

PROGRESS IN BIOFAD PROJECT: TESTING DESIGNS AND IDENTIFY OPTIONS TO MITIGATE IMPACTS OF DRIFTING FADs ON THE ECOSYSTEM

I. Zudaire¹, H. Murua¹ on behalf of consortium members^{2,3}

¹ AZTI, Spain

² Instituto Español de Oceanografía (IEO), Spain

³ MARBEC (IRD, University Montpellier, Ifremer, CNRS), France

Abstract

Despite currently used EU FADs designs have eliminated their entangling characteristic, these are largely made by non-biodegradable materials contributing to increase marine debris, and with other negative impacts in the ecosystem like potential FADs beaching. The IOTC, along with other tuna RFMOs, have made recommendations and published resolutions to promote reduction of the amount of synthetic marine debris by the use of natural or biodegradable materials for drifting FADs. However, there are some practical aspects that needs to be clarified for the operationalization of this type of FADs construction and effective replacement of materials. In line with this, the consortium formed by AZTI, IRD and IEO aims through the Specific Contract N° 07 under the Framework Contract EASME/EMFF/2016/008 provisions of Scientific Advice for Fisheries Beyond EU Waters to address current impediments and to provide solutions that shall support the implementation of non-entangling and biodegradable FADs in the IOTC Convention Area. This project will count on the whole EU purse seine tropical tuna fishery and recently Korean purse seine fleet has joined the project. The International Seafood Sustainability Foundation is also actively collaborating. The project has the following main objectives: (1) to test the use of specific biodegradable materials and designs for the construction of drifting FADs in natural environmental conditions; (2) to identify options to mitigate drifting FADs impacts on the ecosystem; and (3) to assess the socio-economic viability of the use of biodegradable FADs in the Purse Seine tropical tuna fishery. The methodology applied during at sea experimental operations was defined by the Consortium with the agreement of the collaborators. At present, 361 BIOFADs have been deployed and this activity will continue until June 2019. The results of this contract will create fruitful discussions and provide solutions that shall support and help IOTC defining the process of the implementation of non-entangling and biodegradable FADs.

1. Introduction

In the last decade, efforts have been focused to eliminate the entangling characteristics of drifting Fish Aggregating Devices (FADs), as it is believed that this may affect negatively on sensitive species like turtles, sharks, and other associated non-target species. However, most of those non-entangling FADs (NEFADs) are made by non-biodegradable materials (ex., nylon ropes or small pelagic fishing nets) contributing significantly to the increase of marine litter (Dagorn et al., 2012) and other potential negative impacts for the ecosystem, such as FADs beaching (Maufroy et al., 2015). The EU Common Fishery Policy and the Marine Strategy Framework Directive have as objective the need to ensure environmentally friendly fishing methods, which include the minimisation of seafloor or other habitat destruction, avoid effects on other species, but also minimise the introduction of any litter into the marine environment. Along these lines, the different tuna RFMOs have already addressed these issues through several recommendations and resolutions. For example, the Indian Ocean Tuna Commission (IOTC) and the International Council for the Conservation of Atlantic Tunas (ICCAT) have adopted the obligation to replace existing FADs with NEFADs and to undertake research on biodegradable FADs (i.e. BIOFADs). As such, the IOTC defined procedures on a FADs management plan through the resolution 13/08, where in Annex III it was also promoted the reduction of the amount of synthetic marine debris, by the use of natural or biodegradable materials for drifting FADs (IOTC, 2013). Similarly, the Inter-American Tropical Tuna Commission (IATTC) has recently stated the use of NEFADs by January 2019 and it promotes the gradual use of biodegradable materials (IATTC 2016).

However, an effective replacement of non-biodegradable FADs by those fully biodegradable still requires investigation to solve some practical aspects for the operationalization of this type FADs construction, including (1) the selection of appropriate materials taking into account their durability, (2) information of BIOFADs behaviour regarding tuna aggregation, drifting characteristics, etc., and (3) a socio-economic study to assess cost and benefits of a phase in of BIOFADs by EU purse seine tropical tuna fishery.

