



COLLECTION OF DRIFTING FISH AGGREGATING DEVICES MANAGEMENT PLANS

Prepared by: IOTC Secretariat, 29 May, 2019

At its 22st Session, the Commission adopted Resolution 18/08 *Procedures on a fish aggregating devices (FADs) management plan, including more detailed specifications of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-target species.*

The paragraph 1 describes the application of Resolution 18/08:

*“This Resolution shall apply to **CPCs having purse seine vessels and fishing on Fish Aggregating Devices (FADs), equipped with instrumented buoys** for the purpose of aggregating tuna target species, in the IOTC area of competence.”*

This document contains the FAD management plans made available to the Commission in accordance with a) paragraph 11 of IOTC Resolution 18/08:

*“**CPCs having vessels fishing on FADs shall submit, to the Commission, on an annual basis, Management Plans for the use of FADs by each of their purse seine vessels covered at paragraph 1.** Due to their specificity in terms of users, number deployed, type of boat/vessel involved, fishing method and gear used and materials used in their construction, the Management Plans and Reporting Requirements for Drifting FADs (DFAD) and Anchored FADs (AFAD) shall be addressed separately for the purposes of this Resolution. The Plans shall at a minimum meet the Suggested Guidelines for Preparation for FAD Management Plans by each CPC as provided for DFADs in Annex I and AFADs in Annex II. For the purpose of this Resolution, the term Fish Aggregating Device means drifting (DFAD) or anchored floating or submerged objects (AFAD) deployed for the purpose of aggregating target tuna species.”*

b) to assist CPCs in analysing the FADs management plans, as required in by the provision of paragraph 12 of the Resolution:

“The Management Plans shall be analysed by the IOTC Compliance Committee.”

Drifting fish aggregating devices (FADs)

The following nine CPCs have purse seine vessels registered in the IOTC Record of Authorised Vessels: Australia, EU (France, Italy and Spain), Indonesia, Iran (Islamic Rep. of), Japan, Korea (Rep. of), Mauritius, Philippines and Seychelles.

From the above-mentioned nine CPCs, eight have provided a DFAD management plans.

Philippines has 48 purse seine vessels on the record of authorized vessels, and has not submitted a DFAD management plan. Philippines submitted a policy document named “: National Tuna Fish Aggregating Device (FAD) Management Policy” (09.05.2019) with a scope making reference to another tuna RFMOs “b) FADs (anchored & drifting) deployed by Philippine flagged purse seine and ring net fishing vessels including any of its support vessels as duly registered in the WCPFC roster of vessels allowed to operate in the high seas”.

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Australia has indicated that no FAD fishery was authorised in 2016, 2017 and 2018 in IOTC fisheries (*Source: IOTC-2017-CoC14-IR01, IOTC-2018-CoC15-IR01 and IOTC-2019-CoC16-IR01*).

Indonesia has indicated that it operated only anchored FADs in 2018 (*Source: IOTC-2019-CoC16-IR09*).

Six revised DFAD management plans were provided in the 2018 - 2019 intersessional period. The DFAD management plans available to the Commission are presented in Annex 1, and dates of submission are summarised in the following table.

Reception of DFAD MGT PLANS	AUS	EU (FRA, ITA)	EU (ESP)	IDN	IRN	JPN	KOR	MUS	SYC
2013	N/S	N/S	N/S	N/S	N/S	25 December	31 December	N/S	N/S
2014	01 May	N/S	15 January	N/S	26 January	26 December	N/S	14 March	N/S
2015	N/S	N/S	N/S	12 January	N/S	N/S	N/S	N/S	27 April
2016	N/S	11 March	11 March	N/S	N/S	N/S	16 March	N/S	N/S
2017	N/A	13 April	19 April	N/S	N/S	10 April	21 March	N/S	N/S
2018	N/A	19 January	14 March	N/S	N/S	05 July 2018	16 March	14 Nov 2018	N/S
2019	N/A	20 May	20 May	N/A	14 April		9 April		N/S

N/A	Not applicable
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N/S	Not submitted
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The following CPC has reported it will provide a DFAD management plan:

- Mozambique, which had previously indicated that it is preparing to implement its fleet development plan for tuna fisheries and will take first steps in order to develop a FAD management plan, has now informed that it does not have a purse seine fleet yet and consequently does not use FADs in its fishery.

It is to be noted that Resolution 18/08, like its predecessor, Resolution 17/08, had maintained elements pertaining to anchored FADs, while paragraph 1 of both of these resolutions clearly indicate that this measure is only applicable to CPCs having purse seine vessels and fishing on Drifting Fish Aggregating Devices (DFADs). At its Fifteenth Session the Compliance Committee made the following recommendation:

The CoC **NOTED** the inconsistencies contained in Resolution 17/08, inter alia paragraphs 1, 11, 13, Annex I and reporting obligations and **RECOMMENDED** that these inconsistencies be reviewed by the FAD WG, or if it does not meet, by WPICMM and report its finding back to CoC16. (Paragraph 93, *IOTC-2018-CoC15-R*)

The *ad hoc* FAD Working Group did not meet during the 2018/2019 intersessional period. In giving consideration to the CoC15 recommendation, the WPICMM02 was of the opinion that it did not have a

complete understanding of the implications of what the Commission will lose out in terms of data pertaining to fishing activities on AFADs, it made the following recommendation:

The WPICMM02 **CONSIDERED** the recommendation of the Compliance Committee (report IOTC-2018-CoC15-R, paragraph 93) and **RECOMMENDED** that the anomalies relating to paragraphs 1, 11, 13 and Annex II of IOTC Resolutions 18/08 (previously 17/08) be reviewed by the *ad hoc* FAD Working Group. (Paragraph 8, *IOTC-2019-WPICMM02-R*)

Progress report on implementation of DFADs

IOTC Resolution 18/08, paragraph 13, request CPCs to provide a report on the progress of the management plan:

*“The Management Plans shall include initiatives or surveys to investigate, and to the extent possible minimise the capture of small Bigeye tuna and Yellowfin tuna and non-target species associated with fishing on FADs. Management Plans shall also include guidelines to prevent, to the extent possible, the loss or abandonment of FADs. To reduce the entanglement of sharks, marine turtles or any other species, the design and deployment of FADs shall be based on the principles set out in Annex III, which will be applied gradually from 2014. **From 2015 on, CPCs shall submit to the Commission, 60 days before the Annual Meeting, a report on the progress of the management plans of FADs, including reviews of the initially submitted Management Plans, and including reviews of the application of the principles set out in Annex III.**”*

From the eight CPCs that have provided a DFADs management plan, five CPCs have provided a report on the progress of implementation of their DFAD management plans in 2017. All eight CPCs provided a report on the progress of implementation of their DFAD management plans in 2018. Five CPCs have provided a report on the progress of implementation of their DFAD management plans in 2019. These are summarised in the following table.

Reception of progress report on DFAD MGT PLANS	AUS	EU (FRA, ITA)	EU (ESP)	IDN	IRN	JPN	KOR	MUS	SYC
2017	N/A	22 March	22 March	17 March	N/S	15 March	21 March	17 March	N/S
2018	N/A	15 March	15 March	16 March	15 March	16 March	16 March	16 March	12 April
2019	N/A	N/S	N/S	N/A	14 April	01 April	09 April	10 April	09 May
N/A	Not applicable		N/S	Not submitted					

Australia has indicated that no FAD fishery was authorised in 2016, 2017 and 2018 in IOTC fisheries (Source: *IOTC-2017-CoC14-IR01, IOTC-2018-CoC15-IR01 and IOTC-2019-CoC16-IR01*).

Indonesia has indicated that it operated only anchored FADs in 2018 (Source: *IOTC-2019-CoC16-IR09*).

Annex 1

Collection of DFADs management plans

<u>Australia DFADs Management Plan</u>	<u>Received 01.05.2014</u>
<u>European Union (France) DFADs Management Plan</u>	<u>Received 20.05.2019</u>
<u>European Union (Spain) DFADs Management Plan</u>	<u>Received 20.05.2019</u>
<u>Indonesia DFADs Management Plan (drifting)</u>	<u>Received 12.01.2015</u>
<u>Iran DFADs Management Plan</u>	<u>Received 14.04.2019</u>
<u>Japan DFADs Management Plan</u>	<u>Received 05.07.2018</u>
<u>Korea DFADs Management Plan</u>	<u>Received 09.04.2019</u>
<u>Mauritius DFADs Management Plan</u>	<u>Received 14.11.2018</u>
<u>Seychelles DFADs Management Plan</u>	<u>Received 27.04.2015</u>

Australia DFADs Management Plan

Received 01.05.2014



Australian Government

Australian Fisheries Management Authority



Fish Aggregation Device (FAD) Management Plan in Australia's Tropical Tuna Fisheries

 2013

Version 1.2

Important Note:

This is not a statutory Management Plan under the *Fisheries Management Act 1991*.

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01	Version 1.0	Drafting the FAD Management Plan	Nigel W. Abery	27 Aug 2012
02	Version 1.1	Review by AFMA's Foreign Compliance Section		28 Sep 2012
03	Version 1.2	Review by AFMA's Bycatch Section		12 Nov 2012

ACRONYMS

AFMA	Australian Fisheries Management Authority
FAD	Fish Aggregation Device
IOTC	Indian Ocean Tuna Commission
WCPFC	Western and Central Pacific Fisheries Commission



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SCOPE OF THIS POLICY

The Australian Fisheries Management Authority (AFMA) is the Australian Government agency responsible for the efficient management and sustainable use of Commonwealth fish resources on behalf of the Australian community.

This policy applies in both the Australian Fishing Zone and on the High Seas to Commonwealth managed commercial tropical tuna fisheries that permit purse seining as a fishing method. These include the Western Tuna and Billfish Fishery, the Western Skipjack Tuna Fishery and the Eastern Skipjack Tuna Fishery.

OBJECTIVE OF THIS POLICY

The objective of this policy is to describe AFMA's requirements for the use of fish aggregation devices by fishing concession holders in Commonwealth managed commercial tropical tuna fisheries.

This policy fulfils Australia's obligations to regional fisheries management organisations; the Indian Ocean Tuna Commission (IOTC) and the Western and Central Pacific Fisheries Commission (WCPFC). IOTC Resolution 12/08 (*Procedures on a Fish Aggregating Devices (FADs) Management Plan*) requires a Management Plan for the use of Fish Aggregation Devices (FADs). Management of FADs is also an issue under discussion at the WCPFC.

BACKGROUND

WHAT IS A FISH AGGREGATION DEVICE?

FADs are floating objects that attract fish. There are two main types of FADs: natural and man-made. Natural FADs are naturally occurring floating objects such as logs, branches, debris and large live marine organisms (whales, whale sharks, manta rays, etc). Man-made FADs can be found either drifting or anchored.

Tropical tuna such as Bigeye tuna, Yellowfin tuna, and Skipjack tuna show a natural behavioural tendency to aggregate around such floating objects. Fish aggregation devices are used in commercial tuna fisheries to target schooling tuna using a purse seine.

Fishing beside/under FADs takes advantage of the fact that tuna and other pelagic fish naturally congregate around floating objects in the open ocean and can be substantially more efficient than setting on unassociated schools. Man made FADs, improve the efficiency of fishing by aggregating tuna and reducing the time needed for searching. This is especially the case of technologically advanced FADs, with satellite beacons that enable fast location and sonar to monitor the presence and size of aggregations beneath them (Bromhead et al. 2003) thus, FAD fishing saves time, resources and fuel, and has



become a major tool of the industrialised purse seine tuna fleet globally. Tuna that school around FADs are also easier to encircle and catch than free-swimming schools. It is estimated that fishing sets around floating objects have a higher success rate (90%) than those made on free-swimming schools (50%) (Dagorn et al. 2012). FADs are also used by hand line, troll, pole and line and even gillnet fisheries. Livelihoods, food security and the economies of many regions and countries are dependent on FAD fishing.

ISSUES WITH FADS

Fishing by its very nature impacts the marine environment, yet fish are a vital source of protein and income for communities throughout the world. Fishing on FADs can have additional impacts compared to fishing around free schools:

1. It can increase the catch of 'non target' species and sizes of tunas (especially undersized, juvenile Bigeye and Yellowfin Tunas);
2. There can be relatively high bycatch of sharks, threatened, endangered and protected species (e.g. turtles and manta rays), and of other unmarketable fish species and sizes of fish;
3. Without clear ownership they can become persistent marine debris impacting marine habitats such as reefs; and
4. The ecological impact of a network of thousands of artificial drifting and anchored FADs aggregate tunas and other pelagic species from surrounding waters has not been assessed.

Catches associated with FADs (associated catches) typically consist of adult skipjack tuna, juvenile yellowfin tuna and juvenile bigeye tuna. Free-swimming school catches (un-associated catches) typically consist of adult yellowfin tuna and adult skipjack tuna. However, there is a large regional and seasonal variation in the catch compositions of fish caught in both FAD and free-school sets.

A summary of the divergence in catch composition between sets on FADs and free-swimming schools in different regions for the period 2000-2009 is provided in Table 1.

FADs also attract non-tuna species (byproduct and bycatch) (e.g., sharks, turtles, cetaceans, rays, whale sharks, countless variety of other bony fishes) which can be caught with the purse seine in associated sets on FADs. Free-swimming school catches typically contain low levels of non-target (non-tuna) species. It is estimated that the amount of non-tuna and discarded tuna is between 2.8 to 6.7 times more in FAD associated catches than free-swimming school catches (Dagorn et al. 2012).

Large numbers of FADs put into the ocean may change the movement behaviour of tunas, as they move with the FAD instead of following their natural movement pattern exhibited without the addition of extra FADs. However, it has been suggested that where floating objects are naturally present in the environment the impact from the use of additional FADs would be minimal.

Issues of FADs have been acknowledged and are in the process of finding solutions to address these issues on a regional/international scale through Regional Fisheries Management Organisations. FAD closures are being used in the WCPFC to reduce the Bigeye catches and the IOTC requires that Contracting Parties and Cooperating non-



Contracting Parties using FADs have a FAD management plan to collect information on which to base management decisions.

Table 1. Percentage composition of catches of Yellowfin, Skipjack and Bigeye tuna under floating objects (FADs) and in free-swimming schools by region for the period 2000-2009. Reproduced from Dagorn et al. (2012).

	Floating objects			Total	Free-swimming schools			Total
Ocean	Yellowfin	Skipjack	Bigeye		Yellowfin	Skipjack	Bigeye	
Atlantic	17%	69%	14%	100%	76%	19%	5%	100%
Indian	25%	67%	8%	100%	72%	22%	6%	100%
E. Pacific	15%	57%	28%	100%	43%	56%	1%	100%
W. Pacific	14%	82%	4%	100%	22%	77%	1%	100%
Global	16%	75%	9%	100%	35%	63%	2%	100%

FADS USE IN AUSTRALIAN FISHERIES

FADs are not commonly used in Australian fisheries as Australia's skipjack tuna fisheries have been in-active for the past several years for economic reasons.

COMMONWEALTH FISHERIES FAD MANAGEMENT

Purse seining can be used in the Western Tuna and Billfish Fishery, Western Skipjack Tuna Fishery and Eastern Skipjack Tuna Fishery. Fishing concession holders in these fisheries wishing to utilise FADs must apply to AFMA in writing¹.

Upon application the use of FADs in these fisheries is:

1. allowed anywhere in the Western Tuna and Billfish Fishery and Western Skipjack Tuna Fishery.
2. prohibited north of the parallel of latitude 20°S in the Eastern Skipjack Tuna Fishery.

¹ Statutory Fishing Rights still require amendment



REGISTRATION OF FADS

The applications to utilise FADs must include:

1. the number of FAD(s) to be deployed;
2. the type of FAD(s) (drifting / anchored); and
3. details on the design, construction and materials utilised in the FAD(s) (including any electronic devices and their specifications including the serial numbers of radio buoys and satellite transceivers).

AFMA will then issue a unique identification number for each FAD which must be displayed on the FAD.

DEPLOYMENT AND RETRIEVAL OF FADS

Fishing concession holders or their agents are required to give prior written notice and information to AFMA of their intention to deploy and retrieve FADs. The information to be provided includes:

1. location in latitude and longitude, to the nearest second;
2. whether the FAD is being deployed or retrieved;
3. date of deployment or retrieval;
4. if the FAD is a new or replacement FAD; and
5. the FAD's identification number as issued by AFMA.

If the concession holder fails to deploy or retrieve any of the FADs in the manner reported they must immediately notify AFMA in writing of any changes to their FAD deployment(s) or retrieval(s).

LOST AND REPLACED FADS

When a FAD has been lost the fishing concession holders or their agents are required to notify AFMA immediately. The replacement FADs must be of the same type, design, construction, materials and number as the FAD being replaced. Replacement of anchored FADs shall be in the same position as the FAD being replaced.

MARKING OF FADS

All FADs must be suitably marked for visibility and identification, the raft section must be clearly painted with reflective paint so that the raft can be seen from a distance of at least one kilometre. The marking must include the name of the vessel that deployed the FAD and the identification number as issued by AFMA.



In addition, the raft section of the FAD must also support a radar reflector and flashing light that must be suspended at least two meters above the waterline of the raft. At all times, the raft must register on radar at a reasonable distance. Electronic devices such as transponders and radio beacons which automatically and continuously indicate their position by means of signals may be used. Satellite transceivers and radio beacons must have their serial numbers clearly marked. These must not be operated at radio frequencies that would conflict with other devices used for navigation and search and rescue purposes.

DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE OF FADS

The design, construction, operation and maintenance of FADs will be the responsibility of the fishing concession holder deploying the FADs.

However, FADs must be constructed from natural and/or biodegradable materials and must not be constructed of any materials (e.g. netting) that may entangle fish, sharks, turtles and/ or any other non-target species. The “*ISSF Guide for non-entangling FADs*” includes best practice design recommendations (current as at 2012).

Anchored FADs must be constructed such that they can be reliably located at their place of deployment.

The design of anchored FADs should include an appropriate number of counter weights along the rope to ensure that the rope sinks to the bottom in the event that the raft section has come detached and drifted away.

Operators who register FADs must regularly maintain them, replace them as necessary and remove them from the water when they are not in use.

LOCATION OF FADS

Navigational routes and shipping

FADs shall not be set at locations of known high volume of sea traffic. General areas where FADs are deployed shall be reported to the relevant authorities to be published as Notice to Mariners. AFMA reserves the right to refuse FAD deployment in areas of known high volume of sea traffic.

Closed areas

FADs deployment is prohibited from all waters within 12 nautical miles of any land or island. Other closed areas include the Torres Strait Protected Zone, and any other area that may from time to time be declared by relevant Government bodies to be a prohibited area.








Australia will implement any area closures for FAD use as agreed by the WCPFC and IOTC.

FISHING ON FADS

Setting the purse seine or fishing around natural FADs is permitted. It is prohibited to fish around a man-made FAD that is not registered to the fishing concession holder.

BYCATCH MINIMISATION RELATING TO FADS

Fishing around natural or man-made FADs is prohibited if any of the following are present:

-  shark(s);
-  whale shark(s);
-  whale(s);
-  manta ray(s);
-  dolphin(s); or
-  Sea Turtle(s).

The fishing concession holder must take all reasonable measures to ensure that any of these species that are incidentally caught are handled in an appropriate manner and released alive as quickly as possible to maximise post release survival. The ISSF Skippers' guidebook to sustainable fishing practices, Chapter 3 Bycatch mitigation and handling provides best practice guidelines on this.

Concession holders must record interactions in their logbook or listed marine and Threatened Species Forms as usual.

MANAGEMENT OF THE CATCH OF YELLOWFIN TUNA AND BIGEYE TUNA

Yellowfin Tuna and Bigeye Tuna are subject to quota in the Western Tuna and Billfish Fishery and Eastern Skipjack Tuna Fishery.

In the Western Skipjack Tuna Fishery, fishers must retain on board and land all bigeye (*Thunnus obesus*) and yellowfin (*Thunnus albacares*) tuna taken. The total live weight that may be taken must not exceed:

- (a) two percent (2%) of the total live weight of skipjack tuna taken with the use of the boat during the season commencing 1 July in any year and ending on 30 June in the following year; and
- (b) in any trip, fifty percent (50%) of the total live weight of skipjack tuna taken during that trip.



