 FADs in the EPO) will soon inform about the performance of the different materials and FAD designs (BIOFAD EU project in the IO, EU funded project in the EPO and ISSF-ABNJ funded project in the AO).

Currently for biodegradable FAD tests only natural fibers/materials that are sustainably harvested should be used. The definition of biodegradable FADs could also consider synthetic polymers that degrade into products that are not problematic, and not just vegetal fibers (Zudaire *et al.* 2018). The important issue is that the product of their degradation should be non-toxic for the environment, or the food web.

There is no unique solution to reduce the impacts of FAD structure on the ecosystem. Testing of biodegradable FADs, and production of "better FADs" in general, should be accelerated as well as the design of protocols to reduce the abandonment and loss of FADs.

3. LESSONS LEARNT FROM RECENT RESEARCH AND RECOMMENDATIONS

3.1. Reducing ghost fishing

- Only FADs constructed without netting can completely eliminate the unintentional entanglement of turtles, sharks and finfish species. Fleets should gradually move from the current low entanglement risk FADs that use netting materials, towards non-entangling FADs without any netting.

3.2. Reducing marine debris

3.2.1. Biodegradable FADs

There are several small and large-scale projects testing biodegradable FADs in the 3 oceans. Although research has not finished yet, some recommendations can be drawn from them:

- Currently for biodegradable FAD tests only natural fibers/materials that are sustainably harvested should be used, until other materials such as synthetic bio-plastics become available and proven to be non-toxic for the marine environment.
- As the impact of FAD structure is proportional to the size of the structure, fleets should strive to reduce the size of the FADs (mainly the tails) they build.
- Fleets should avoid the use of plastics to build FADs, except the buoy used to track them.
- For FAD flotation, reduce as much as possible the need for plastic buoys and containers, as for instance reducing the weight and volume of the FAD structure. Balsa wood is promising in the Eastern and Western Pacific regions.
- The lifetime of biodegradable FADs required in the EPO for fishing should be from 6 months to a maximum of one year depending on the region and fishing strategy (Moreno *et al.* 2016).
- Experimental, biodegradable FADs need to be tested in great quantities in order to obtain meaningful results.
- Effort should be done to define the criteria of what constitutes a biodegradable FAD, in term of materials used and their configuration.

3.2.2. Recovery of FADs

The initiatives to recover FADs have been scarce till now. There is a FAD watch program designed to recover FADs in the Indian Ocean (Zudaire *et al*. 2018). In the EPO, there is an obligation to recover fished FADs 15 days before the closure (Resolution C-17-02). A recent workshop held on FAD recovery with the participation of fishers and scientists of the 3 oceans recommended the following:

- Data on the position of FADs that are abandoned or lost is needed in order to (i) quantify the impact (ii) develop better models of risk areas and (iii) measure the efficiency of the initiatives taken to mitigate the loss and abandonment of FADs. These data could be available through fishing companies or through service providers (buoy manufacturers).
- Quantify strandings: Identify main stranding zones by establishing priority areas based on the vulnerability of the ecosystem and the frequency of stranding. If possible, based on real FAD trajectories, collaborating with shipowners and buoy manufacturers or, failing that, using FAD drift models.
- Develop a guide of good practices for tuna purse seiners and auxiliary vessels with the aim to reduce

the loss and abandonment of FADs, as well as to facilitate their collection.

- Study the trajectories of FADs based on the position and time of deployment to determine which are the deployment areas with the highest risk of FAD loss or stranding in vulnerable ecosystems.
- In projects on FAD retrieval from the coast, to ensure the efficiency of the collection system, determine the minimum requirements for the vessels that would recover FADs, as well as ensure the management of the waste on land.
- Carry out workshops with the participation of scientists and fishers to define the potential solutions and recommendations based on the characteristics of each region.

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