The Consortium, formed by the European research centres AZTI, IRD and IEO, has begun the Specific Contract N^o 07 under the Framework Contract EASME/EMFF/2016/008 provisions of Scientific Advice for Fisheries Beyond EU Waters in August 2017. The project addresses the problems associated to the current used materials and designs for FADs construction. This 28-month project aims to provide solutions that shall support the implementation of BIOFADs (i.e. non-entangling and biodegradable) through the collaboration with the International Seafood Sustainability Foundation (ISSF), the EU purse seine tropical tuna fishery, Seychelles Fishing Authority (SFA) and through the consultation with IOTC.

The aim of this document is to present the preliminary outcomes of the at sea trials as requested by the Scientific Committee (SC) in the 20th Session of the IOTC SC. Future works to be conducted will also be shown in this regard.

Main objectives

The main purpose of the project is to test the use of specific biodegradable materials and designs for the construction of BIOFADs in natural environmental conditions. The study will also provide criteria and guidelines to identify options to mitigate drifting FADs impacts on the ecosystem. It will also assess the socio-economic viability of the use of NE and BIOFADs in the purse seine tropical tuna fishery in the Indian Ocean. Finally, it will suggest potential biodegradable materials and designs providing recommendations to foster the implementation of fully NE and BIOFADs.

Specifically, this Specific Contract will carry out the following tasks (Figure 1):

- Task 1 – Revision of the state of the art regarding the use of "conventional FADs" (i.e. entangling and non-biodegradable), "NE FADs" (i.e. non-entangling and non-biodegradable) and "BIO FADs" (i.e. non-entangling and biodegradable) worldwide;
- Task 2 – Evaluating the performance (e.g. lifetime) of specific biodegradable materials and designs for the construction of FADs in natural environmental conditions;
- Task 3 – Testing, comparing and measuring the efficiency of new BIO FADs against current NE FADs to aggregate tuna and non-tuna species at sea in "real" conditions with the involvement of EU Purse Seine fishing fleet;
- Task 4 – Assessing the socio-economic impacts of BIO FADs use and phasing in the purse seiner fleet;
- Task 5 – Assessing the feasibility of using new biodegradable materials by the purse seiner fleet and recommendation of an optimum BIO FAD prototype.

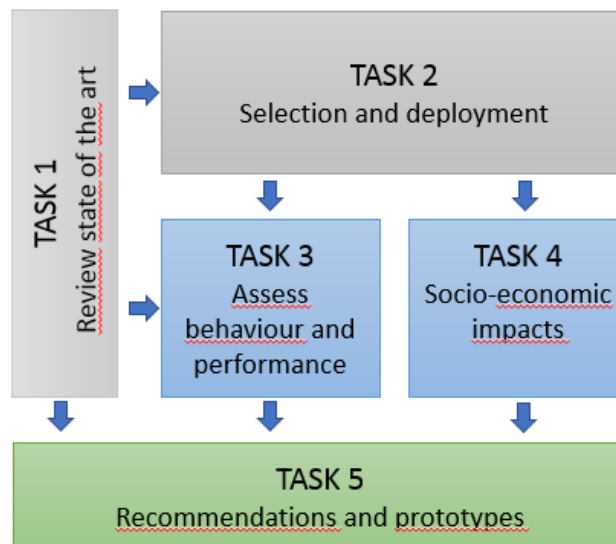


Figure 1. Flow chart of tasks of Specific Contract N° 7.

2. Material and Methods

2.1. Partners, timeline and deployment effort

The project is led by AZTI, IRD and IEO with the collaboration of the European purse seiner fleet (fleets associated to ANABAC, OPAGAC and ORTHONGEL), ISSF and SFA. Recently, the participation of the Korean purse seine vessels (DONGWON fishing company) operating in the Indian Ocean was also agreed.

The Specific Contract N°7 has started in August 2017 and will last 28 months after being requested to the EASME/MARE an extension of the project in order to reach the goal of BIOFAD deployments and derived analysis. Thus, the Consortium, in order to obtain enough data to conduct reliable scientific research, has planned a large-scale experiment with the deployment of 1000 BIOFADs, along with their corresponding 1000 NEFADs for comparison, in 2018-2019.