CATCH AND EFFORT REPORTING RELATING TO FADS

Where fish are caught using a FAD, the FAD identification number for man-made FADs or the type of FAD for natural FADs and recorded in the comments section for the corresponding shot of the vessel's logbook, currently *the Purse Seine Daily Fishing Log* (PS01A).

Relevant information collected in logbooks will be reported to the IOTC as required under their standards for scientific data according to Resolution 10/02.

INTERNATIONAL FAD MANAGEMENT

Conservation and Management Measures and Resolutions agreed to by Australia at the WCPFC and IOTC will be reflected in domestic management.

IMPLEMENTATION OF THIS PLAN

This plan will be implemented through conditions on Statutory Fishing Rights or fishing permits for the relevant fisheries.

DURATION, MONITORING AND REVIEW OF THIS POLICY

This policy remains valid until revised, replaced or removed. The use and catch composition of FAD associated fishing will be monitored through the mandatory prior reporting (stated in this policy), routine observer coverage, mandatory logbook records and routine compliance activity. This policy will be reviewed after two years of data on catch and effort taken on FAD has been collected.

REFERENCES

Bromhead, D., Foster, J., Attard, R., Findlay, J. and Kalish, J. (2003) *A review of the impact of fish aggregating devices (FADs) on tuna fisheries*. Bureau of Rural Sciences, Department of Agriculture, Fisheries and Forestry. Pp 121.

Dagorn, L., Holland, K.N., Restrepo, V., and Moreno, G. (2012) *Is it good or bad to fish with FADs? What are the real impacts of the use of drifting FADs on pelagic marine ecosystems?* Fish and Fisheries. 16 May 2012 online.

Indian Ocean Tuna Commission (2012) Resolution 12/08 *Procedures on a Fish Aggregating Devices (FADs) Management Plan*.



FAD Management plan in the Indian Ocean for 2019

Section I - Management measure framework

Article 1 - Reference texts

- IOTC Resolution 17/08, Procedures on a fish aggregating devices (FADS) management plan, including a limitation on the number of FADS, more detailed specifications of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-targeted species.
- IOTC Resolution 17/01 On an interim plan for rebuilding the Indian Ocean yellowfin tuna stock in the IOTC area of competence.
- IOTC Resolution 16/08 On the use of aircrafts and unmanned aerial vehicles as fishing aids.
- IOTC Resolution 16/07 On the use of artificial lights to attract fish.
- IOTC Resolution 15/08, Procedures on a Fish Aggregating Devices (FADS) management plan, including a limitation on the number of FADS, more detailed specifications of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-target species.
- FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations adopted at the Twenty-sixth Session of the Committee on Fisheries (COFI), held in March 2005.
- Recommendations from the CECOFAD project on data collection on floating objects (Annex 1).

Article 2 – Scope

This FAD management plan applies to tuna purse seiners registered in a French port and operating in the Indian Ocean waters.

It also applies to French-flagged auxiliary vessels used as part of the tropical tuna purse seine fisheries.

It only applies to drifting FADs that are deployed in the high seas. No interaction with another fishing gear used by other fleets or conflict over usage has been noted so far.

Article 3 – Definitions

Fishing activity: Any activity related to locating fish, releasing, deploying, towing, hauling of a fishing gear, taking catch on board, transshipping, retaining on board, processing on board, transferring and landing of fish and fisheries products.

Buoy: An electronic device designed to locate or monitor a FAD.

Active Buoy: In accordance with IOTC Resolution 17/08, a buoy is considered active when it has been switched on and then deployed. A deactivated buoy may be activated only when physically present on board the purse-seine vessel to which it belongs or its supply vessel.

Owned Buoy: A buoy transmitting exclusively information (position reports and echo-sounder signal) to the vessel it has been associated to.

Common Buoy: A buoy transmitting information (position reports and echo-sounder signal) to two vessels sharing the buoy, at least.

Fish Aggregating Device (FAD): A floating and drifting object, natural or artificial, deployed or used by any fishing vessel and designed to aggregate tuna schools underneath to be harvested with purse seine. Activities related to FAD are: deployment/releasing, attaching a buoy for FAD trajectory tracking (whether deployed or encountered by the vessel), fishing on aggregated schools, visits, FAD maintenance, repairing and hauling.

Trackable Fish Aggregating Device (TFAD): A floating and drifting object, natural or artificial, equipped with a buoy for location and tracking purposes, resulting in substantial changes in the fishing strategy and fishing effort of the vessel. The activities related to TFAD are the same as the ones related to FAD, in addition with releasing, exchanging or removing a buoy for FAD trajectory tracking.

Fishing Vessel: Any vessel equipped for commercial exploitation of living fishery resources.

Auxiliary vessel: Any vessel used in support of a fishing vessel during fishing operations. The support vessel has no fishing gear.

Number of active buoys at any time: The sum of the number of active owned buoys and the number of common buoys (managed by a fishing vessel or an auxiliary vessel) divided by the number of tuna vessels using these common buoys.

Article 4 – Objectives

The French management plan has three objectives:

- **Improving the knowledge on FAD fishing:**

Increased knowledge on this fishing practice will result in a better assessment of the potential impacts and in more appropriate management measures. In this regard, the scope of data collected by the vessel masters on FAD operations will be largely increased and become mandatory.

In addition to the data on the FAD set (natural log, artificial raft, “classic” or “non-entangling” FAD) that are already reported, information on releasing, hauling, or transfer/changes in the FAD will be collected by the purse seiner masters and the support vessels on the logbooks (whose format has been changed) and through a “FAD” module in the electronic logbook (ERS) adjusted to tuna fishing and to RFMOs obligations. These data are of special interest to scientific assessments as they enable to better quantify purse seine fishing effort, improve stock assessments and can be crosschecked with scientific observer data. Additional data may be collected by the on-board observers. These data will be collected in accordance with the recommendations from the CECOFAD project.

Moreover, since 1st January 2010, the number of activated/deactivated buoys per vessel is quarterly reported by the buoy providers. These reports are independent from the reports from the masters and ship-owners. Two levels of control may be implemented by the relevant authority. First, at the buoy supplier level (any INMARSAT or IRIDIUM identifier is assigned to a vessel - or to several vessels in the event of buoy-sharing). The identification of the owner(s) can be checked through the buoy supplier. Secondly, at the

satellite communication supplier level (to enable satellite transmission of the buoy – position reports/echo-sounder messages- each buoy supplier has to activate the buoy transmitter for each client).

All these data will be reported as soon as possible to IRD scientists for the Joint RFMOs FAD working groups.

- Limitation on the use of FADs

For French ship-owners, the main management measure to regulate FAD fishing is the limitation on the use of FADs. This limitation shall apply to buoys associated with FADs (more than 90% of purse seine sets on objects are natural logs or rafts encountered and equipped with buoys). As these buoys are satellite-tracked, the most efficient and accurate way to determine the actual number of rafts deployed at sea is to use the data from the buoys (including data on their activation and deactivation). A system based on a mandatory reporting of the buoys used together with a “numerus clausus” mechanism has thus been implemented by the ship-owners.

The owner of a FAD is the vessel receiving the data transmitted by the buoy associated to a FAD.

A regulation on support vessels used by the ship-owners to manage a series of FAD has also been implemented.

- Reducing potential ecosystem impacts of FAD

In addition to the reduction of the potential impacts resulting from the limitation on the number of TFAD, the management plan also includes qualitative provisions resulting from additional experiments or research on the following: adoption of good practices (e.g. entangled turtles releases), improvement of selectivity (non-entangling FADs, “turtle/shark free FAD), different strategy for searching for fish, identification of fish sizes by echo integration on lateral echo-sounder...

The FAD management plan sets gradual changes in FADs so that they become fully biodegradable after a few years (by removing the nets to strengthen the raft and the tail).

Finally, measures have been proposed to reduce the damages that may arise from beaching events on coral reefs.

Chapter II - Management measures

Article 5 - Identification and markings of FADs

Any TFAD released at sea by a French tuna purse seine vessel is identified by the associated buoy serial number. It should be fully displayed without having to remove the buoy and designed to be water-resilient and readable throughout the buoy lifespan.

The FAD authorized to be used under this Management plan are not dangerous for marine shipping. Thus, it is not necessary to include a radar reflector.

Article 6 - Buoy record and monitoring

The master or ship-owner maintains a specific record on the buoys used by the vessel including:

- Its serial number;
- The vessel(s) receiving location reports from the buoy;
- Brand and type.

The use of TFAD is monitored through quarterly reports submitted by the buoys suppliers and used for FAD tracking. The quarterly reports set the number of active buoys at the beginning of the period, the number of buoys activated during the quarter, the number of buoys deactivated at the end of the period and the number of transmitting buoys during the quarter.

For scientific and statistical purposes, these data, location reports and echo-sounders data are sent to the relevant scientific institutes and fisheries management organizations, while complying with any confidentiality requirement.

Article 7 - Registration of specific FAD activities

The master of the fishing vessel or auxiliary vessel records the following activities on the logbook:

- Deployed/released FAD or marking of a FAD with a buoy
- Removal of any FAD or buoy
- Visit or fishing with or without any action on the FAD (maintenance/exchange)
- Discontinued buoys (lost FAD)

For each activity, the information collected includes:

- Date and Time
- Position (latitude, longitude) ;
- Type of FAD (natural log, of anthropogenic origin, artificial raft, “classic” or “non-entangling” FAD) with a short description, if necessary (tree trunk, pile of straw, canister, rope...);
- Type, number or ownership of the buoy associated in the event of a TFAD;
- Number or ownership of the removed buoy in the event of a TFAD;

In addition to the above information, the fishing vessel master also records on the logbook the following information for each FAD set (partly already provided for by the current rules):

- In the event of a TFAD, indicating the ownership (the master himself or belonging to a third vessel);
- Tonnages caught by species (target tuna species or bycatch);
- Possible quantities of discards

The observers on-board systematically record:

- The same information as the masters;
- The design characteristics of the FADs (Annex 1);
- Possible shark or turtle entanglements observed when some parts of the FAD are made up of nets;

For scientific and statistical purposes, data on FAD sets from the masters may be sent to the relevant scientific institutes and fisheries management organizations, while complying with any confidentiality requirement (see Article 15).

Article 8 - Limitation on the FAD number

Taking into account that no advice has been provided by the Scientific Committees of the RFMOs on this issue;

Considering that an uncontrolled FAD proliferation is threatening the sustainable tropical tuna fishery;

In line with French ship-owners commitment to curb FAD proliferation since 2012;

Aware of the scientific advice on yellowfin from the IOTC Scientific Committee at its 18th session in November 2015;

In accordance with a precautionary approach;

Considering that a limitation on the number of active buoys per vessel at any time may efficiently limit the number of FADs at sea;

Considering that to ensure a responsible and sustainable fishery, Orthongel will continue to promote the rational use of FADs through a limitation on the number of active buoys already adopted by the RFMOs and applied to all the fleets;

Encouraging the ship-owners not to increase the number of FADs above the sound levels established by OP in 2012;

Considering that IOTC limits the number of active buoys per vessel at any time at 350 and that this measure cannot ensure the sustainability of the tropical tuna resource;

The plan sets an average limit of 300 FADs deployed per vessel and ship-owner.

Vessels shall be subject to the individual limitation on FAD set by IOTC at any time.

The number of active buoys per vessel at any time shall be the sum of:

- The number of owned active buoys and
- The number of common buoys (activated by a fishing vessel or an auxiliary vessel) divided by the number of associated tuna vessels.

As the use of HF buoys cannot be controlled independently, these buoys shall be forbidden.

The masters and ship-owners shall continue to implement all the needed measures to prevent or limit lost FAD at sea.

Article 9 - Prohibition on the use of HF buoys

As the use of HF buoys cannot be controlled independently, these buoys shall be forbidden.

Article 10 - Prohibition on the use of lights to attract tuna beneath the FADs

In accordance with IOTC Resolution 15/07, the use of lights beneath the FADS shall be prohibited as well as anchoring an auxiliary vessel on the shoals, under the Resolution 61/105 on sustainable fishing adopted in December 2006 by the United Nations, providing for the need to take immediate actions to protect marine ecosystems or seamounts that are deemed vulnerable.

Article 11 – Regulation of auxiliary vessels and other devices in support of FADs

The auxiliary vessels can manage FAD provided that:

- They are listed in the specific lists of IOTC;
- They do not use lights (aerial or underwater) for the purposes of aggregating fish.
- An auxiliary vessel serves at least two purse seine vessels designated that are not associated with another auxiliary vessel.

A table listing the auxiliary vessels and their purse seine vessels associated for 2018 is annexed.

Using aircrafts and unmanned aerial vehicles from the vessels shall also be prohibited.

Article 12 - Fight against the uncontrolled TFAD drifting in sensitive areas

The masters and ship-owners shall continue to implement all the needed measures to prevent or limit lost FAD at sea.

The ship-owners agree to report the positions of the TFAD buoys entering areas where beaching on coral reefs¹ or damaging interactions with other activities (e.g. seismic surveys²) are likely to occur to organizations - previously identified and complying with data confidentiality requirements - that may avoid or limit to the lowest possible level the abovementioned risks.

Article 13 - Mitigation measures to limit the impact of FAD on the environment

Any action aiming at improving purse seine selectivity when fishing on FADs is encouraged to limit discards, including catches of juveniles and small individuals of target species or non-target species bycatch (with due consideration on sensitive species, as sharks).

The ship-owners shall provide the crew with the information needed to build FADs that ensure the lowest possible level -or none – of turtle and shark entanglement and provide the vessels with material needed to build these FADs. The ship-owners shall continue to hold and operate non-entangling FAD workshops based in every French purse seiner ports (Seychelles and Mauritius). The FADs used by the fleet subject to this plan are designed to

- Avoid any shark or turtle entanglement;
- Avoid any risk for marine shipping.

The ship-owners are working on biodegradable FADs to limit their impact on the environment, even when lost at sea.

Fishing vessels and auxiliary vessels are not allowed to release a FAD that is not designed to avoid shark and turtle entanglement.

Article 14 - Measures aimed at the conservation of sharks (mainly related to FADs)

The ship-owners shall encourage the crew to implement any method of shark live release that they deem more efficient and less dangerous for their safety, and standard procedures for the different catches (big sharks, small sharks, manta rays, whale sharks), and make them available.

The ship-owners shall request the crew to facilitate the works of the on-board scientists to tag the sharks before releasing into sea to assess their survival rate.

¹ A study on the FAD-WATCH device to inform the coastal state authority in the event of FAD beaching is ongoing. A study on the lost buoys and the main beaching areas is being conducted with the scientific organizations. A partnership with associations for the protection of the environment is also under consideration to limit the impact on FAD on the marine ecosystem (collection of FADs...). The outcomes of these works may be included, where appropriate, when this plan will be reviewed.

² The mechanism described in this paper has already been implemented in the seismic surveys off Gabon.

The ship-owners shall provide the crew with the information and training needed to improve release of all live sharks caught by seiners in optimal safety conditions for the crew and provide vessels with handling and release devices for sharks and rays.

Article 15 - Use of supply vessels

The ship-owners commit to comply with IOTC Resolution 16/01 under which the number of auxiliary vessels is limited to two vessels per five purse seiners.

Section III – Implementation measures

Article 16 - Confidentiality requirements for data on FAD sets

All the information collected under this management plan shall be treated as confidential and its use shall be restricted solely to scientific, statistical and/or monitoring and control purposes. Any other use of this information shall be subject to the prior consent of the ship-owner.

Article 17 – Duration of the management plan

This management plan applies from 1st January 2019.



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ALIMENTACIÓN Y MEDIO
AMBIENTE

SECRETARÍA GENERAL DE PESCA
DIRECCIÓN GENERAL DE RECURSOS PESQUEROS
SG de Acuerdos y Organizaciones Regionales de
Pesca

(COURTESY TRANSLATION)

MANAGEMENT PLAN FOR FISH AGGREGATING DEVICES

(FAD)

1. Basis and background of this plan

The current legislation in force covers the following provisions that justify the elaboration of this management Plan for fishing aggregating devices utilized by the Spanish purse seiner fleet targeting tropical tunas:

- The 1995 United Nations Stock Agreement has as the main goal the assuring of long term conservation and sustainable exploitation of the stocks of highly migratory species.
- FAO code of good practices, with regard to fishing investigation, sets the obligation of the reliable data collection which enables the due stock assessment just like the implementation of studies on fishing gear selectivity and its environmental impact and to promote the results of the investigation as the basis to establish the management objectives.
FAO code of conduct points out that “fishing gear should be marked according to national legislation to identify the owner of the gear. The requirements of this marking should have into account uniform marking systems and internationally acknowledged.”
Lastly, and following the FAO Code, “the States should cooperate in the perfection and implementing of operative fishing technologies, materials and methods to minimize the loss of fishing gear and its effect as ghost fishing”.
- EU Regulation 1380/2013, 20th Dec 2002, on the Common Fisheries Policy, points out as the main target is the sustainable exploitation of living aquatic and aquaculture resources in the context of sustainable development, having into account environmental, economic and social aspects in a balanced fashion. This regulation modifies EC Regulations 1954/2003 and 1224/2009, and repeals Regulations 2371/2002 and 639/2004, as well as Council Decision 2004/585.
- Law 3/2001, of Maritime Fisheries, sets amongst its goals, in article 3 the safeguard of the responsible fisheries resources exploitation, encouraging its development and adopting all necessary measures to protect, preserve and regenerate the said resources and their ecosystems and promote the fisheries and oceanographic research.

The experience from the first FAD plan in Spain of 2010, as well as the new international provisions, has led to the current revision of the Plan.

2.- Scope of application of the present plan

The present plan is aimed at Spanish-flagged freezer tuna purse seiners operating in the Indian, Atlantic and Pacific Ocean, targeting tropical tuna as well as Spanish flagged supply vessel supporting the mentioned purse seiner vessels.

The Secretary General for Fisheries shall be the authority that ensures the implementation of this plan.

3. Objectives

- Improving information collection for scientific advice purposes.
- Contributing to enhanced knowledge of catch composition in FAD sets.
- Increasing knowledge of these devices with regard to their technical features and their possible impact on ecosystems.
- Establishing information-sharing mechanisms among operators, scientists and administrations, in order to achieve better knowledge of progress made in this field and the implications thereof.

4.- Definitions

The following definitions shall only affect the present plan, in order to enhance understanding thereof.

- Main vessel: Fishing vessel making catches and to which catches made are assigned.
- Support vessel: Fishing vessel acting as an auxiliary vessel for main vessels, assisting in fishing; for example in deploying, monitoring and hauling in FADs.
- Fishing activity: Extracting fishing resources in external waters, as well as crustaceans and mollusks, using fishing gears and methods.
- Fish Aggregating Device (FAD): Natural or artificial objects deposited on the surface, under which various species aggregate, thus making them more accessible for fishing vessels to locate and catch.

Types of FADs

- Anchored FADs: Those artificially moored to the seabed to prevent drifting, including support vessels anchored to a seamount.
- Drifting raft with a net: Unanchored FADs composed of a panel— either continuous or grill-shaped— associated with a net used as a sail at sea.
- Drifting raft without a net: Unanchored FADs composed of a panel— either continuous or grill-shaped.
- Natural FADs: Any FAD found at sea (e.g. plant remains, dead animals, man-made waste) used as a FAD
- Other drifting FADs: Any FAD other than those above.

FAD-related activities

- Deployment: Operation by which a vessel release a FAD at sea.
- Verification: Operation by which a vessel monitors a previously deployed FAD in order to perform maintenance activities or to check the aggregation of fish around the device.
- Set: Fishing maneuver to catch shoals of fish associated with a FAD.
- Hauling: Operation by which a vessel retrieves a FAD from the sea.
- Beacon: Device whose purpose is locating or monitoring a FAD.

Types of beacons

- GPS beacon: Beacon accompanied by a global positioning system (GPS)
 - Radio beacon: Beacon accompanied by a radio system
 - Visual beacon: Beacon without any electronic device, only identifiable by sight
- Oceanographic buoy: Buoys used for oceanographic research

5.- Obligations under the RFMOs regarding FADs.