The BIOFADs deployment activity has begun in April 2018, deployments are organized by trimesters, and they will last 15 months (June 2019) to cover possible seasonality effects. For that, the project counts on the active collaboration of European purse seine industry with a participation of 42 purse seine vessels and recently two Korean purse seine vessels operating in the Indian Ocean agreed to join the project. In total, each vessel will deploy 24 BIOFADs, 6 BIOFADs by trimester (2 per month). This deployment strategy has been planned by the Consortium to avoid the limitations identified in earlier small-scale trials (Moreno et al., 2017).

The consortium oversees both the construction of experimental BIOFADs and the monitoring of deployed BIOFADs, and their paired NEFADs, at sea, as well as the data collection and reporting. The procedures to do so, were agreed among all participants, and are described in the following subsection (subsection 2.2), as well as all details were described in Zudaire et al. (2017).

2.2. Methodology for BIOFAD construction, deployment, comparison to NE FADs and data collection

The methodology used for BIOFAD construction, selected biodegradable materials and prototypes, as well as BIOFAD deployment strategy and comparison with NE FADs, and BIOFAD monitoring, data collection and reporting was defined by the Consortium after being agreed with collaborators (Zudaire et al., 2017)

2.2.1. Materials and prototypes for BIO FADs construction.

Three prototypes (Figure 2) were designed by the Consortium based on designs previously identified for Indian Ocean in the ISSF Workshop held in Donostia in 2016 (Moreno et al., 2016). Fishermen's requirements and needs for FADs construction

were considered for those designs covering the different drifting performance that fisherman seek with their conventional NEFADs: superficial FADs (BIOFAD prototype C), medium-deep FADs (BIOFAD prototypes A1 and A2), and high-deep FADs (BIOFAD prototypes B1 and B2). All the details of these 3 prototypes regarding variations in their construction, dimensions and selected materials were provided in Zudaire et al. (2017).

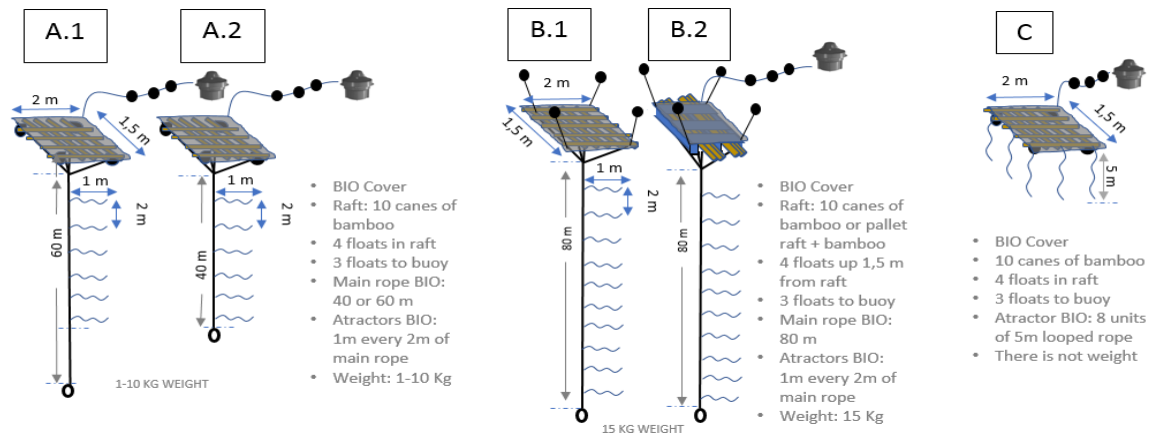


Figure 2. Prototypes designed during the workshop. Details of materials and dimensions are given for each prototype.

2.2.2. Identification and deployment strategy for BIO FADs and pairing conventional NE FADs.

Identification and deployment strategy for BIO FADs and pairing conventional NEFADs, allowing scientist to follow BIOFAD traceability during its entire life cycle, was described in Zudaire et al. (2017).