Tuna RFMO have adopted the following provisions:

WCPFC:

- Conservation and Management Measure for bigeye, skipjack and yellowfin tuna (CMM 2017-01). It includes provisions on FADs.
- Conservation and Management Measure on the application of high seas

FAD closures and catch retention (CMM 2009-02), which sets out the specifications regarding FAD closure.

- Conservation and Management Measure on instrumental buoys (CMM 2009-05)
- Conservation and Management Measure on cetaceans (CMM 2011-03)

IOTC:

- Resolution 17/08, on FAD management Plan.
- Resolution 17/01, on a yellowfin stock recovery plan in the Indian Ocean.
- Resolution 15/02, on the recording of statistical data. Sets the obligation of reporting number of FADs by quarter, including position, type and other information.
- Resolution 15/09 that sets a Working Group on FADs
- Resolution 12/03 on recording catches, including information on deployment of FADs.
- Resolution 13/04, on the conservation of cetaceans.
- Resolution 13/05 on the conservation of whale sharks.

IATTC:

- Resolution 2017-02, on the multiannual program for the conservation of tunas in the East Pacific Ocean (2018-2020).
- Resolution 2016-01, on recording FAD information.

ICCAT:

- Recommendation 16-01, for the conservation of tropical tunas.
- Recommendation 16-02, on a multiannual program for the conservation of tropical tunas.

6.- Identification of FADs

Each FAD shall have a sequence of characters serving as an identifier for each device to be used. This sequence shall not vary during the device's lifespan.

Operators may choose the identification system, with the only prerequisite that it be individual and unique for each FAD.

Depending on the results obtained through the implementation of the present plan, in the future—if it is considered appropriate—a single

7. Register and information-sharing regarding FADs: Inventory and Specific Activity Register (FAD logbook). Records in fishing logbooks.

Operators will send to the General Secretariat of Fisheries information of the operational FADs and buoys associated with their corresponding identification through some files called "FAD Diaries" that contain a list of FADs. Based on this information, the SGP will have at its disposal an inventory of FAD with an identification code and with its updated information punctually through quarterly mailing of the newspapers.

The information contained in the "FAD Diaries" for each FAD is grouped by fishing vessel, respecting the format and instructions for completing them, as set out in Annex I. "FAD Journal" template.

For each FAD it is noted if it has an associated buoy ("beacon") and in this case, the mooring model and its identification code. A specific activity record is included for each FAD where the activities related to each FAD are collected, with the tag's assignment being understood as deployment and the removal of the tag to be collected. In addition, the type of FAD is noted, as well as the technical characteristics of the FAD, including the floating structure and the "tail". In the case of using a natural FAD, operators must also record this information. In addition, if a FAD intends to continue being used periodically, it must be recorded.

Finally, in every activity that takes place on a FAD, all the incidents related to accidental catches must be recorded: species, number of specimens and number of specimens released alive.

When any activity is carried out on a FAD that does not initially belong to the fishing or auxiliary vessel that detects it, all the information about the activity carried out on it must also be communicated. In the section corresponding to the identification, the word "external" must be consigned accompanied by the sequence of visible characters that may lead to its identification. It must also be recorded if the FAD has been returned to the sea or any action on it (change of beacon, change of identification, etc ...) if the vessel decides to continue using it. In the latter case, these modifications must be included in the FAD Journal, noting the information collected in Annex I.

The aim of the FAD Journals is to provide as much information as possible about the characteristics of the FADs used and to provide the scientific managers with the analysis of the entries made in the fishing journals thanks to the individual identification of each FAD.

On the other hand, the use of FAD means that its use is recorded in the corresponding section of the vessel's fishing logbook, in such a way that it must be recorded for each haul if it has been carried out on Banco Libre (BL) or on FAD (FAD)), noting in the latter case the identification code of the FAD in accordance with the criteria of the previous section.

Since 2016, different scientific bodies in Spain are working on the development of a new FAD Diaries format to solve problems of the previous format, so that its use by ship owners is easier and, to respond to data requirements of the different RFMOs. In 2017, the Spanish Institute of Oceanography presented the new format of FAD in the joint meeting of the tuna RFMOs of the working groups on FAD. The new FAD Journals include all the information of the previous format, along with additional information and changes to improve the registration of FAD and the acquisition of data by the sector. The presentation of the meeting is attached in annex II. New format of the "Diaries of FAD": solving problems and responding to new needs.

Currently, the FAD Journals in use are those that result from the analysis shown in the document in Annex II.

8. Monitoring of FADs

As far as possible, vessels must record monitoring information for each FAD, which has a satellite beacon, based on its assigned number. Moreover, efforts should be made to record information obtained from other beacons (e.g. visual, radio).

There shall be no obligation to communicate the recorded information. However, such information may be requested in order for the designated scientific personnel to conduct specific studies or in order to carry out monitoring activities. This information may be requested, prior approval by the operators for its use.

9. Measures to prevent loss of FADs

Vessel operators shall prevent, as far as possible, loss of FADs at sea.

In the event of a loss or of the impossibility of hauling in a FAD (areas or seasons closed to fishing), operators must record, in the Specific Activity Register, its last known date and position.

10. Measures to mitigate the catch of juvenile tuna and non-target species

From January 1, 2015 on, all entangling FADs should be progressively replaced by others which minimize incidental catches, including these features:

- The upper part will not be covered, and if that is metallic, the material should be tightly covered or with a maximum of net size of 3 cm.
- The tail should be of non entangling material. If that include nets, its maximum size will be 3 cm.

All withdrawal or replacements should be recorded in the In the FAD logbook and the inventory

From June, 30, 2015 on all activity on entangling FADs is forbidden.

From September, 30, 2015 on all entangling FADs must have been removed, even if they are recorded in the inventory of the vessel.

The use of methods that reduces juvenile catches and associated species is encouraged in order to get cleaner catches.

The Parties to this plan may propose pilot actions in order to advance in some of the aspects described.

11. Specific closures on fishing with FADs

11.1. WCPFC:

- Closure:

Since last February 6, 2018, fishing on FAD between July 1 and September 30 is prohibited for all purse seiners fishing in the EEZ or high seas. In addition, for the high seas three additional months of closure are fixed (between April and May or, November and December for all the purse seiners fishing).

The prohibition referred to includes:

- Hauls cannot be made in 1 nautical mile around the FAD.
- It is forbidden to catch concentrated fish under a boat or move this fish, including the use of lights and mist to attract it.
- FADs and beacons can only be withdrawn, with prior authorization, provided they are kept on board until the landing or the end of the closure and no haul is made within 7 days or within 50 nautical miles around the point of departure.
- In addition, in relation to the previous section, two vessels cannot cooperate to avoid this measure by prohibiting hauls of any ship in a nautical mile around the FAD withdrawal point in the following 24 hours.

In order to comply with the Recommendation, each vessels must submit the available information on satellite tracking of all FADs and beacons on a weekly basis during the closure period.

- Limitation of the number of buoys:

No more than 350 FAD can be deployed with active instrumented buoys, (clearly identified and equipped with a tracking system).

For the follow-up of this measure, each vessel operating in the WCPFC area shall send a certificate from the buoy supplier company that collects the number of active buoys per vessel.

11.2. CIAT:

Whale shark sets are prohibited.

- Closure:

72 days closure is established since 2018 until 2020, and it applies since 00:00 hours on July 29 to 24:00 hours on October 8, or, since from 00:00 hours on November 9 until 24:00 hours on January 19 of the following year.

In addition, purse seiners are not allowed to fish from 00:00 hours on October 9 to 24:00 hours on November 8 within the area of 96° and 110° W and between 4°N and 3°S, "corralito".

During this period, only innocent passage will be authorized with the appropriate request.

- Limitation of the number of buoys:

No more than 450 FAD per vessel can be deployed. For the follow-up of this measure, each vessel operating in the WCPFC area shall send a certificate from the buoy supplier company that collects the number of active buoys per vessel. The information must be sent quarterly to the CIAT Secretariat.

11.3.- ICCAT:

Sets using oceanographic buoys as FADs are forbidden.

- Temporary and space closure:

Fishing for, or supported activities to fish for bigeye, yellowfin and skipjack tunas in association with objects that could affect fish aggregation, including FADs, are prohibited during the period 1 January to 28 February in the following area:

- Southern limit: parallel 4° / South latitude
- Northern limit: parallel 5° / North latitude
- Western limit: meridian 20° / West longitude
- Eastern limit: the African coast

The prohibition referred to in paragraph includes:

- launching any floating objects, with or without buoys;
- fishing around, under, or in association with artificial objects, including vessels;
- fishing around, under, or in association with natural objects;
- towing floating objects from inside to outside the area.

All purse-seine vessels and auxiliary vessels that intend to operate in the closed area shall ship an observer assigned by the ICCAT Regional Program during the closure.

In order to comply with the Recommendation, each vessels must submit the available information on satellite tracking of all FADs and beacons on a weekly basis during the closure period.

- Limitation of the number of buoys:

500 FAD cannot per vessel at any time can be exceeded, with or without active instrumental buoys. For the follow-up of this measure, each vessel operating in the WCPFC area shall send a certificate from the buoy supplier company that collects the number of active buoys per vessel.

11.4. CTOI:

- Limitation of the number of buoys:

350 active instrumental buoys cannot be exceeded per vessel at any time. In addition, the number of instrumental buoys acquired by each vessel is fixed at a maximum of 700.

In order to comply with the FAD limit, each vessel must submit a certificate issued by the company that supplies the beacons or by a scientific institute that certifies the following data:

- Number of instrumental buoys per vessel at any time by quarter.
- Number of instrumental buoys contracted by year.

Non instrumental buoys shall be gradually eliminated by January 1, 2017.

12.- Control of the regulatory measures of the RFMOs.

12.1. Control of the limitation of the number of buoys:

The industry controls the number of FADs since 2014 and, thanks to AZTI that carries out the control tasks.

The General Secretariat for Fisheries establishes the obligation of the control of FADs in the annexes of the Temporary Fishing License. The guarantee of compliance are the certificates of a Scientific Institute which includes the information of the number of instrumented buoys active and acquired by vessels. Last January 2018, the General Secretariat for Fisheries requested the industry those certificates.

Each FAD is associated with a buoy, so the control is done through the number of active instrumented buoys per day and per vessel.

The main information is provided aggregate by the suppliers of instrumented buoys to the Scientific Institute who receives this information per month in .csv files containing the daily information.

The main tasks include control mechanisms as analysis of buoys deactivated in port, data crossing of the first moment of activation of a buoy and VMS location of the vessel, as well as with FAD notebooks and observer information.

In Annex III. AZTI Methodology, the methodology carried out to control the FAD number is explained in detail.

12.2. Control of FAD's spatial and temporal closures:

The General Secretary of Fisheries carries out the control of the FAD closures in the Fisheries Monitoring Center thanks to VMS systems.

13. Measures to monitor and follow up the present plan

The relevant authorities may perform documentary monitoring of the provisions envisaged in the present plan, and they may require, if necessary, the data described in section 6.

The Spanish Institute of Oceanography (IEO), as the Spanish scientific authority in this regard, shall be responsible for processing and monitoring the information provided by the operators, and shall be authorized to draft the follow-up reports for this plan and to propose the measures it deems appropriate in order to improve the functioning thereof.

Moreover, the General Secretariat for Fisheries may determine, in coordination with the IEO, the participation of other scientific bodies in order to fulfill the objectives set forth in the present plan.

13. Confidentiality measures for the information provided by operators

The information provided by the operators shall be treated as confidential at all times, and its use shall be restricted solely to scientific or monitoring purposes, if necessary. The General Secretariat for the Sea undertakes not to disclose this sensitive information, other than for the aforementioned purposes, without the express consent of the shipowners.

14. Amendments to the present plan

This plan shall be amended in line with future measures adopted within the different RFMOS and with the conclusions of the reports envisaged in section 12.

15. Implementation

All provisions in this Plan will be in force until further modifications are adopted or new international provisions are set.

ANNEX I

Vessel:	XXXXXXXX	Code vessel:	XXXXXXXX
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ANNEX II

SPANISH FADs LOGBOOK: SOLVING PAST ISSUES, RESPONDING TO NEW GLOBAL REQUIREMENTS

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ABSTRACT

This document presents a renewed Fish Aggregating Devices (FADs) logbook designed for collecting data within the Fish Aggregating Device National Management Plan undertaken by the Spanish General Secretariat of Maritime Fisheries (Ministry of Agriculture and Fisheries, Food and Environment), in collaboration with the Spanish Institute of Oceanography (IEO - Ministry of Economy, Industry and Competitiveness), which is compulsory for the Spanish freezer purse-seine fleet targeting tropical tuna (yellowfin-YFT, skipjack-SKJ and bigeye-BET) in the Atlantic, Indian and Pacific oceans.

The IEO, the AZTI Foundation, the International Seafood Sustainability Foundation (ISSF), the Organization of Associated Producers of Large Tuna Freezers (OPAGAC-AGAC) and the National Association of Tuna Freezer Vessels Shipowners (ANABAC) have held continuous conversations since June 2016 in order to implement this new format for the Spanish FAD logbook, with the following aims: i) solving the issues identified with the previous format, ii) developing easy to follow guidelines for the Spanish fleet and iii) responding to all tuna Regional Fisheries Management Organizations (t-RFMOs) requirements on FAD data collection.

A field-by-field analysis has been conducted, pointing out the major problems that have been identified in past versions of the logbook and describing the solutions and improvements adopted.

KEYWORDS: *Spanish, logbook, fish aggregating device, FAD, management plan, tropical tuna, purse-seine*

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1. Introduction

Drifting floating objects, not only man-made but also with a natural origin, have been regularly used by the tuna purse seine fishery in the tropical oceans of the world since the late 1980s and early 1990s (Fonteneau *et al.* 2015) to aggregate targeted species and increase fishing efficiency (Figure 1). Tuna catches associated to objects by the Spanish tropical purse seine fleet have accounted on average for 56%, 70%, 88% and 93% of the yearly catches in the Atlantic, Indian, Eastern Pacific (EPO) and Western Pacific oceans (WPO), respectively for Spanish tropical tuna purse seine fishery (Figure 2). If these catches are grouped into five-year periods, a marked increase is observed in the global trend from almost a 60% in 1991-1995 period to nearly an 80% for the last five years analyzed (2011-2015) (Table 1 and Figure 3).

The increasing use of drifting FADs by tropical tuna purse seiners and its potential effects on target and non-target species populations and ecosystem (i.e., marine pelagic and vulnerable coastal areas) is one of the major concerns of t-RFMOs. Evaluating the level of use and the operational changes of the fleet through time (i.e., number of FADs deployed and materials used for its construction) is essential for correct FAD-fishing assessment and the reliable analyses of tropical tuna catches. In this sense, efforts are being made to collect detailed information of FAD-related activities. Since 1999 the Inter-American Tropical Tuna Commission (IATTC) is collecting information on FAD structures and components in the EPO (Figure 4) and the International Commission for the Conservation of Atlantic Tunas (ICCAT) has been requesting this information since 2011 for the Atlantic Ocean FAD-fisheries (ICCAT 2011). Similarly, the Indian Ocean Tuna Commission (IOTC) has requested information on FADs since 2001 (IOTC 2001) (Figure 5). The Western and Central Pacific Fisheries Commission (WCPFC) FAD data are collected by the observers on board (WCPFC 2016).

Due to the complexity of this fishing strategy and activities and the lack of unified formats and criteria for the data collection, the information collected so far by the skippers and available for analysis has been of limited utility. Therefore, efforts from all the stakeholders are required to improve the collection of FAD-related data in a comprehensive way.

The FAD management plan resolution was agreed in ICCAT in 2011 and amended in 2013. The Spanish Ministry of Agriculture and Fisheries, Food and Environment, in close collaboration with the IEO and the Spanish tropical tuna purse seine fleet organizations (ANABAC/OPAGAC), laid down a Fish Aggregating Device Management Plan for its national fleet in 2010 which has been running since then. The preliminary data and results were presented in Delgado *et al.* (2015), where it was stated that *“it is worth to note that this plan has been the first initiative of this kind adopted by a CPC member of tuna RFMOs, and can be considered as a pioneer and the seed for the implementation of FAD management plans in Tuna RFMOs. In fact, the Spanish FAD Management Plan has been used as a template and model in Tuna RFMOs and the agreed FAD Management Plans of all Tuna RFMOs included the elements developed in the Spanish FAD Management Plan”*.

From January 2017, the tropical purse seine fleet in the Eastern Pacific ocean is recording FAD data in a new logbook form (IATTC 2016a), and the Spanish purse seiner fleet in the Atlantic, Indian and Pacific oceans is beginning to use the new version of the Spanish FAD logbook presented in this document (Annex 1), an updated version of the logbook first introduced in 2010 (Delgado de Molina *et al.* 2013).

The aim of the present paper is to summarize the issues encountered when analyzing the data collected by skippers using the original FAD logbook, and discuss the solutions agreed in order to improve the data collection system and data quality. The new format presented here is the result of a collaborative work between the scientific bodies and the fishing industry, which integrates all the data requirements of the t-RFMOs in a single logbook with a user-friendly format for the skippers.

2. On the objectives, resolutions and FAD data required by t-RFMOs

The main objectives pursued and reasons to improve the current Spanish FAD logbook form are:

- a. Providing a simple format adapted to be used by the crew on board with clear and concise guidelines which aim to increase data quality by: i) merging the inventory and activity forms, ii) including templates and instructions in a single file, iii) including examples of the main FAD operations performed by purse seiner vessels iv) simplifying the identification of FADs, using the unique identifier of the buoy, as provided by the manufacturer and followed by the skipper, v) avoiding filling in more data than needed and vi) attaching a user's guide with photographs
- b. Facilitating data processing by: i) organizing data fields according to their succeeding processing, ii) including all fields needed to comply with current FAD data requirements by t-RFMOs (Figure 6)
- c. Having an easy to modify tool for future requirements and research

The FAD report requests and data requirements by t-RFMO are detailed below:

IATTC data requirements:

- In 1998 and 1999, the IATTC expressed its concern about tuna catches and bycatch associated with FADs in two separate resolutions (IATTC 1998) (IATTC 1999). As a consequence, scientists recommended banning supply vessels in EPO and limiting the number of FADs on board. A working group was established to monitor the relationships between certain FAD characteristics and tuna catch rates. In 2004, the IATTC recommendations focused on non- entangling FAD designs, particularly for sea turtles (IATTC 2004). In 2013, this RFMO edited the first resolution on data collection and analyses on FADs (IATTC 2013), which was refined till ongoing C-16-01 resolution (IATTC 2016b). This resolution requests CPCs to collect the following information at each interaction with a FAD:

- i. Position;
- ii. Date;
- iii. Hour;
- iv. FAD identification¹;
- v. FAD type (e.g., drifting natural FAD, drifting artificial FAD);
- vi. FAD design characteristics (dimension and material of the floating part and of the underwater hanging structure);
- vii. Type of the activity (set, deployment, hauling, retrieving, loss, intervention on electronic equipment, other (specify));
- viii. If the activity is a set, the results of the set in terms of catch and bycatch; and
- ix. Characteristics of any attached buoy or positioning equipment (positioning system, whether equipped with sonar, etc.).

¹ CPCs shall obtain unique alphanumeric codes from the IATTC staff on a periodic basis and distribute those numbers to the vessels in their fleets for FADs that may be deployed or modified, or in the alternative, if there is already a unique FAD identifier associated with the FAD (e.g., the manufacturer identification code for the attached buoy), the vessel owner or operator may instead use that identifier as the unique code for each FAD that may be deployed or modified.

The alphanumeric code shall be clearly painted in characters at least 5 cm in height. The characters shall be painted on the upper portion of the attached radio or satellite buoy in a location that does not cover the solar cells used to power the equipment. For FADs without attached radio or satellite buoys, the characters shall be painted on the uppermost or emergent top portion of the FAD. The vessel owner or operator shall ensure the marking is durable (for example, use epoxy-based paint or an equivalent in terms of lasting ability) and

visible at all times during day-light. In circumstances where the observer is unable to view the code, the captain or crew shall assist the observer (e.g. by providing the FAD identification code to the observer).

From January 2017, this information is being collected by the Spanish purse seine fleet in a logbook edited by the IATTC (Figure 7). This information has also been collected in the Spanish FAD logbook since 2012.

Most recently, the IATTC Secretariat has also instructed the observer programmes to record the unique identifier established by Resolution C-16-01 in the Floating Objects Form (Figure 4).

ICCAT reporting obligations on FADs and on support vessels (yearly):

- From 2011, ICCAT recommended to register FAD activities (deployments, retrievals and sets) in fishing logbooks, identifying these devices with a code (ICCAT 2011). The first guidelines for the preparation of FAD Management Plans were edited in 2013, and are continuously under revision since then (ICCAT 2013, 2014, 2015 and 2016). Currently, ICCAT requirements in FADs logbooks for purse seine, baitboat and support vessels are as follows (Figure 8) (ICCAT 2016a):

(a) Deployment of any FAD

- i. Position
- ii. Date
- iii. FAD type (anchored FAD, drifting artificial FAD)
- iv. FAD identifier (i.e., FAD Marking and buoy ID, type of buoy – e.g. simple buoy or associated with echo-sounder)
- v. FAD design characteristics (material of the floating part and of the underwater hanging structure and the entangling or non-entangling feature of the underwater hanging structure)

(b) Visit on any FAD

- i. Type of the visit (deployment of a FAD and/or buoy¹, retrieving FAD and/or buoy, strengthening/consolidation of FAD, intervention on electronic equipment, random encounter (without fishing) of a log or a FAD belonging to another vessel, visit (without fishing) of a FAD belonging to the vessel, fishing set on a FAD²)
- ii. Position
- iii. Date
- iv. FAD type (anchored FAD, drifting natural FAD, drifting artificial FAD)
- v. FAD identifier (i.e., FAD Marking and buoy ID or any information allowing to identify the owner)

¹ Deploying a buoy on a FAD includes three aspects: deploying a buoy on a foreign FAD, transferring a buoy (which changes the FAD's owner) and changing the buoy on the same FAD (which does not change the FAD's owner).

² A fishing set on a FAD includes two aspects: fishing after a visit to a vessel's own FAD (targeted) or fishing after a random encounter of a FAD (opportunistic).

vi. If the visit is followed by a set, the results of the set in terms of catch and by-catch, whether retained or discarded dead or alive. If the visit is not followed by a set, note the reason (e.g. not enough fish, fish too small, etc.)

(c) Loss of any FAD

- i. Last registered position
- ii. Date of the last registered position
- iii. FAD identifier (i.e., FAD Marking and buoy ID)

The Commission also focuses on supply vessels deployment activities, requesting the number of FADs deployed per month, area, type of object and type of beacon.

Following SCRS (Standing Committee on Research and Statistics) recommendation, the Commission requests the number of FADs actually deployed on a monthly basis per 1°x1° statistical rectangles, by FAD type, indicating the presence or absence of a beacon/buoy or of an echo-sounder associated to the FAD, as well as specifying the number of FADs deployed by associated support vessels, irrespective of their flag (ICCAT 2016a).

In response to Rec. 13-01 (ICCAT 2013), the form ST08-FadsDep was created in 2014 (Figure 9).

IOTC data requests:

- The IOTC asks for FAD data through Form 3FA (Figure 10), requiring the number of FADs visits per month, type of FAD and type of activity (IOTC 2014).

- Type of FAD:

IOTC Code	English Description
LOG	Drifting log or debris NOT located using a tracking system (radio or satellite transmission)
LGT	Drifting log or debris located using a tracking system (radio or satellite transmission)
NFD	Drifting raft or FAD with a net NOT located using a tracking system (radio or satellite transmission)
NFT	Drifting raft or FAD with a net located using a tracking system (radio or satellite transmission)
FAD	Drifting raft or FAD without a net NOT located using a tracking system (radio or satellite transmission)
FDT	Drifting raft or FAD without a net located using a tracking system (radio or satellite transmission)
ANF	Anchored FAD
DFR	Other drifting objects NOT located using a tracking system (radio or satellite transmission) (e.g. dead animal, etc.)
DRT	Other drifting objects located using a tracking system (radio or satellite transmission) (e.g. dead animal, etc)

- Type of visit:

IOTC Code	English Description
DD	Deployment of drifting FAD
AD	Deployment of anchored FAD
DH	Retrieval/encounter and hauling of drifting FAD
AH	Revisiting and towing of anchored FAD
DR	Retrieval of drifting FAD
AR	Revisiting anchored FAD
DL	Loss of drifting FAD (tracking signal lost)
AL	Loss of anchored FAD (detached from anchorage point or damaged heavily)
DI	Retrieval/encounter, hauling, and intervention on electronic equipment of drifting FAD

- **Effort:** Total number of FAD visits by purse seiners, support vessels, baitboats, or boats using other gears operating under the flag of the country reporting the data. Note that this number shall include all of the FADs visited, including visits to FADs set by the same vessel that reports the visit and other types of FAD, as defined in Type of FAD above.

- **FAD sets:** Indicate the number of FAD visits that ended up in a set; FAD sets can be performed following the retrieval of a FAD, drifting (DH, DR, and DI), or anchored (AH and AR).

- Catches by species: including:

a. Retained catches: catches for each species retained on board in live weight and/or number. IOTC CPC's shall provide catches for IOTC species (Table 3) and other species identified by the Commission (Table 4) and are encouraged to provide catches for all other species that are retained on board (Appendix V; Table 5 and Table 6). The catches of specimens for which only part/s of their bodies is retained on board shall be always reported as retained catches, in live weight.

b. Discard levels: discard levels for each species in live weight or number. IOTC CPC's shall provide discard levels for IOTC species (Table 3, page 16) and other species identified by the Commission (Table 4). IOTC CPC's are encouraged to provide discard levels for other species of bony fish (Table 5), sharks (Table 6), marine turtles (Table 7), seabirds (Table 8), and marine mammals (Table 9).

WCPFC:

In the case of the WCPFC, there are no requirements on data provision. Since 2010, purse seine vessels operating in the Convention Area of this t-RFMO have a 100% observer coverage since 2010 (as established by CMM2008-01 and following Conservation and Management Measures). The Regional Observer Program includes data collection on FAD activities (WCPFC 2017). Some preliminary data have been obtained as of these observer data (Abascal et al. 2014).

3. New Spanish FAD logbook

The FAD data collection forms have been reviewed, modified and adapted for its use on board purse-seine and supply vessels, in response to the t-RFMOs requirements and previous experiences on data collection and processing. The new model of the Spanish FADs logbook described in this document includes the main data requested by t-RFMOs (Figure 6). The specific analysis of the information recorded in the logbook is presented in this section, field by field:

- **Position** → A fundamental problem found with these data comes from its format. It is important to provide a field easy to fill, easy to use in data processing and in accordance with the one generally used on board.

Two fields are provided in FAD logbook with a familiar format for the captains:

FADs Logbook:

Position	
Lat	Lon
ggmm	gggmm
01°30'S	009°58'W

Instructions:

	Field	Format	Description	Example
POSITION	Lat	ggmm	Grades (gg): Two digits, e.g. 03 (<i>initial 0 is not needed</i>) Minutes (mm): Two digits, e.g. 08. Begin with sign '-' for <i>south latitude</i> . Format gg°mm'N/S will automatically appear in the field	-203 (for 02°03'S)
	Lon	gggmm	Grades (gg): Three digits, e.g. 050 (<i>initial 0 is not needed</i>) Minutes (mm): Two digits (e.g. 08) Begin with sign '-' for <i>western longitude</i> . Format ggg°mm'E/W will automatically appear in the field	5023 (for 050°23'E)

- Date and hour → The variability in the formatting of date and time usually results in bugs in data processing. Two fields are included in FADs logbook, with a familiar format for the captains. Time is recorded in GMT:

FADs Logbook:

Date	Time (GMT)
DDMMYYYY	HHMM
01/12/2017	09:01

Instructions:

Field	Format	Description	Example
Date	DDMMYYYY	Day (DD): Two digits (e.g. 15) Month (MM): Two digits (e.g. 06) Year (YYYY): Four digits (e.g. 2017) <i>Format 'dd/mm/yyyy' will automatically appear in the field</i>	28092017
Time (GMT)	HHMM	Hour GMT (HH): Two digits (e.g. 12) Minutes (MM): two digits (e.g. 08) <i>Format 'HH:MM' will automatically appear in the field</i>	603

- FAD identification → As buoys are often re-used and some vessels renumber them in order to have an easy to use inventory on board, in the 2nd FAD Working Group of ICCAT it was concluded that the FADs should be tracked by the buoy unique ID attached to the FAD (given by the buoy manufacturer), recording in the logbook details of all changes (ICCAT 2016b). Any modification on the tracking system (i.e. buoys) of a FAD is registered in a new line, following the initial activity with the object, as “modification over previous object”, allowing the individual tracking of FADs.

These fields ask for this unique buoy ID and the model (manufacturer's brand) of the buoy in order to deduce its characteristics (echo-sounder, GPS, radar reflectors, visible distance...)

An open drop-down menu with the list of most frequent models has been included to facilitate data entry. It also allows for the inclusion of free text (new models) as this technology is constantly improving:

FADs Logbook:

Buoy	
Model	Numeric ID
m3i+	133259

Instructions:

BUOY	Field	Format	Description	Example
	Model		Select from the drop-down menu the model of the buoy (d+, dl+, ds+, dsl+, te7, m3i, m4i...) In case of not being included in the list, select " Other " and overwrite the new model. Avoid generic names as: Nautical, Tunabal, Satlink...	ds+
	Numeric ID	number	Register the unique ID number used to identify the buoy (the one usually written after the model) without spaces or symbols	13448

The previous FAD forms included both the FAD and buoy IDs. Several issues were identified when trying to track FADs by these codes. Since the practical totality of FADs used by the fleet are tracked with satellite buoys, most of the skippers named the FADs with the beacon ID. Once the buoy was reused in a new FAD, it resulted in a non-unique identifier. In other instances, captains used their own codes, but these were not usually kept by other skippers. Given its simplicity, this coding resulted in frequent duplicates, as well. Therefore, it was decided to use the buoy ID as the unique identifier.

The use of the buoy ID as unique identifier has the inconvenient that it is useful as long as these IDs are visible, the activity is carried out by, or with the permission of, the buoy owner or the FAD is hauled onboard. Of course, this does not cover activities with FADs tracked using other type of locating buoys, which may not have unique identification codes printed externally (not the case of the Spanish fleet).

Some solutions, like the labeling of the FAD/buoy are being explored by t-RFMOs, although its feasibility is still under discussion (e.g. readability, covering of solar cells, etc.)

- **FAD type** → It has been considered to distinguish between i) drifting (DFAD) and anchored (AFAD) objects (Field: 'FAD Type'), ii) own and external origin (Field: 'Owner'), iii) natural and artificial objects (commonly 'rafts') (Fields: 'Origin' and 'Buoy?' and the following FAD characteristics) and iv) tracked or not (Field: 'Buoy?').

FADs Logbook:

Owner	Buoy? (Y/N)	FAD Type
Vessel-1	Y	Drifting

Table 0:

Owner

Own	Device belonging to the own vessel
"Vessel name"	If the object belongs to another known vessel, select this option and overwrite its name
Unknown	If the owner is unknown
Non applicable	For objects (including rafts) without a tracking system ('logs')

Table 2:

FAD Type	Description/Comments
Drifting	Any drifting object
Anchored	Supply vessel anchored to a seamount

Instructions:

Field	Format	Description/Comments	Example
Owner		Select from the drop-down menu depending on the origin of the object (see Table 0)	Own
Buoy?	S/N	Select 'Y' (Yes) if the object has a buoy or 'N' (No) if not <i>This field has been designed to easily register objects without buoys, not only with natural origin but also man-made (nets, carrion, herbs, pallet...)</i> <i>If a buoy or any other element is added, register a new line with the new FAD characteristics (See Table 1 – Modifications over previous object and Examples Sheet)</i>	Y
FAD Type		Select from the drop-down menu the type of object (See Table 2 and Examples Sheet) <i>NOTE: The characteristics of FADs are not registered (floating part and hanging structure) if the activity is focused on an anchored FAD (e.g. supply vessel)</i>	Anchored

Any addition of a tracking system and/or modification in logs structure (e.g., joining a raft) is registered in a new line, associated to the activity: 'Modifications over previous object'. These records make viable tracking the modifications made.

- **FAD design characteristics** → For every activity on an object, captains register the materials located/employed, its characteristics and dimensions. With a view to identify entangling objects, it has been introduced two fields that detect nets mesh size not only in the more superficial part of the floating structure but also becoming part of the underwater structure. This is also effective for drifting nets (e.g., gillnets).

FADs Logbook:

Floating part					Underwater hanging structure				Depth (m)
Material / Structure	Floating devices	Superficial covering material	Superficial covering net mesh	Dimensions aaxbbxcc	Material / Structure	Supplements	Ballast	Net mesh NOT 'in a sausage'	
Bamboo	Corks	Net	< 3 cm	2x3x0,5	Sausage form	Man-made	Ring/Eyebolt	NO mesh	20.5

Instructions:

	Field	Format	Description	Example
FLOATING PART	Material / Structure		Select from the drop-down menu the main material of the floating (or half-submerged) structure of the object (See Table 3)	Bamboo
	Floating devices		Select from the drop-down menu the main material used to keep FAD buoyancy (See Table 4)	Corks
	Superficial covering material		Select from the drop-down menu the main material used to wrap the most superficial part of the FAD (See Table 5)	Net
	Superficial covering net mesh		Select ' <i>NO mesh</i> ' if the most superficial covering of the floating part has NO any net. If the superficial covering has, at any section, net mesh, select its range from the drop-down menu.	< 3 cm
	Dimensions	aaxbbxcc	Write down in this field the digits required to indicate the length (aa), the width (bb) and height (cc), in meters	2x1x0.3
UNDERWATER HANGING STRUCTURE	Material / Structure		Select from the drop-down menu the main material/structure used in the hanging structure (See Table 6)	Net with 'sails'
	Supplements		Select from the drop-down menu the group of materials added to the main structure. <i>If they are mixed (natural+man-made), select 'Both' option</i> (See Table 7)	Coloured tapes
	Ballast		Select from the drop-down menu the material used as ballast of the FAD (See Table 8)	None
	Net mesh NOT 'in a sausage'		Select from the drop-down menu the net mesh range if any section of the underwater hanging structure or any supplement presents a net. If there is no net, select 'NO mesh'	NO mesh
	Depth (m)	number	Write down, with digits, the maximum depth reached by the FAD	30

Tables:

Table 3. MATERIAL / STRUCTURE (Floating part)	Description/Comments
Bamboo	Floating part (or half-submerged) made of bamboo stalks
Metal	Floating part (or half-submerged) made of metal
Plastic / PVC	Floating part (or half-submerged) made of plastic and/or PVC
Bamboo + Plastic/PVC	Floating part (or half-submerged) made of bamboo and plastic/PVC
Bamboo + Metal	Floating part (or half-submerged) made of bamboo and metal
Natural logs	Any object with natural origin that was NOT DESIGNED to aggregate tuna (carrion, trunk, herbs...)
Man-made logs	Any object with a man-made origin that was NOT DESIGNED to aggregate tuna (gillnet, pallet, ropes...)
Mixed	Floating part (or half-submerged) combining the previously cited materials listed in this table or VARIOUS types of objects (e.g. rafts) joined, including natural objects (describe in the 'Observations' field)
Single buoy	Select if any activity is carried out a single buoy (NO object associated) It is NOT required the registration of the rest of the components (floating part, hanging structure)
Other	Floating part (or half-submerged) made of any material not included in the previously cited types (bamboo stalks and net in a 'sausage' form, corks and net in a 'sausage' form, big containers, ropes and net....)
Unknown floating structure	ONLY when there is no way to know or approximate the main material of the floating part
Table 4. FLOATING DEVICES	Description/Comments
Containers	Floating device made of plastic containers
Corks	Floating device made of corks or plastic floats
'Balls'	Floating device made of plastic spherical balls
Other	Floating device made of any other material or mixed materials (describe in the 'Observations' field)
Table 5. SUPERFICIAL COVERING MATERIAL	Description/Comments
Raffia/Nylon	Select if any kind of cloth is employed to cover the floating part of the object (raffia, nylon, sailcloth...)
Net	Select if any kind of net with any mesh is employed to cover the floating part of the object (purse seine, gillnet, trawl net...)
NO covering	Select if the floating part of the object lacks of a covering
Other	Select if the covering is made of any other kind of material or if it is made of mixed materials (describe in the 'Observations' field)
Table 6. MATERIAL / STRUCTURE (Hanging structure)	Description/Comments
Net in a 'sausage' form	Net in a 'sausage' form along its entire length
Open net	Open net along its entire length
Net with 'sails'	Sections of open net ('sails')
Ropes	Ropes / 'rope ends' as major or unique material
Other	Any other kind of material not listed in the previous lines of this table or mixed materials (describe in the 'Observations' field)
Unknown extension	ONLY when there is no way to know or approximate the main material of the hanging structure
Table 7. SUPPLEMENTS	Description/Comments
Natural origin	Palm leaves or any other natural component in the underwater hanging structure
Man-made origin	Coloured tapes, plastic bags, pieces of sacks, remains of orange floats... in the underwater hanging structure
Both	If both, natural and man-made components become part of the underwater hanging structure
None	If NO components were added to the structure selected from Table 6

Table 8. BALLAST	Description/Comments
Metal rings / Eye bolts	Metal rings, eye bolts or any other similar material as ballast
Metal wire	Metal wires (e.g., pieces of purseline) or any other similar material as ballast
Stone	Stones as ballast
Cinder block	Cinder blocks or pieces of them as ballast
None	If NO components were added as ballast to the structure selected from Table 6
Other	Select if the ballast is made of any other kind of material or if it is made of mixed materials (<i>describe in the 'Observations' field</i>)

Drop-down menu for the net mesh:

Net mesh
NO mesh
< 3 cm
3-7 cm
> 7 cm

These fields are designed to improve the knowledge about FAD characteristics since all of them are adjustable to the new situations on FAD fishing. One important improvement consists on registering modifications and replacements on the structure as new lines. New materials not included in the drop-down menu can be identified in the "Observations" field. In this sense, as the FAD design evolves, new materials will be included in the drop-down menus of the logbook.

- Type of activity → Keeping in mind the main activities performed by the purse-seine vessels with objects and taking into account the significance of tracking the objects paths, it has been considered to register the following activities. The combination of some of them point out the active FADs at any one time per vessel:

Logbook:

Activity
Set

Instructions:

Field	Format	Description	Example
Activity		Identify the activity performed on the object (or buoy) in the drop-down menu (see Table 1 and the <i>examples sheet</i>)	Retrieval at sea

Tables:

Table 1. ACTIVITY	Description/Comments
Deployment	If a FAD is deployed (NO for markings of natural objects with a buoy. See 'Modifications over previous object') (<i>Check the rest of the fields in this table and the examples sheet</i>)
Verification (visit)	With every visit, NOT if the object is retrieved or if a set is performed, regardless of its modification (see the <i>examples sheet</i>)
Set	If a set is performed on any kind of object. Add one line for every group of species captured (see Table 8 , filling in the following lines only those fields concerning to bycatch (see the <i>examples sheet</i>) If the object is modified or retrieved at sea, add a new line registering the activity 'Modifications over previous object' or 'Retrieval at sea'
Modifications over previous object	This activity should be registered in a new line after a set or a verification if: (i) a buoy is added to a log, (ii) a buoy is changed and/or (iii) the structure of the object is modified, filling in only the fields modified (see the <i>examples sheet</i>)
Retrieval at sea	If an object is retrieved and not returned to sea. After a set , this activity will be registered in a new line (see the <i>examples sheet</i>)
Loss	If the signal of the buoy is lost. Register the last position detected (fields 'Lat' and 'Lon'), 'Date' and 'Time'
Recovering at port	Recovering of buoys at port. Fill in only those data concerning to the buoy (fields 'Model' and 'Numeric ID' and those indicating the 'Date', 'Time' and position ('Lat' and 'Lon'))

Some Spanish purse-seine vessels work in collaboration with other purse seiners and/or with supply vessels. In these cases it is important to clarify that every vessel is obliged to register its own activities, even when they are supporting other vessels (e.g., deployment of buoys for another vessel).