2.2.3. Data collection and reporting of data procedures.

All the details regarding the protocol for data collection and reporting were described in Zudaire et al. (2017). Information regarding any activity with deployed experimental FADs are reported by the fleet. All this information is reported to the Consortium using an email template and a dedicatedly designed form for skipper and observers, and so making data available to scientist very quickly.

Similarly, these forms include a table to gather the information regarding BIOFAD and NEFAD structure status control. The procedure for data collection was described in Zudaire et al. (2017).

3. Main progress and scientific products

3.1. Progress in BIOFAD construction, deployment, comparison to NEFADs and data collection.

To date, the Consortium has been informed about 361 BIOFADs been deployed (Figure 3) together with their pairing conventional NEFADs by the EU fleet. This represents 52% of the initially planned deployments for the first six months. From the total of 361 BIOFAD deployed 75% corresponded to A1 prototype, 14% to A2, 8% to B1 and 2% to C1.



Figure 3. BIOFAD deployment by the EU PS fleet.

The engagement of the fleet participating in the project is being positive. The new prototypes are used by fleet with normal fishing and use strategies. SC request to consider special allocations for these experimental FADs deployed was rejected, and thus these FADs are included within the limit of 350 active FADs per day. For the moment, this decision has not affected the activity and the Consortium does not observe that fishers use them in a non-regular manner biasing results and hiding their real effectiveness.

Table 1. Updated information about the activities conducted by EU purse seine fleet with experimental

	BIOFAD	NEFAD	Total
New deployments	361	361	722
Reported buoy exchange	56	45	101
No reported buoy exchange	53	45	98
Set	14	7	21
Eliminated	11	5	16
Traceability	84%	88%	86%

The reports sent by the fleet to the Consortium regarding different activities conducted with the experimental FADs, especially those related to buoy exchange activities, the Consortium is being able to keep high rates of traceability for those FADs deployed and followed by the fleet. For example, 84% of deployed BIOFADs are being followed by the Consortium through the information reported by the fleet while this % increase to 87% for NEFADs.

The Consortium has identified certain difficulties to obtain the status control of tested materials. This information is very important to assess the degradation process of the materials and to reach reliable conclusion of which of these material and prototypes work better.

3.2. Scientific products.

The Specific Contract will deliver the following main scientific products which aim to create fruitful discussions and provide solutions that shall support the implementation of non-entangling and biodegradable materials and designs for FADs construction through collaboration of EU purse seine tropical tuna fisheries and ISSF and consultation with IOTC.

- Review the state of the art regarding FADs use, development and impacts worldwide including initiatives in the Atlantic, Indian and Pacific oceans.
- List of best materials and designs for non-entangling and biodegradable drifting FADs as a result of experiments in natural conditions. This product will also take into account previous experiments conducted worldwide. Moreover, workshops and meetings with purse seine tropical tuna fishery will be carried out during the project.
- Detailed recommendations regarding the use of new biodegradable materials and designs by EU fleet based on their performance (i.e., aggregation performance, life-cycle assessment of materials) and costs (i.e., socio-economic impacts).
- Final recommendation of an optimum biodegradable FAD prototype.

Besides Effort is being done by the Consortium together with experts from GAIKER

to find the most accurate definition to be applied to the BIOFAD (biodegradable and non-entangling FAD). The main goal is to introduce all the important parameters (e.g. material, derived-components and environmental considerations) that should be considered when setting a definition (Zudaire et al., 2018).

4. Relevance for IOTC process in implementing a non-entangling and biodegradable drifting FADs

This project will contribute to summarize previous and current efforts carried out in the IOTC Convention Area as well as in other RFMOs for the implementation of non-entangling and biodegradable FADs. The results of this project will help IOTC to focus the discussion of suitable biodegradable materials and designs for FADs construction addressing the problematic of marine litter, ghost fishing and lost FADs beaching. The main scientific products and results of this Specific Contract aim to create fruitful discussions and provide solutions that shall support the implementation of non-entangling and biodegradable FADs.

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