- Catch and Bycatch → In order to get information and improve the knowledge about impacts on targeted and non-targeted species, it has been considered to include both fields. Though catch data are received in logbooks, it takes a year to process them. This way, catch data of target species (loads and discards together) associated to object schools are available in a shorter period.

Bycatch data are registered by observers on board purse seiner and the coverage of National Data Collection Program is only a 10% of the national fishing trips. So the FADs logbooks provide this data with a 100% of coverage, including supply vessels.

The list of groups of bycatch species includes small tuna and tuna-like species.

Logbook:

School estimate (tons)	Catch (tons)			Bycatch			
	SKJ	YFT	BET	Group	In number or weight (t)	N/W	Nº/Weight specimens released alive
30	10	2	1	Whale shark	1	N	1

Instructions:

	Field	Format	Description	Example
Catch (tons)	School estimate (tons)	Round number	Note down a unique number of tons the catch of SKJ, YFT and/or BET estimated if the set is not performed. Register a '0' if any other kind of trick or fishes is detected (bony fishes, bait, garbage...)	5
	SKJ	number	Catches of SKJ (<i>Katsuwonus pelamis</i>) loaded plus the discards of this species, in tons	10
	YFT	number	Catches of YFT (<i>Thunnus albacares</i>) loaded plus the discards of this species, in tons	2
	BET	number	Catches of BET (<i>Thunnus obesus</i>) loaded plus the discards of this species, in tons	1
Bycatch	Group		Select from the drop-down menu the group of species caught. If more than one group is caught, note them down in the following lines (one by group) (see the <i>examples sheet</i>) (see Table 9)	Bony fishes
	In number or weight (t)	number	Number of specimens or weight (<i>in tons</i>) of the group of species (one number for every group). It is not necessary to indicate numbers by species, only by group. If part of the catch is estimated in number and part in weight, register them in two consecutive lines	0.5
	N/W		Select 'N' (number) or 'W' (weight)	W
	Nº/Weight specimens released alive	number	Register, with number, the number or weight of the specimens of the group released alive. It is not necessary to indicate numbers by species, only by group	0.1

Tables:

Table 9. GROUP*	Description/Comments
Small tuna and tuna-like fish	Select small tuna if specimens of black skipjack (<i>Euthynnus lineatus</i>), kawakawa (<i>E. affinis</i>), frigate tunas (<i>Auxis thazard</i>), bullet tunas (<i>Auxis rochei</i>), bonito (<i>Sarda spp.</i>) or similar are caught, regardless of its destiny
Sharks (hammerhead, shortfin mako, silky shark...)	Select sharks if specimens of this group are caught, regardless of its destiny. <i>NOTE: DO NOT select for whale sharks</i>
Billfishes	Select billfishes if specimens known as spearfishes, sailfishes, marlins or swordfish are caught, regardless of its destiny
Turtles	Select turtles if any specimen of this group is caught, regardless of its destiny
Rays and manta-rays	Select this group if rays, mantas or manta-rays are caught, regardless of its destiny
Marine mammals (whales, dolphins...)	Select marine mammals if any specimen is rounded by the purse seine net, regardless of its destiny
Whale shark	Select whale shark if any specimen is rounded by the purse seine net, regardless of its destiny
Other bony fishes (triggerfishes, rainbow runner, dolphinfishes...)	Select bony fishes if any specimen not included in the previous lines is caught, regardless of its destiny
*NOTE: All those specimens rounded by the purse seine net at the eyebolts raising time (purseline closure) must be included, regardless of its destiny	

4. Conclusions and recommendations

The analysis of data collected thanks to the Spanish Fish Aggregating Device Management Plan has allowed to detect the improvements needed in the data collection system for its adaptation to the use on board. The current version presented in this document integrates all the data requirements from t-RFMOs in a user-friendly format for the skippers, increasing the quality of the information obtained.

On the other hand, there is of course much room for improvement. In our view, the current system is excessively time-consuming, and the development of a specific tool for data entry is required (e.g., forms that upload the latest known configuration of a FAD, once the ID is entered, with checkboxes instead of dropdown menus, etc.).

Standardization of templates, tools and guidelines at the RFMO level and, if possible, among t-RFMOs, would be highly desirable, and would no doubt improve data usability. It must also be noted that there is little information that supports the collection of many of the current fields. Future analyses, feasible in the short-term, are required to fine-tune the trade-offs between the efforts and benefits in the acquisition of FAD-related information.

Finally, it is important to note the need of involving all the stakeholders in the elaboration of successful FAD management plans. The current work is an example of the collaboration between scientists and fishing companies, which has proved essential to develop a method for data compilation that is efficient and, at the same time, takes into consideration practicalities on-board.

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Tables

YEAR / AREA	ATL	IND	EPO	WPO	
1991	53%	51%	46%		
1992	49%	60%	21%		
1993	46%	51%	71%		
1994	46%	53%	80%		
1995	53%	70%	91%		
1996	59%	58%	93%		
1997	42%	76%	100%		
1998	29%	74%	99%		
1999	35%	79%	95%	99%	
2000	52%	77%	99%	100%	
2001	46%	66%	97%		
2002	46%	76%	96%	100%	AVERAGE of means
2003	43%	63%	98%	100%	
2004	43%	55%	97%	100%	
2005	63%	62%	94%	94%	
2006	58%	74%	100%	100%	
2007	62%	72%	95%	71%	
2008	64%	68%	98%	100%	
2009	55%	83%	100%	89%	
2010	66%	87%	100%	97%	
2011	77%	83%	100%	97%	
2012	76%	73%	69%	95%	
2013	83%	88%	100%	90%	
2014	84%	86%	81%	84%	
2015	73%	78%	90%	90%	
TOTAL MEAN	56%	71%	88%	93%	
MEAN (1991-1995)	49%	57%	62%		56% (except for WPO)
MEAN (1996-2000)	44%	73%	97%		71% (except for WPO)
MEAN (2001-2005)	48%	64%	96%		70% (except for WPO)
MEAN (2006-2010)	61%	77%	99%	91%	82%
MEAN (2011-2015)	79%	82%	88%	91%	85%

Table 1. Percentages of catches associated to floating objects by t-RFMO areas and year for Spanish tropical purse-seine fishery and means of percentages in five-year periods. For WPO it has been taken into account 2002-2015 period to calculate averages.

Figures



Figure 1. Main types of objects visited by the Spanish tuna purse-seine fleet.

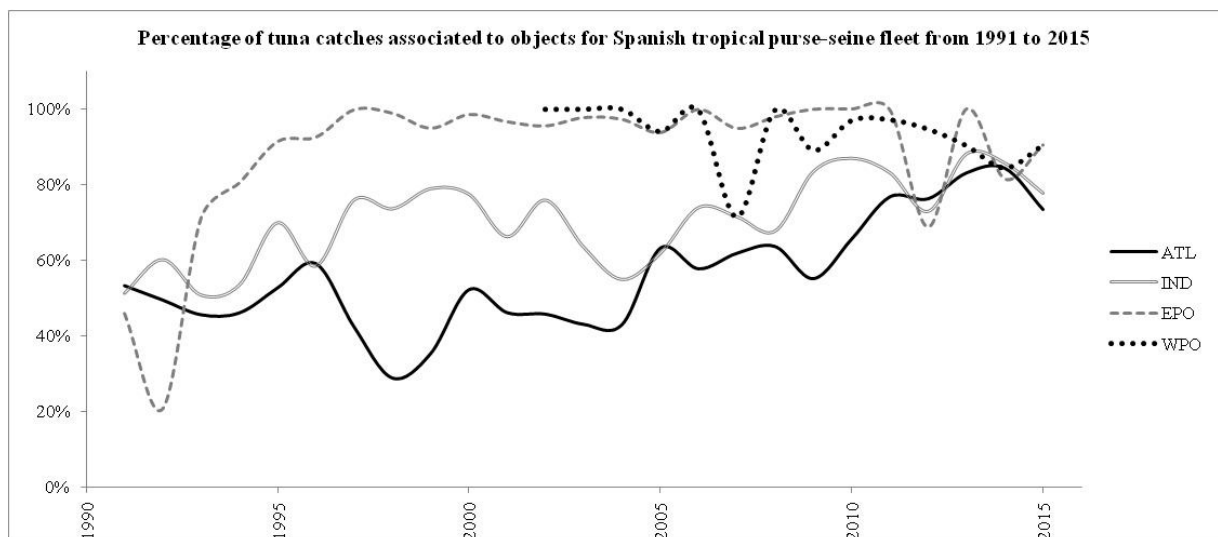


Figure 2. Percentages of tuna catches associated to objects by t-RFMO area for Spanish purse-seine fleet from 1991 to 2015. For WPO area data represented correspond to the 2002-2015 period.

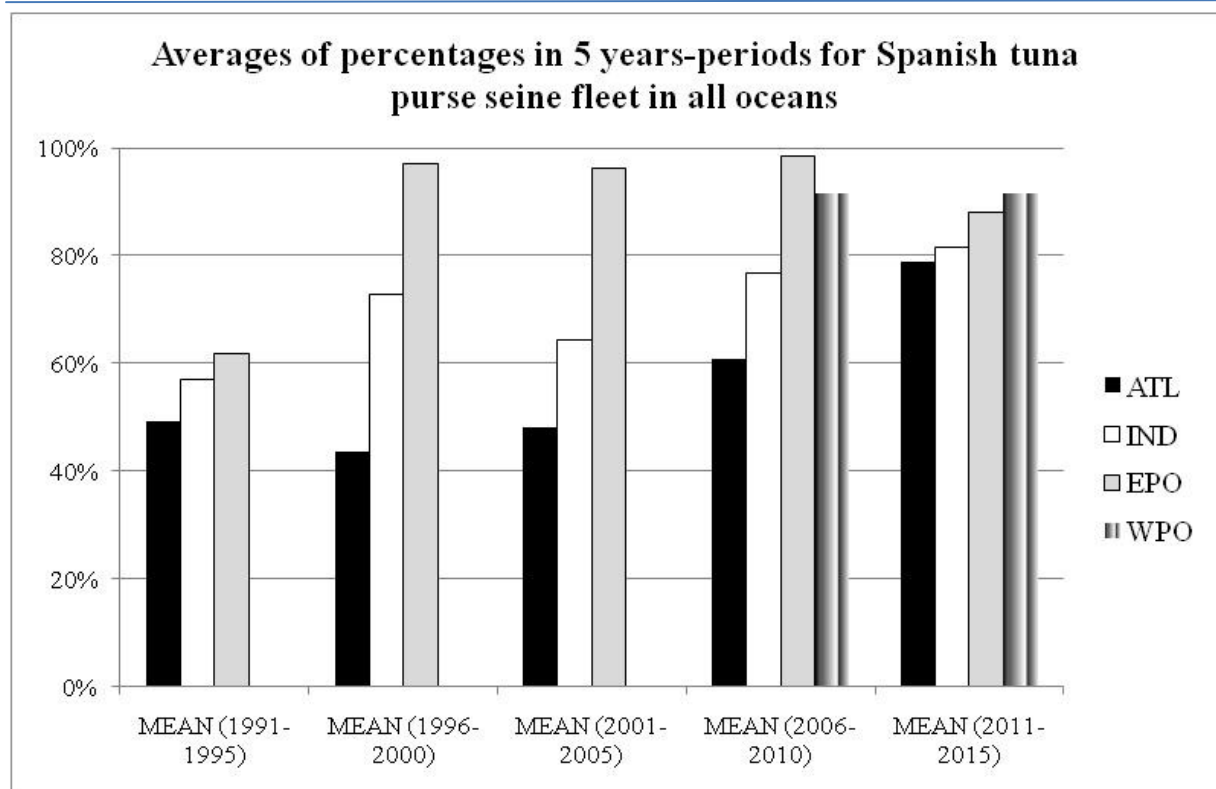


Figure 3. Means of percentages of tuna catches associated to objects by t-RFMO from 1991 to 2015, grouped in five-year periods. For WPO area data represented correspond to the 2006-2015 period.

Comisión Interamericana del Atún Tropical
REGISTRO DE OBJETOS FLOTANTES (ROF)

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1a. VISTA DE ARRIBA (incluya dimensiones)	1b. VISTA DE PERFIL (incluya dimensiones)
J. COMENTARIOS ADICIONALES	

Figure 4. IATTC Floating Objects Form for observers on board purse seiners in the IATTC area.

Historical overview on FADs data requirements by Tuna RFMOs														
YEAR	1999	2001	2004	2005	2006	2008	2010	2011	2012	2013	2014	2015	2016	2017
RFMO														
IATTC	C-98-10 y C-99-07: Prohibition of support vessels and limiting the number of floating objects on board. Interest on FADs depth and other FADs characteristics (baited objects f.e.)		C-04-05: Recovery of FADs when they are not being used. Non-entangling FADs								C-04-04: Inventory of FADs, design characteristics relation of for 2015. Non-entangling and biodegradable	C-15-03: Identification of deployed or modified FADs for 2017	C-16-01: FADs logbooks including type, activities and characteristics	
ICCAT								Rec-11-01: Guidelines for FAD Management Plans. Registration of FADs deployment, retrievals and sets in current logbooks (with an identification code)			Rec-14-01: New Guidelines and formats for FADs Logbooks. Non-entangling FADs	Rec-15-01: New Guidelines and formats for FADs Logbooks. Non-entangling and biodegradable FADs	Rec-16-01: New Guidelines and formats for FADs Logbooks. Non-entangling and biodegradable FADs	
IOTC		CMM-01/05: Number, characteristics and activity level of supply vessels				CMM-08/01: Number and types of FADs set by fleet	4-10/02: Number and types of FADs set by fleet 4-10/03: Registration of sets and deployments in logbooks		CMM-12/08: Guidelines for Management Plans		4-13/08: New Guidelines FAD Managements Plans principles for designing	CMM-15/02, 15/08 and 15/09: Limitation on number of FADs	CMM-16/01: Limitation on number of buoys and supply vessels	
WCPFC				CMM 2005-01: Development of FADs Management Plans	CMM 2006-01: Development of FADs Management Plans and Research		CMM 2008-01: Identification and on number of FADs deployed / un Guidelines for preparation of FA		oring of FADs. Limitation of FADs sets Management Plans	CMM 2012-01: New guidelines for preparation of FADs Management Plans	2013-01: Preparation of FADs management Plans	CMM 2014-01: Preparation of FADs management Plans	CMM 2015-01: Preparation of FADs management Plans	CMM 2016-01: Preparation of FADs management Plans

Figure 5. Historical overview on FAD data requirements and report requests by Tuna RFMOs. Remark of Spanish response.

										FAD design characteristics											
										Raft	Covering	Floating devices	Hanging structure materials	Hanging structure configuration							
	Vessel name	Number of trip	Registration	Position	Date	Hour	FAD identification	FAD type	General FAD design characteristics						Type of buoy	Type of the activity (hauling, intervention on electronic equipment, other (specify))	Type of activity with the buoy	If the activity is a set, the results of the set in terms of catch and bycatch	Characteristics of any attached buoy or positioning equipment	Observations	
IATTC RESOLUTION C-16-01 AMENDMENT OF RESOLUTION C-15-03 ON THE COLLECTION AND ANALYSES OF DATA ON FISH-AGGREGATING DEVICES	-	X	-	X	X	X	Serial number	Natural, Own, External or Anchored	Dimension and material of the floating part and of the underwater hanging structure	Bamboo raft, bamboo in a sausage form, metallic, PVC/Plastic, no raft or other	Entangling net, non-entangling net, cloth, palm fronds, no wrapping, other	Corks, buoys, containers, no floats, other	Nylon, plain fronds, bamboo, no tail, other	Sausage, ropes, cloth, other	GPS, with echosounder, no echosounder, other...	Set, Deployment, Retrieving, Loss, Intervention on electronic equipment	Derived from the type of activity	Tuna catch (YFT, BET, SKJ, OTHER) and bycatch (sharks, billfishes, manta-rays, other) NUMBER or WEIGHT	Positioning system, whether equipped with sonar, etc.	-	
ICCAT 16-01-TRO RECOMMENDATION BY ICCAT ON A MULTI-ANNUAL CONSERVATION AND MANAGEMENT PROGRAMME FOR TROPICAL TUNAS	-	-	-	X	X	X	Mandatory readable buoy identification	Log (related or not with fishing activities, animals or plants), Artificial or Anchored	Material of the floating part and of the underwater hanging structure and the entangling or non-entangling feature of the underwater hanging structure	-	-	-	-	-	Simple buoy (GPS) or associated with echo-sounder	Set (targeted or opportunistic), Deployment, Retrieving, Visit to an own or foreign object, Strengthening or consolidation	Tagging, Removing or Loss	Tuna catch (SKJ, YFT, BET) and bycatch (group, number or weight, n° of specimens released alive)	-	-	
IOTC GUIDELINES FOR THE REPORTING OF FISHERIES STATISTICS TO THE IOTC - 2014 AND RESOLUTION 15/08 PROCEDURES ON A FISH AGGREGATING DEVICES (FADS) MANAGEMENT PLAN, INCLUDING A LIMITATION ON THE NUMBER OF FADS, MORE DETAILED SPECIFICATIONS OF CATCH REPORTING FROM FAD SETS, AND THE DEVELOPMENT OF IMPROVED FAD DESIGNS TO REDUCE THE INCIDENCE OF ENTANGLEMENT OF NON- TARGET SPECIES	-	-	-	-	-	-	Marking or beacon ID (unique and readable identifier)	Log, Raft with net, Raft without net, Anchored or Other (located or not with a tracking system)	Dimension and material of the floating part and of the underwater hanging structure	With or without a net. Detect entangling and not biodegradable materials	With or without a net. Detect entangling and not biodegradable materials	-	With or without a net. Detect entangling and not biodegradable materials	With or without a net. Detect entangling and not biodegradable materials	-	Set, deployment, retrieval, visiting, loss and intervention on FADs	Loss	Weight and/or number of retained catches and discard levels (n°/weight) of target and bycatch species	-	-	
WCFC CMM-2016-01 PREPARATION OF FAD MANAGEMENT PLANS (NO LOGBOOK)	X	-	-	X	X	X	Marking and identifiers	Natural, Raft with or without a net, or Anchored	Dimension and material of raft and net. Description of design	-	-	-	-	-	GPS, radio, visual	Deployment, verification, set, hauling (retrieval)	-	-	-	-	
NEW SPANISH PROPOSAL	X	X	X	X	X	X	Model and readable identification number	Drifting or anchored	Dimension, material and characteristics of the floating and underwater parts (entangling, biodegradable...)	Bamboo, metallic, PVC/Plastic, log (man- made or natural), mixed, other	Entangling or non- entangling nets, no covering, other	Containers, corks or buoys, plastic balls, other, no floats	Addings: natural, man- made, both, other Ballast: ring, eyebolt, steel rope, stones, concrete blocks, other, no additions	Net in a 'sausage' form, open net, mixed net form (with 'saik'), ropes, other	Derived from model registration (radio, GPS, echo sound...)	Deployment, verification, set, object modifications, retrieval, recovering at port, loss	Deployment, removing, recovering or loss	Tuna catch (SKJ, YFT, BET) and bycatch (group, number or weight, n° of specimens released alive) Groups: Sharks, billfishes, rays and manta-rays, marine mammals, whale- shark, bony fishes, small tuna	Derived from model registration (radio, GPS, echo-sound...)	X	

Figure 6. Main Tuna RFMOs current requests on FAD characteristics and activity data. The 'X' symbol means that the data is being collected. The '-' symbol means that the particular FAD design characteristic is not defined in the guidelines provided.

ACTIVIDAD DE LOS PLANTADOS

FAD FORM 3.1.3 SPN.DOCX

21-sep-16

INFORMACIÓN DE LOS PLANTADOS

FAD FORM 3.1.3 SPN.DOCX

21-sep-16

Figure 7. IATTC FAD logbook

FAD logbook

FAD marking	Buoy ID	FAD type	Type of visit	Date	Time	Position		Estimated catches			By-catch				Observations
						Latitude	Longitude	SKJ	YFT	BET	Taxonomic group	Estimated catches	Unit	Specimen released alive	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
...
...

- (1,2) If FAD marking and associated beacon/buoy ID are absent or unreadable, report it in this section. However, if FAD marking and associated beacon/buoy ID are absent or unreadable, the FAD shall not be deployed.
- (3) Anchored FAD, drifting natural FAD or drifting artificial FAD.
- (4) i.e., deployment, hauling, strengthening/consolidation, removing/retrieving, changing the beacon, loss and mention if the visit has been followed by a set.
- (5) dd/mm/yy.
- (6) hh:mm.
- (7) N/S/mm/dd or °E/W/mm/dd.
- (8) Estimated catches expressed in metric tons.
- (9) Use a line per taxonomic group.
- (10) Estimated catches expressed in weight or in number.
- (11) Unit used.
- (12) Expressed as number of specimen.
- (13) If no FAD marking neither associated beacon ID is available, report in this section all available information which may help to describe the FAD and to identify the owner of the FAD.

List of deployed FADs and buoys on a monthly basis

Month:

FAD Identifier		FAD & electronic equipment types		FAD				Observation
FAD Marking	Associated buoy ID	FAD Type	Type of the associated buoy and/or electronic devices	FAD floating part	FAD underwater hanging structure			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
...
...

- (1) If FAD marking and associated beacon/buoy ID are absent or unreadable, the FAD shall not be deployed.
- (2) Anchored FAD, drifting natural FAD or drifting artificial FAD.
- (3) E.g., GPS, sounder, etc. if no electronic device is associated to the FAD, note this absence of equipment.
- (4) Mention the material of the structure and of the cover and if biodegradable.
- (5) E.g., nets, ropes, palms, etc., and mention the entangling and/or biodegradable features of the material.
- (6) Lighting specifications, radar reflectors and visible distances shall be reported in this section.

Table 1. Codes, names and examples of different types of floating object that should be collected in the fishing logbook as a minimum data requirement. Table from 2016 SCRS report (section 18.2 Table 7).

Code	Name	Example
DFAD ⁽¹⁾	Drifting FAD	Bamboo or metal raft
AFAD	Anchored FAD ⁽²⁾	Very large buoy
FALOG	Artificial log resulting from related to human activity (and related to fishing activities)	Nets, wreck, ropes
HALOG	Artificial log resulting from human activity (not related to fishing activities)	Washing machine, oil tank
ANLOG	Natural log of animal origin	Carcasses, whale shark
VNLOG	Natural log of plant origin	Branches, trunk, palm leaf

Table 2. Names and description of the activities related to floating objects and buoys that should be collected in the fishing logbook as a minimum data requirement (codes are not listed here). Table from 2016 SCRS report (section 18.2 Table 8).

	Name	Description
FOB	Encounter	Random encounter (without fishing) of a log or a FAD belonging to another vessel (unknown position)
	Visit	Visit (without fishing) of a FOB (known position)
	Deployment	FAD deployed at sea
	Strengthening	Consolidation of a FOB
	Remove FAD	FAD retrieval
Buoy	Fishing	Fishing set on a FOB ¹
	Tagging	Deployment of a buoy on FOB ²
	Remove BUOY	Retrieval of the buoy equipping the FOB
	Loss	Loss of the buoy/End of transmission of the buoy

¹ A fishing set on a Fishing Object (FOB) includes two aspects: fishing after a visit to a vessel's own FOB (targeted) or fishing after a random encounter of a FOB (opportunistic).

² Deploying a buoy on a FOB includes three aspects: deploying a buoy on a foreign FOB, transferring a buoy (which changes the FOB owner) and changing the buoy on the same FOB (which does not change the FOB owner).

Figure 8. ICCAT logbook model

Flag (current) cod.	Month	FAD type	Lat	Lon	No. Deployed with beacons	Type of beacon deployed	Average No. Active beacons followed per vessel	Average No. Deactivated beacons followed per vessel	No. Deployed without beacons	Average No. of active lost FADs	No. Of FADs deployed by support vessels
+++++	+++++	+++++	+++++	+++++	+++++		+++++	+++++	+++++	+++++	
FlagCodeCur	Month	FadType	Lat	Lon	NoDepBeaconsYes	BeaconType	NoBeaconsFollowed	NoDeactivBeacons	NoDepBeaconsNo	NoLostFADS	SuppFads
Table. Fad types											
FadTypeCode	FadType										
FAA	Anchored FAD										
FADN	Drifting Natural FAD										
FADA	Drifting artificial FAD										
Table. Beacon types											
BeaconCode	BeaconType										
RDF	Radio direction finder										
RDFGPS	Radio direction finder and GPS										
GPS	GPS										
SON	Sonar										
SONES	Sonar with echo-sounder										
SATES	Satellite and echo-sounder										
SAT	Satellite without echo-sounder										

Figure 9. ICCAT ST08 Form

[illegible]

Figure 9. IOTC 3FA Form

Annexes

Annex1. New Spanish FADs logbook form (*see excel attached file*)

Excel description:

Sheet 1 - Registration

Sheet 2 - Instructions

Sheet 3 - Tables

Sheet 4 - Examples

ANNEX III



Annex III. Methodology to count the number of FADs

The Industry agreed to count the number of FADs since 2014, so AZTI started to carry out this task on September 2015 through a contract with the Industry.

The General Fisheries Secretariat (GFS) established in the annexes of the Spanish Temporary fisheries Licences, as a guarantee of compliance with the maximum number of FADs, the necessity of a certificate by a Scientific Institute with the information concerning the number of active instrumented buoys and acquired instrumented buoys per vessel. Last January 2018, the GFS requested the sector these certificates.

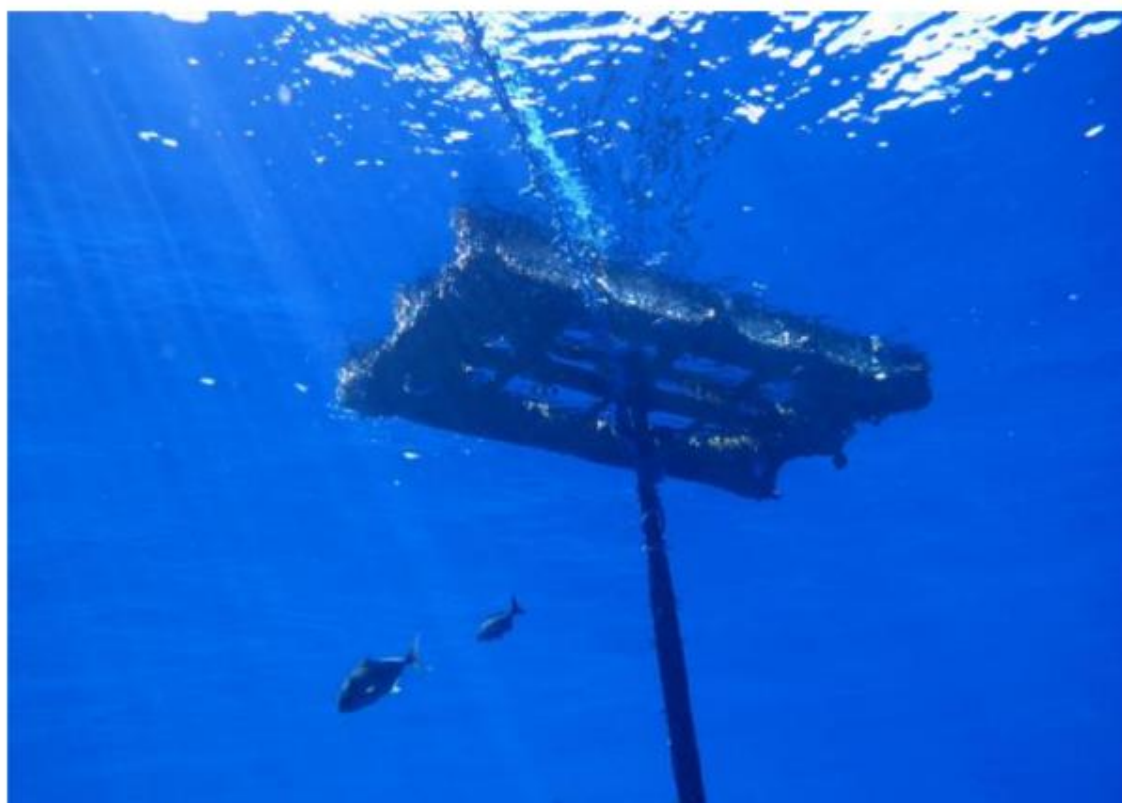
The accounting of the number of FADs implies that each FAD is associated with a buoy, so there is a complete control of the number of active instrumented buoys per day and vessel.

The main information is provided by buoys suppliers through provides buoys with a location system and daily speed data. A Scientific Institute receives this information per month and with a delay of two months in csv files.

The processing of information implies a filtering of data to discard records that do not correspond to data of active buoys, deployed at sea or in the scope of application corresponding to each RFMOs.

In addition, there are other control mechanisms that include analysis of disabled buoys in port, data crossing of the first moment of activation of a buoy and VMS location of the vessel, as well as with FADs notebooks and observer information.

**INDONESIA DRIFTING FISH AGGREGATING DEVICES
MANAGEMENT PLAN IN INDIAN OCEAN
(DFADs MANAGEMENT PLAN FOR 2015 – 2017)**



Source: ISSF

INDONESIA DRIFTING FISH AGGREGATING DEVICES MANAGEMENT PLAN IN INDIAN OCEAN (DFADs MANAGEMENT PLAN FOR 2015 – 2017)

1. Objective

The objective of this FADs management plan are but not limited to:

- a. Strengthen a collection of scientific data.
- b. Minimize the catch of bycatch of small tuna on FADs
- c. Strengthen catch composition data collection to purse-seine fisheries on FADs.
- d. Limit a number of deployed FAD.

2. Scope

Description of its application with respect to:

- a. Vessel Type:
 - i. Small pelagic purse-seiner with one boat;
 - ii. Large pelagic purse-seiner with one boat;
 - iii. Large pelagic purse-seiner-group
 - iv. Handline
 - v. Pole and line
- b. DFAD numbers and/or DFADs beacon numbers to be deployed:

Each eligible vessel only granted to deploy maximum 3 (three) sets of FADs.

- c. Reporting procedures.

Reporting procedure is classified into two (2) categories, namely:

c.1 Reporting Procedure for DFAD deployment

Any company or operator or person who has deployed FADs is required to submit a FAD deployment report to Directorate General of Capture Fisheries, shall include:

- i. Date and time of FADs deployment.
- ii. Number of deployed FADs
- iii. Marking of FADs
- iv. FADs position (Latitude and Longitude)
- v. Name of fishing vessel and its gear type.
- vi. Conclusion and recommendation

c.2 Reporting Procedure for DFADs Harvesting

Any fishing company or operator or person who has harvested fish on FADs is required to submit a harvesting report to Directorate General of Capture Fisheries, shall include:

- i. FADs location (latitude and longitude)
- ii. Marking of FADs
- iii. Name of fishing vessel and it's gear type
- iv. Frequency of harvesting.
- v. Number and catch species
- vi. Catch composition

d. incidental bycatch reduction and utilization policy:

i. Catch Retention

Each eligible vessel to have FADs shall retain all catch on board, both target species and bycatch such tuna juvenile.

ii. Releasing Turtle

Each eligible vessel to have FADs shall require to release all marine turtles which are entangled in fishing gear.

e. Consideration of interaction with other gear types:

There is a potential conflict between eligible vessel to have FADs and Tuna Longline fleet.

f. Plans for monitoring and retrieval of lost DFADs

Monitoring may be undertaken at the time of deployment as well as harvesting. During this monitoring, losted DFADs will be retrieved. In this incident, investigation will be made to find out the owner of DFADs.

3. Institutional arrangements for management of the DFAD Management Plans:

a. Institutional responsibilities:

Directorate General of Capture Fisheries, Ministry of Marine Affairs and Fisheries is responsible to manage FADs to be deployed by Indonesia flagged vessels.

b. Application processes for DFAD and /or DFAD beacons deployment approval:

- b.1 Each person who is intending to deploy FADs within Indonesia Fisheries Management Area and High Seas shall require to have FAD License to be issued by Director General of Capture Fisheries.

- b.2 Application to have FAD shall be submitted to Director General of Capture Fisheries by Providing the following information:
- Date of FADs Deployment;
 - Proposed of Number of FADs;
 - Location of FADs Deployment (latitude and longitude);
 - Estimation of harvesting frequency (monthly or yearly basis);
 - Estimation of fish species and catch in each setting.
- b.3 In addition to the requirement as stipulated in point b.2, the application shall be accompanied with the following document:
- Copy of Fishing Permit;
 - Copy of ID of vessel owner or responsible person;
 - FADs layout and general specification such as material, dimension, and number of each FADs main component;
- c. Obligations of vessel owners and masters in respect of DFAD and /or DFAD beacons deployment and use
- c.1 Vessel owner and master shall submit a report to Director General of Capture Fisheries in respect of DFADs deployment shall include minimum information as following:
- Date of FADs Deployment;
 - Number of Deployed FADs;
 - Location of each FADs (latitude and longitude);
 - FADs Marking;
 - Name of vessel and type of fishing gear;
 - Conclusion and recommendation.
- C.2 Vessel owner and master shall submit a report to Director General of Capture Fisheries in respect of DFADs use shall include minimum information as following:
- Location (latitude and longitude) of used FADs;
 - FADs Marking;
 - Name of vessel and type of fishing gear;
 - Frequency of harvesting of FADs;
 - Catch by species.
- d. DFAD and/or DFADs beacons replacement policy
- d.1 In case FADs license is expired and not be renewed, the holder of FADs License shall discharge of the deployed of FADs.

- d.2 In case the holder of FADs license does not discharge the deployed FADs as stipulated in para d.1, he or she will be classified as non-eligible person to have new FADs license.
- e. Reporting obligations
 - e.1 Report of FADs deployment shall be submitted to Director General of Capture Fisheries within 14 days after the deployment.
 - e.2 Report of FADs use shall be submitted to Director General of Capture Fisheries every six (6) month.

4. DFAD construction specifications and requirements

- a. DFAD design characteristics (a description)

DFAD component consist of:

 - i. buoy;
 - ii. attractor;
 - iii. rope; and
 - iv. weight.
- b. DFAD markings and identifiers, including DFADs beacons:

DFAD marking composed of:

 - i. Name of owner;
 - ii. Number of fishing permit and fishing vessel authorized to use DFADs.
 - iii. Location (latitude and longitude) of DFADs deployment.
- c. Lighting requirements

4000 watt – 16000 watt.
- d. Radar reflectors

Radar reflector is a piece of flat galvanized steel that could be detected by radar.
- e. Visible distance

DFADs can be deployed with a minimum distance ten (10) nautical miles each other.
- f. Radio buoys (requirement for serial numbers)

No radio buoys requirement regulated.
- g. Satellite transceivers (requirement for serial numbers)

No satellite transceivers requirement regulated

- h. Technical requirement in DFADs use.

It is prohibited to shift of DFADs by vessel or other auxiliary tool which is intending to gather aggregated fish in more than one DFADs.

5. Applicable areas

This plan is applied to Indonesia flagged vessel that are fishing in the following waters:

- a. Indonesia archipelagic waters
- b. Indonesia territorial waters
- c. Indonesia Exclusive Economy Zone
- d. High Seas of Indian Ocean

6. Applicable period for the DFAD–MP

DFAD Management Plan will be implemented during 2015-2017.

7. Means for monitoring and reviewing implementation of the DFAD–MP

- 7.1 Regular monitoring will be undertaken by fisheries observer by fishing vessel or fisheries patrol boat.
- 7.2 DFAD Management Plan will be reviewed every 3 (three) year and will be amended at any time if deemed necessary. The first review will be done in 2017.

8. DFAD logbook

No specific DFAD logbook regulated.

IRAN Management Plan for DFAD preparation (Revised on 2019)

1. Objective :

- Catch Increase
- Data collection of catch volume, composition and sizes as well as by-catch amount
- Implementation a DFADs monitoring and control plan

2. Scope:

- 2.1. There are 8 purse-seine vessels that currently 5 of those are active with GT capacity between 1200-2500 Mt. The vessels sizes range is among 60-90 meters.
- 2.2. There are almost 40 DFAD beacons deployed for each vessel; however for operating vessels, some logs could be deployed; which are not reported.
- 2.3. A logbook considered for each vessel; which contains DFAD installation timing report, harvest, catch amount and composition.
- 2.4. Regular DFADs are deployed but any incidental catch or endangered caught species will be released to sea as much as possible.
- 2.5. Fishing permission license for these vessels are issued for two different seasons. DFADs are not permitted in Oman Sea. Besides There is not any type of fishing method in Arabian Sea and Indian Ocean that engages with other fishing gears.
- 2.6. Numbers of DFADs of each vessel are regularly checked. In case of any loose condition, SHILAT receives the report.
- 2.7. SHILAT is making necessary arrangements to collect the documents on DFADs ownership.

3. Institutional arrangements

- 3.1. Deputy of Fishing and fishing Harbors of Iran Fisheries Organization is officially responsible for Management and Policy making for DFADs deployment.
- 3.2. Amount and composition of fish that unloaded in ports, is compared to the logbook data for verification and final approval.
- 3.3. The owners are obliged to report DFADs deployment condition via logbooks

- 3.4. According to the number of deployed DFADs by each vessel in Iran, that is notably fewer than maximum announced level by IOTC, there is no definite policy for DFADs replacement.
- 3.5. Logbook reports are received upon arrival of vessels in unloading ports. It is necessary for fishing license issuance.

4. DFAD construction specifications

- 4.1. DFADs are mostly made of Bamboo wood or renewable materials in their natural form. Dimensions of these DFADs are approximately 2*3 and/or 3*3 meters.
- 4.2. Name of the vessel has been marked on DFADs.
- 4.3. There is no lighting requirement.
- 4.4. These devices have no reflection on radar instruments.
- 4.5. Visibility distance is 4 miles.
- 4.6. Some buoys are installed on DFADs have special serial numbers
- 4.7. Buoys are also traceable via satellite.

5. Application areas

- 5.1. Operation zone of purse seiners is Oman Sea and International waters of Indian Ocean including fishing Islands, coastal waters and EEZ areas of coastal countries (by loyalty payment to coastal countries)

6. Applicable period for DFAD-MP

From 1st of August till 30th of March

7. Monitoring and reviewing of MP

Logbook data and the activities of DFADs management plan, is reviewed annually by fishing management Committee.

8. DFAD Logbook

- a) DFADs logbook is merged with catch logbook to ease data collection (attached), however Data on DFAD sets catch and effort is included in this logbook.
- b) DFADs characteristics are provided to SHILAT by vessel owners. If required, SHILAT could visit DFADs. DFADs data during operation collected by captain and filled in logbook.
 - i. Position included in logbook (by latitudes and longitudes)
 - ii. Date is included in logbook (by year, month and day)

- iii. DFADs identifiers data is provided in the logbook
- iv. DFADs type is included in logbook.
- v. DFADs design characteristics is already identified and provided to SHILAT but no data on design included in logbook.
- vi. Visits are implemented during deployment and hauling.

C. if the visit followed by a set the results of the set in terms of catch and by-catch is filled in logbook through caught species specifications (type and Amount)

LOGBOOK & FAD LOGBOOK OF PURSE SEINERS((Revised on 2019)

Name of vessels:

Name of captain:

[illegible][illegible]

DFAD Management Plan for Japanese tuna purse seine fishing vessels

Fisheries Agency of Japan (FAJ)

1. Objective

This document describes Drifting Fish Aggregating Devices (DFAD) Management Plan to be applied to Japanese tuna purse seine fishing vessels, in order to fulfill paragraphs 2 and 6 of IOTC Resolution 17/08. The objective of the plan is to ensure that the use of DFAD by Japanese tuna purse seine fishing vessels is managed in a manner consistent with the conservation and management measures and data collection requirements of the IOTC.

2. Scope

(1) Vessel-types and support and tender vessels:

This Management Plan applies to DFAD used by Japanese tuna purse seine fishing vessels during their fishing operation in the Indian Ocean.

(2) DFAD numbers and/or DFAD's beacon numbers to be deployed:

Each vessel may deploy at maximum 150 sets of DFAD.

(3) Use of support (or supply) vessel

According to the agreement at the 22nd Session of the IOTC (see para 53 of the report), Japan will register one support vessel (Gouta-maru).

(4) Reporting procedures for DFAD deployment:

A vessel operator shall record information about deployment of DFADs in the FAD logbook (See attached) and submit it to the Japan Far Seas Purse Seine Fishing Association after each cruise. The Japan Far Seas Purse Seine Fishing Association shall submit it to FAJ after reviewing it.

(5) Incidental bycatch reduction and utilization policy:

The primary objective of this DFAD Management Plan is to reduce captures of non-target species associated with fishing on DFADs.

FAJ and Fisheries Research and Education Agency (FRA) have been carrying out a series of research activities in order to develop effective and practical methods for reduction of both juvenile bigeye and yellowfin tuna and non-target species catch in DFAD operation.

The more specific purposes of the research activities have been:

- To investigate effectiveness of larger mesh size nets;
- To develop simulation models visualizing under-water shapes of purse seine nets; and
- To evaluate new DFAD designs (sheet type) that potentially can avoid entanglements of non-target species such as sharks and sea turtles.

FAJ periodically holds consultation with scientists, industries and other experts to review the development of effective mitigation measures for juvenile bigeye and yellowfin tuna catch for further improvements of the measures.

(6) Consideration of interaction with other gear types

When a fishing operator finds other gear type vessels, the operator does not deploy DFADs near the vessels.

(7) Plans for monitoring and retrieval of lost DFADs:

The location of DFAD which is marked with the identified number is monitored by GPS. If the signal is lost, every effort is made to retrieve it. If it cannot be collected, the incident is recorded on FAD logbooks.

(8) Statement or policy on “DFADs ownership”:

Vessel operators monitor the location of DFAD through GPS. Each DFAD is marked with relevant information in order to identify the owner.

3. Institutional arrangement of the DFAD Management Plans:

(1) Institutional responsibilities:

Vessel operators are responsible for implementation of this DFAD Management Plans including the FAD logbook control. The Japan Far Seas Purse Seine Association will guide and assist the implementation of this plan. The FAJ provides guidance for proper application of this plan, if necessary, through the Japan Far Seas Purse Seine Fishing Association.

(2) Application processes for DFAD and /or DFAD beacons deployment approval:

Vessel owners shall notify FAJ of the number of DFAD and beacons planned to deploy in advance. All actual deployment is recorded on the FADs logbook.

(3) Obligations of vessel owners and masters in respect of DFAD and /or DFAD beacons deployment and use:

Vessel operators and owners shall comply with requirements stipulated in this Management Plan and IOTC management measures regarding DFAD operation

(4) DFAD and/or DFADs beacons replacement policy:

All replacement will be recorded on the FADs logbook. Old DFAD should be retrieved as practically as possible.

(5) Reporting obligation

Fishing operators and/or owners will report use of DFAD through the FADs logbook after each cruise to the Japan Far Seas Purse Seine Fishing Association. The Japan Far Seas Purse Seine Fishing Association will submit the logbook to the FAJ.

4. DFADs construction specifications and requirements

(1) DFAD design characteristics

DFAD design characteristics are sheet type and net type.

(2) DFAD marking and identifiers, including DFADs beacons

Vessel operators monitor the location of DFAD through GPS. Each DFAD is marked with relevant information in order to identify the owner.

(3) Lighting requirements

The GPS buoy has a function to light up when the vessel approaches.

(4) Radar reflectors

Radar reflectors are not installed in a DFAD.

(5) Visible distance

It depends on the ocean condition.

(6) Radio buoys (requirement for serial numbers)

No radio buoy is used on DFAD.

(7) Satellite transceivers (requirement for serial numbers)

A GPS buoy is installed in each DFAD.

5. Applicable areas

This Management Plan will be applied to fishing operation in the IOTC convention area. All Japanese fishing vessels follow area/time closures adopted as the IOTC conservation and management measures.

6. Applicable periods for the DFAD-MP

This Management Plan will be applied for the entire period while Japanese purse seiners operate in the IOTC convention area. This plan may be modified if the IOTC conservation and management measures are amended.

7. Means for monitoring and reviewing implementation of the DFAD-MP

The Japan Far Seas Purse Seine Fishing Association will review the submitted logbook and will submit it to the FAJ. The FAJ provides guidance to the Japan Far Seas Purse Seine Fishing Association based on the information on the logbook, if necessary.

8. DFAD logbook

The format of FADs logbook is attached.

DFAD logbook																																	
Address																																	
Name														Name of vessel				Gross tonnage															Tonnage
														Call sign				Licence number															Number
year	month	day	Latitude				Longitude				ID	DFAD type (drifting natural FAD, drifting artificial FAD) DFAD design characteristics	(1) deployment (2) hauling (3) retrieving (4) loss (5) operation	Remarks																			
			N				E																										
			S				W																										
			N				E																										
			S				W																										
			N				E																										
			S				W																										
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Drifting Fish Aggregating Devices (DFADs) Management Plan

Ministry of Oceans and Fisheries

Republic of Korea

1.Objective

This DFADs Management Plan is devised to minimize and reduce fishing mortalities of juvenile bigeye and yellowfin tunas and non-target species associated with fishing on FADs and to collect data concerning the fishing activities. This Management Plan covers the use of drifting fish aggregating devices (DFADs) by Korean-flagged purse seiners for the year of 2019 in accordance with paragraph 11 of the IOTC Resolution 18/08. The Ministry of Oceans and Fisheries (MOF) is responsible for the implementation of this Management Plan.

2. Scope

This Management Plan applies to Korean-flagged purse seine vessels and supply vessels. The Republic of Korea will ensure that no more than 350 instrumented buoys are active at sea at any one given time in relation to each of its vessels and no more than 700 instrumented buoys shall be acquired annually by each of its fishing vessel.

The master of fishing vessels is required to record each activity related to DFADs on the drifting FAD logbook (*Please refer to 8. DFAD logbook of this Management Plan*) and report to the National Institute of Fisheries Science (NIFS) on a monthly basis. Furthermore, the Republic of Korea is developing e-reporting system so that fishermen can report the logbook data on a daily basis.

During the periods of 2016 to 2018, NIFS had carried out a project under the title of *Development of Improved FAD design* to reduce the incidence of entanglement of non-target species.

MOF also encourages fishing vessels concerned to prevent, to the extent possible, the loss or abandonment of DFADs at sea. In the event any DFAD is lost or is highly unlikely to be hauled, the master of a fishing vessel shall record its last known date and position on the drifting FAD logbook. If a fisherman finds any FAD lost by other vessels at sea, they are encouraged to retrieve and bring it back to a port. To ensure DFAD ownership, drifting fish aggregating devices are equipped with instrumented buoys, a kind of buoy with clearly marked vessel name, call-sign and ID number.

3. Institutional arrangements for management of the DFADs Management Plan

MOF in cooperation with NIFS closely monitors the implementation of applicable IOTC resolutions with regard to DFADs management including the IOTC Resolution 18/08, in accordance with relevant domestic laws and regulations.

In order to implement national DFADs management plan, MOF ensures that each fishing vessel records required information on activities related to DFADs on its drifting FAD logbook and fishing logbook and report them to NIFS.

In respect to DFADs and/or DFADs beacons deployment and use, the operators of distant water fishing vessels are obliged to supervise their fishing vessels against this DFADs Management Plan and ensure that the masters are in full compliance with this DFADs Management Plan and applicable conservation and management measures adopted by IOTC.

If deployed DFADs are worn out or need to be replaced, the master of the fishing vessel will replace it and record the case on the drifting FAD logbook. In general, the master of each fishing vessel shall record information concerning DFADs activities on the drifting FAD logbook and report them to NIFS.

4. DFAD construction specifications and requirements

It is required that Korean-flagged purse seiners submit their DFADs construction specifications to the Korean government. In addition, the master of the fishing vessels shall record the information about FAD characteristics on the drifting logbook. DFADs are equipped with instrumented buoys, a kind of buoy with clearly marked vessel name, call-sign and identification number.

5. Applicable areas

This plan is applicable to the IOTC areas of competence.

6. Applicable period for the DFADs-MP

This DFADs-MP is applied during the time when Korean-flagged purse seiners are in operation in the IOTC area of competence.

7. Means for monitoring and reviewing implementation of the DFADs-MP

Every activity on drifting FAD is recorded by the master of fishing vessels on drifting FAD logbook which is reported to NIFS, and the relevant information is collected by scientific observer programs as well.

8. DFAD logbook

Following is a drifting FAD logbook sample which is used by Korean-flagged purse seine fishing vessels and supply vessel.

Attachment 1. DFAD logbook

[illegible]

Reviews of Initially Submitted DFADs Management Plan

Ministry of Oceans and Fisheries

Republic of Korea

The Republic of Korea has fully implemented the DFADs Management Plan submitted previous year. The Korean-flagged purse seine vessels and the supply vessels used drifting FADs in accordance with the Plan, and all drifting FADs used were recorded in the drifting FAD logbook. In addition, all the relevant reporting requirements were also fully met.

In 2018, two purse seiners engaged in fishing activities in the IOTC area of competence and the total number of instrumented buoys allowed for the vessels was 1,400 (700 for each vessel) pursuant to the IOTC Resolution 18/08. In the same year, the two purse seiners acquired 846 instrumented buoys in total, and each vessel used 350 or less active instrumented buoys at any one time in full compliance with the requirements made in the Resolution.

Mauritius DFADs Management Plan

Received 14.11.2018

Drifting Fish Aggregating Device (DFAD) Management Plan

Submitted by: Mauritius

Operator: SAPMER/IOSMS (Indian Ocean Ship Management Services)

Purse Seiners: Belle Isle and Belle Rive

Supply vessel: Balbaya

1. **Objective:** Appropriate deployment and management of DFADs to maintain tuna stocks at sustainable levels.
2. **Scope:**
 - a. **Vessel type:** purse seiner and supply vessel.
 - b. **DFAD numbers or number of beacons to be deployed:** A maximum of 350 instrumented buoys are active at sea at any one time in relation to each of its vessels through such measures as for example the monthly review sent by the provider and a maximum of 700 instrumented buoys may be acquired annually by each of its fishing vessel.
 - c. **Reporting procedures:** Through Logbooks (refer to Appendix 1)
 - d. **Incidental by catch reduction and utilization policy:** Deployment of Non-entangling FADs. Details on non-entangling FADs are given at Appendix 2a and 2b. Furthermore, biofads also are being used (Appendix 3)
 - e. **Consideration of interaction with other gears type:** The Mauritius tuna longline fleet operating from Port Louis carry out fishing activities mostly in the EEZ and hence has no interaction with the purse seine operations which occur mostly outside the EEZ. Moreover licensed foreign longliners operate mostly in the EEZ of Mauritius thereby eliminating the risk of conflict between purse seine fishing and tuna longlining arising from the use of DFADs. The DFAD MP shall be reviewed in case of any adverse impacts reported as a result of DFADs or part of DFADs having interfered with longline operation.
 - f. **Monitoring and retrieval of lost DFADs:** All DFADs are marked and are equipped with satellite buoys that allow movement monitoring. Vessel masters are encouraged to prevent, as far as possible, loss of FAD sets at sea. In the event of a loss or of the impossibility of hauling in a FAD, operators must record in the logbook (Appendix 1) its last known date and position.
 - g. **Statement or policy on DFAD ownership:** DFADs beacons are clearly marked with a serial number.

3. Institutional arrangement for management of the DFAD Management Plan:

- **Institutional responsibilities:** Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping monitors activities of its flagged vessels DFADs through DFADs logbooks. The purchase order of the vessel owners and operators is also verified to ensure that their annual purchase of beacons is within the limit of 700 instrumental buoys that can be acquired annually by vessel.
- **Application processes for DFAD and/or DFAD beacons deployment approval:** Presently, no application process and approval is required for the deployment of DFAD and DFAD beacons. However, the Ministry ensures that the deployment of DFAD is being properly done by the vessels owners and operators according to the DFAD-MP. Moreover, all information pertaining to deployment of DFAD and or DFAD beacons is recorded in logbooks that are inspected for compliance by the Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping.

DFAD and/or DFADs beacons replacement policy:

- **Obligations of vessel owners and masters in respect of DFAD and/or DFAD beacons deployment and use:**
 - (i) The maximum number of instrumental buoys active at any one time at sea should not exceed 350 for each purse seiner.
 - (ii) Only non-entangling DFAD or biofads should be deployed by the purse seiners or the supply vessel.
 - (iii) Record each activity with respect to DFAD and DFAD beacon deployment and use in the logbook/DFAD logbook.
 - (iv) All DFADs deployed are marked with a detailed marking scheme defined by the beacon ID.
- **Reporting obligations** – All information pertaining to DFAD/DFAD beacons deployment is recorded in logbooks (refer to Appendix 1). This include:
 - (i) The date of deployment
 - (ii) The position (latitude and longitude) of DFAD/DFAD beacon deployment.
 - (iii) Identification number of the beacon
 - (iv) The total number of DFAD/DFAD beacons deployed per trip.
 - (v) DFAD type (drifting natural, drifting artificial)
 - (vi) Type of visit (deployment, hauling, retrieving, loss, intervention on electronic equipment)

4. **DFAD construction specifications and requirements**

- a. DFAD design characteristics (a description): As per annexed plan (refer to Appendix 2 and 3)
- b. DFAD markings and identifiers, including DFAD beacons: DFAD identified by serial number
- c. Lighting requirements: flash command
- d. Radar reflectors: visible without radar reflectors
- e. Visible distance: 1 NM
- f. Satellite buoys (requirement for serial numbers): marine instruments

MSI XXXXX

M3I XXXXX

M4I XXXXX

- g. Satellite transceivers (requirement for serial numbers): All DFADs are equipped with satellite transceivers to allow the monitoring of FAD trajectory.

5. **Applicable areas:** on high seas and EEZ of the Indian Ocean Coastal State through licenses, shipping lanes, away from fishing grounds of the artisanal fishery.

6. **Applicable period for the DFAD-MP:** The current Management Plan is valid for a period of one year.

7. **Means for monitoring and reviewing implementation of the DFAD-MP:** The implementation of the DFAD-MP will be monitored and reviewed by the Ministry of Ocean Economy, Marine Resources, Fisheries, and Shipping at regular intervals. The monitoring will be done jointly with the ship owners and operators and the tuna export industry. The DFAD-MP will be reviewed on a yearly basis to accommodate new management measures accepted at the Commission meeting with regard to FADs. Submission of logbook with complete information on DFAD related activities have been made compulsory. All the information with regard to DFAD is recorded in the Ministry's database that allows easy access for verification and monitoring. For instance, the number of DFADs deployed at sea is recorded based on the logbooks and verified if they are within the set limits of the Resolution 18/08. This information is processed and submitted to the IOTC on a yearly basis. A progress report on the implementation of the DFAD-MP will be prepared and submitted to the IOTC on a yearly basis.

8. DFAD Logbook:

For purse seiners: all activities are reported in the applicable fishing logbook designed to accommodate all information concerning activities related to DFAD.

For supply vessel: a specific FAD logbook is used to report all information concerning activities related to DFAD.

Activities include:

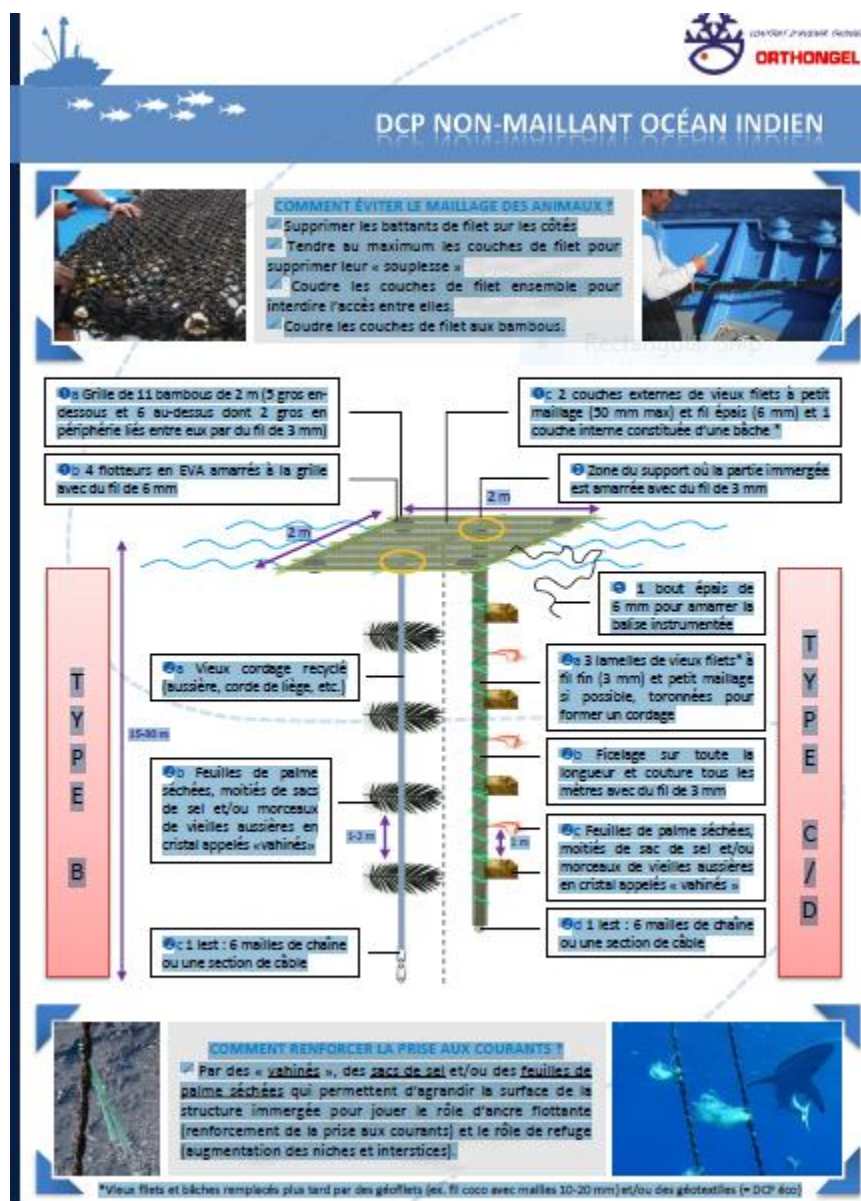
- Deployment/launch of FADs
- Removal of FADs
- Visiting of FADs with or without handling (maintenance/exchange)

For each of the above activities, the following information is also recorded in the logbook:

- Date and time;
- Position (latitude & longitude);
- Type of FAD (natural, artificial, "classic" or "non-entangling" draft) along with a short description (tree trunk, pile of straw, container, rope, ...)
- Number of associated beacon in case of a TFAD;
- Number of removed beacon in case of a TFAD if the beacon belonged to the vessel, if not write "beacon of a third vessel";
- Any observation with regard to entangled sharks or turtles if ever the FAD has net counterparts;
- Tons caught per species;
- Any discard quantities

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APPENDIX 2a



APPENDIX 2b

ANNEXE 3 : PHOTOS DE DCP NON-MAILLANTS

a) DCP non-mailants en mer

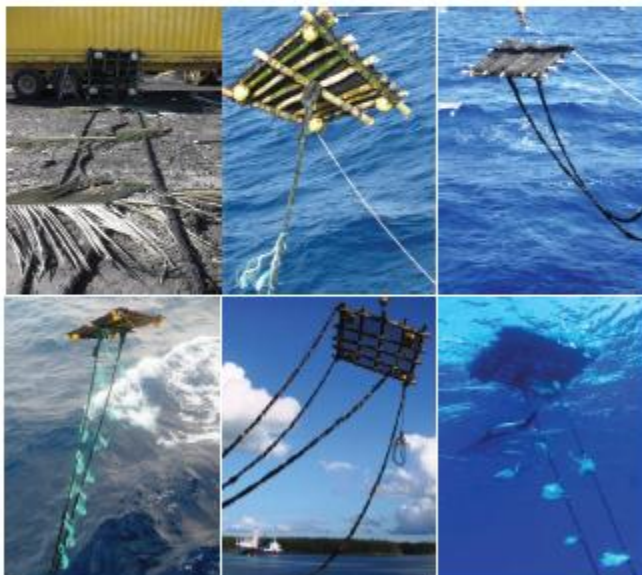


b) DCP non-maillants déployés dans l'océan Indien

Design B



Design C/D



APPENDIX 4



Since January first 2012, SAPMER SA does not permit its vessels to deploy Fishing Aggregation Device (FAD) presenting entanglement risks. SAPMER Group's vessels operated by Tuna Fishing Company (TFC) and Indian Ocean Ship Management Service (IOSMS) are subject to the same environmental measure.


This non-entangling FAD Policy is based on our Producer Organization ORTHONGEL Decision n°11 dated November 23rd 2011 which is available at the following link : <http://www.orthongel.fr/contenu/docs/decisions/Dec11-DCPeco.pdf>.

The characteristics and engineering of non-entangling FAD were determined during the "tuna for tomorrow program ECO FAD" and are consistent with ISSF Guide for non-entangling FAD.

This policy and our membership to ISSF are posted on Company's website (<http://www.sapmer.com>) and are also available onboard every SAPMER Group's vessels related to Tuna activities.

This policy and the associated technical means have been developed since then in a process of continuous improvement.

APPENDIX 5



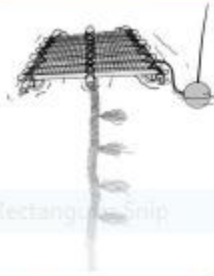
Le Contrat d'Avenir Thonier « DCP éco »

Objectifs et moyens

Sur la base des résultats du programme MADE, ce programme avait pour objectif de modifier les Dispositifs de Concentration de Poissons (DCP) de l'ensemble de la flottille de thoniers senniers français afin d'éradiquer le maillage dans les DCP des tortues et des requins.

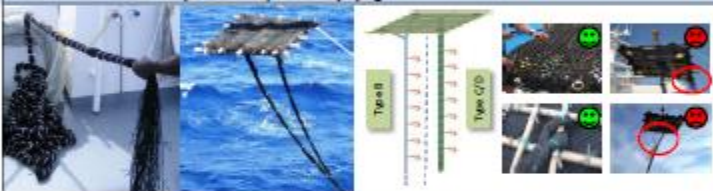
Ce programme a bénéficié d'une aide financière publique de la DPMA et de l'UE dans le cadre des actions collectives prévues pour le FEP et a été réalisé en étroite coopération avec l'IRD.

Durée du programme : juillet 2010 à juin 2012



Rectangular Snip

Déploiement par les équipages des DCP non-maillants



Protocole du programme

- Présentation aux équipages des objectifs et les designs initiaux imaginés par l'IRD.
- Fourniture aux navires de matériel pour DCP.
- Documentation par le capitaine des déploiements et des coups de senne sur un DCP non-maillant.
- Debriefing en fin de marée avec le chargé de mission.
- Redéfinition des caractéristiques des DCP non-maillants avec rédaction de fiches pour les équipages.


Résultats du programme

- 3 designs retenus.
- 1100 mises à l'eau documentées de DCP non-maillants en Océan Indien, 130 en Atlantique (où les thoniers senniers français déploient très peu de DCP).
- Analyse comparative des données de pêche sur DCP non-maillants et sur DCP traditionnels montrant que le temps de maturation du DCP et le tonnage moyen pêché sont identiques et qu'il n'y a donc pas de différence significative entre les rendements de pêche sur DCP traditionnels et sur DCP non-maillants.

Implications du programme en termes de gestion

Depuis 2012, la flottille Orthongel ne met donc plus à l'eau que des DCP non maillants (décision n° 11) et a largement diffusé ces résultats qui ont servi de bases aux avis des comités scientifiques des ORGP et de l'ISSF sur la conception des DCP.

Décision Orthongel n° 11 <http://www.orthongel.fr/conteru/doss/décisions/Déc11-DCPeco.pdf>
 Descriptif du programme <http://www.orthongel.fr/index.php?orthongelcat8:pagesdespeco>
 Goujon, M., Vernet, A.L., Dagorn, L., 2012. Preliminary results of the Orthongel program « eco-FAD » as June 30th 2012. IOTC-2012-WPEB08-INF21



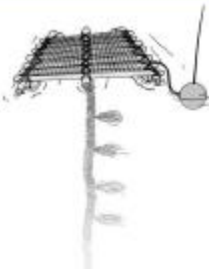
The Tuna for Tomorrow Program « ecoFAD »

Objectives and means



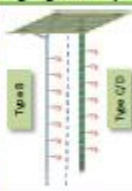

Based on the results of the MADE program, this program intended to modify the Fishing Aggregating Devices (FADs) of the whole French tuna purse-seiners in order to eradicate the entangling of turtles and sharks.

This program has received public funding from DPMA and EU in the context of EFF collective actions and was carried out in close cooperation with IRD.

Duration : July 2010 to June 2012



Deployment of non-entangling FADs by the crews

Program protocol

- Presentation to the crews of the objectives and of initial designs conceived by IRD.
- Provision to the vessels of materials to build non-entangling FADs.
- Documentation by captains of the deployments and sets on non-entangling FADs.
- Debriefing the end of the cruise with the person in charge of the program.
- Redefinition of the characteristics of non-entangling FADs & writing of design sheets for the crews.

Program results

- 3 designs retained.
- 1100 non-entangling FAD deployments documented in the Indian Ocean, 130 in the Atlantic Ocean (where the French tuna purse-seiners use few FADs).
- Comparative analysis of fishing data on non-entangling and traditional FADs showing that the FAD maturation time and the average tonnage caught per set are identical and that there is therefore no significant difference in terms of yield fishing on non-entangling FADs rather than on traditional FADs.

Program implications in terms of management

Since 2012, the fleet of Orthongel therefore does deploy only non-entangling FADs (Decision n° 11) and Orthongel has widely disseminated these results which were used as bases for advice by the scientific committees of RFMOs and ISSF on FAD design.

Orthongel Decision n° 11 <http://www.orthongel.fr/contenu/docs/decisions/Dec11-DCPeco.pdf>

Program description <http://www.orthongel.fr/index.php?content=cat&page=ecopaco>

Goujon, M., Vernet, A.L., Dagorn, L., 2012. Preliminary results of the Orthongel program « eco-FAD » as June 30th 2012. IOTC-2012-WPEB08-INF21

Drifting Fish Aggregation Devices (DFADs) Management Plan for Seychelles fleet fishing for tuna and tuna-like species in the IOTC area of competence

1. Objective

This Management Plan For Drifting Fish Aggregation Devices (DFADs) for Seychelles have as principal aim to provide guidelines for the use of drifting FADS by Seychelles' fleet targeting tuna and tuna-like species in the IOTC area of competence. This Management Plan fulfils Seychelles' obligations as a member of the Indian Ocean Tuna Commission (IOTC) in regards to IOTC's Resolution 13/08 (*Procedures on a Fish Aggregating Devices (FADs) Management Plan*) that requires all IOTCCPCs that use FADs to submit FAD Management Plans for their fleets targeting tuna and tuna-like species in the IOTC area of competence.

2. Scope

The current plan applies to:

- a) Seychelles flagged purse-seiners and
- b) Support (or supply) vessels,
 - i. under the flag of Seychelles, which operate in conjunction with purse-seiners of any flag;
 - ii. of any flag, acting in support of Seychelles flagged purse seiners, provided that they are not covered by a FAD-MPs from their flag states or are not reporting DFAD logbooks to the Seychelles Authority.

Seychelles considers that support (or supply) vessels are an integral part of the purse seine fishing effort and that it is necessary to understand their operations, and the extent to which they contribute to increase the fishing efficiency of the purse seine fleet.

Seychelles vessels currently do not operate anchored FADs, so these are not covered by the current Plan.

3. Definitions

For the purpose of the DFAD- Management Plan, the term beacons is used to define radio buoys, satellite transceiver or any other electronic device used to track and retrieve DFADs.

4. Background

The term FAD stands for "Fish Aggregating Device". There are two main types of FADs: natural and man-made. Natural FADs are naturally occurring floating objects such as logs, branches, debris and large dead floating marine organisms (whales, whale sharks,

manta rays, etc). Man-made FADs are usually bamboo rafts with old nets hanging underneath and can be found either drifting or anchored.

In the open ocean many fish species including tuna, associate with objects floating on the surface, such as logs. This is highly advantageous to purse seine fishing as free swimming tuna tend to aggregate in the proximity of floating objects and remain highly aggregated making those schools more susceptible to capture by tuna purse seiners.

In the mid 1980's, skippers experimented with ways to maximize the potential of floating objects as tools to enhance fishing. Initially, reflectors and radio beacons were attached to logs to improve their detection over distances and fishers eventually started to construct purpose built Drifting Fish Aggregation Devices (DFADs) fitted with electronic buoys to simultaneously boost the number of floating objects in the ocean and further aid their detection. The most recent generation of DFADs are equipped with echo-sounders that transmit daily or hourly estimates of fish biomass beneath the buoy significantly reducing the searching time.

The increasing use of DFADs has improved catch rates thus greatly enhancing the ability of purse seiners to catch tropical tunas, and allowing boat owners to expand the capacity of their fleets in an attempt to exploit more of the resources. Thus, at present about half of the global tuna catches comes from the use of DFADs.

While DFADs are evidently useful fishing tools, their use has been associated with several potential negative ecosystem impacts such as;

- Catch of juvenile tuna (mainly yellowfin and bigeye)
- Higher levels of bycatch of non-targeted, associated and dependent species (NTAD) -such as sharks and marine turtles-, as compared to those obtained when fishing on free-swimming schools.
- Unsustainable exploitation of stocks through increased fishing effort.
- Ecological impact on marine habitat including coral reefs.
- Marine pollution (persistent marine debris)

In 2010 the IOTC adopted Resolution 10/02, which includes provisions for IOTC CPCs having industrial tuna purse seiners that use supply vessels and/or FADs to report information on the total numbers of FADs deployed by quarter and daily activities of supply vessels. However, in recent years the IOTC, recognizing the need to enhancing monitoring of activities on FADs, adopted Resolution 13/08. Resolution 13/08 calls for all IOTC CPCs that use FADs, drifting and/or anchored, to prepare and present FAD Management Plans for their fisheries, using the Guidelines provided in such resolution. Provisions in this resolution also include collection and reporting through FAD logbook.

5. Historical use of DFAD's by the Seychelles Purse seine fleet fishing for tuna and tuna-like species in the Indian Ocean.

There are very limited data on the actual number of DFAD's deployed by the Seychelles purse seine fleet and their supporting supply vessels. The logbook for purse seine vessels only make provisions for the reporting of sets made on DFAD's associated schools including the corresponding catches by species, irrespective of the type of DFAD involved (natural or man-made). Over the period 2004 to 2013 an annual average of 49,185 MT of tuna were reported as being taken on DFAD's associated schools which corresponds to an average of 73% of the total annual reported catch of this fleet. The catch composition of target species consisted on average of 63% skipjack tuna, 29% yellowfin tuna and 8% bigeye tuna.

6. Use of drifting FADS by Seychelles' purse seine fleet targeting tuna and tuna-like species in the IOTC area of competence.

This Management plan (DFAD – MP) will provide guidelines in the following nine areas:

- i. Institutional arrangements for implementation of the DFAD Management Plans
- ii. Deployment of DFAD (including numbers, markings and identifiers, recording of serial numbers of beacons),
- iii. Fishing on DFADs,
- iv. DFAD design and construction specifications,
- v. Obligations of vessel owners and masters in respect of DFAD and DFAD beacons deployment and use,
- vi. Data collection and reporting obligations (including DFAD logbook/ Observer programme),
- vii. Applicable area for the DFAD–MP,
- viii. Applicable period for the DFAD–MP,
- ix. Means for monitoring and reviewing implementation of the DFAD–MP.

6.1 Institutional arrangements for management of the DFAD Management Plan:

The Seychelles Fishing Authority will be the entity responsible for monitoring the implementation of the DFAD – MP, and for taking action in case of infractions.

The responsibility for implementing the DFAD – MP is entrusted with the vessel owners and masters of the Seychelles flagged purse-seiners and supply vessels as defined under clauses 2(a) and 2(b).

6.2 Deployment of DFAD / DFAD beacons (including numbers and procedures)

a. Number of DFAD or DFAD beacons to be deployed

Noting the lack of fine-scale data on DFAD's related fishing activities and the need to regulate FAD fisheries, Seychelles *recognizes* the need for additional measures on FADs, in line with FAO Precautionary Approach to Capture Fisheries.

Seychelles will set an interim limit on the number of DFADs set and drifting at sea at any given time (i.e. equipped with beacon), at 550 FADs per tuna purse seine vessel. Therefore, the total number of DFADs that a fishing company can use will be estimated as the number of tuna purse seiners in operation at any time multiplied by 550, irrespective of whether they receive the support of supply vessels or not.

This measure will be applicable as from 1 January 2016. Following the analysis of data collected under the DFAD – MP, this interim limit could be revised based on advice provided by the IOTC Scientific Committee.

All DFADs set by purse seine and support vessels shall be equipped with electronic devices such as radio buoys, satellite transceiver or any other device, (defined as beacons under section 3), which automatically and continuously indicate their position and allow tracking by the vessel that set the DFAD or its support vessel. Each beacon shall be activated onboard the vessels prior to deployment.

b. Application processes and approval for deployment of DFAD and DFAD beacons

No specific approval will be required prior to the deployment of a DFAD and DFAD beacons.

c. DFAD ownership

DFADs beacons or any other electronic devices used for locating DFAD should be clearly and visibly marked with the name of the fishing company owning the beacon and the name of the fishing vessel that set the device..

d. Recording of serial numbers

The serial numbers of all beacons shall be unique and recorded in the appropriate logbook at the time of deployment of the corresponding DFADs.

e. Reporting procedures for DFAD deployment and encounter

DFAD deployment, as well as all other activities related to the DFAD once it is deployed,

is to be reported in the DFAD logbooks (*see Annex I and II*). Furthermore, whenever a scientific observer is present onboard the vessels the appropriate observer form (*Annex III*) shall also be filled in by the observer. Information to be collected include, type of DFAD deployed or visited, DFAD identification/markings, beacons type and serial number, type of operation undertaken on DFAD.

f. Monitoring and retrieval of lost DFADs

Every single DFAD must be equipped with radio buoys, satellite transceiver or any other tracking device. Vessel masters are encouraged to prevent, as much as possible, loss of DFAD at sea. In the event of a loss or of the impossibility of hauling in a DFADs the master of the vessel must record in the appropriate logbook, the date it was lost and its last known position. Likewise, masters of fishing vessels shall report in the DFAD logbook of any encounter and interaction with DFADs belonging to a third party as per the same requirements applicable to the DFADs they set.

6.3 Fishing on DFADs

a. Mitigation for non-marketable specimens of tropical tunas and other by-catch

Vessels owners and masters shall do their utmost to improve purse seiners' selectivity when fishing on DFADs so as to limit bycatch and discards in particular, harvesting of non-marketable individuals of targeted species (e.g. tunas of very small size), and non-targeted species (with particular attention to sensitive species such as sharks and turtles).

Fishing around any DFAD shall be conducted in accordance with the following IOTC Resolutions:

- Resolution 12/04 – On the conservation of marine turtles,
- Resolution 13/04 – On the conservation of cetaceans,
- Resolution 13/05 – On the conservation of whale shark (*Rhincodon typus*),
- Resolution 05/05 Concerning the conservation of sharks caught in association with fisheries managed by IOTC,
- Resolution 13/06 – On a scientific and management framework on the conservation of shark species caught in association with IOTC managed fisheries,
- Resolution 12/09 On the conservation of thresher sharks (Family Alopiidae) caught in association with fisheries in the IOTC area of competence, and
- Resolution 13/11 On a ban on discards of bigeye tuna, skipjack tuna, yellowfin tuna, and a recommendation for non-targeted species caught by purse seine vessels in the IOTC area of competence.

All reasonable measures must be undertaken under optimal security conditions for the crew, to ensure that any of these species that are incidentally caught are handled in an

appropriate manner and released alive as quickly as possible to maximize post release survival.

6.4 DFAD design and construction specifications,

a. DFAD design characteristics

The design, construction, operation and maintenance of DFADs will be the responsibility of the vessel owners and masters. As of January 1st 2016, all DFADs deployed should conform to the following design principles to mitigate the entanglement of non-target species:

- The surface structure of the DFAD should not be covered, or should only be covered with non-meshed material.
- If netting is used as a sub-surface component, it should be tied in a strand like manner so as to reduce its surface area.
- Each DFAD deployed shall be equipped with a beacon
- The use of non-meshed materials such as ropes or canvas sheets should be promoted as sub-surface component.
- To reduce the amount of synthetic marine debris, the use of natural or biodegradable materials (such as hessian canvas, hemp ropes, etc.) should be promoted.

More details on DFADs construction specifications and requirements are provided in Annex IV. As of 1st January 2017 all DFADs must be non-entangling DFAD's and as much as possible constructed from natural and or biodegradable materials.

6.5 Obligations of vessel owners and masters in respect of DFAD and DFAD beacons

Vessel owners and masters are responsible for the fulfillment of the obligations under the DFAD – MP, including observance of the limit on DFADs deployed, appropriate markings of DFADs, and completion of the relevant logbooks and submission of the required data.

6.6 Data collection and reporting obligations

The Commission does not currently have detailed catch and effort data on DFADs, such as how long DFADs are left in the water, composition and structure, hence unable to determine how any of those components may affect catch rates of DFADs. This information is essential to developing conservation and management measures in respect to DFADs.

Purse seine logbook (Annex I) shall be completed by the master of the vessel and

submitted to the Seychelles Fishing Authority at the end of each fishing trip.

Supply vessel logbook (Annex II) shall be completed by the master of the supply vessel and submitted to the Seychelles Fishing Authority at each port call of the supply vessel.

Observer form (Annex III) describing characteristic of DFAD's and operations undertaken on them shall be completed by an observer when present onboard the purse seiner or supply vessel.

Relevant information collected in logbooks will be compiled by the Seychelles fishing Authority and reported to the IOTC as per the requirements of IOTC Resolution 10/02. In addition, the Seychelles will share DFAD logbooks data with any flagstate whose purse seiners receive the support of supply vessels flagged in Seychelles.

6.7 Applicable areas

The provisions of this Plan are applicable in all the areas of operation of the vessels, as described in section 2, for as long as they are flagged in Seychelles or support Seychelles flagged purse seiners.

6.8 Applicable period for the DFAD–MP

The provisions of this Management Plan will enter into effect on 1st January 2016. Provisions in this plan will be revised to accommodate any future recommendations from the IOTC, as required.

6.9 Means for monitoring and reviewing implementation of the DFAD–MP

The Seychelles Fishing Authority will be the authority responsible to compile the data needed for a proper monitoring and verification of the implementation of the DFAD – MP, including, but not necessarily limited to, logbook data, VMS data, the Seychelles National Observer Programme, and port inspections of the fishing fleet involved.

REFERENCES

Indian Ocean Tuna Commission (2013)- Resolution 13/08 *Procedures on a Fish Aggregating Devices (FADs) Management Plan*.

Indian Ocean Tuna Commission (2013)- Compendium of Active Conservation and Management Measures for the Indian Ocean Tuna Commission

Corredera	Comienzo	Marea	(millas)	Corredera	Final	Marea	(millas)
PUERTO DE PARTIDA		PORT VICTORIA		FECHA DE PARTIDA		HORA (GMT)	
PUERTO DE DESCARGA				FECHA DE LLEGADA		HORA (GMT)	

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DATE / FECHA									
HORA / HOUR									
CORREDERA / LOCH			VIAJE / TRIP						

[illegible]



Annex III: Scientific Observer Data Collection Programme (Seychelles)

Form D

Version 4.3 Feb. 3013

Monitoring of Drifting FADs

Form D (Drifting FADs) N°:

Date :

Form Route N°:

Route Line N°:

Vessel IOTC N°:

FAD Activities	Tick only one box
1 - Deployed at sea	<input type="checkbox"/>
2 - Visited without fishing	<input type="checkbox"/>
3 - Fished	<input type="checkbox"/>
4 - Recovered without fishing	<input type="checkbox"/>

FAD Operation		
FAD type (T.12)	<input type="text"/>	
Future status (T.13)	<input type="text"/>	
Number of days deployed	<input type="text"/>	
Ownership of the FAD	Unknown	<input type="checkbox"/>
	To the vessels or same company	<input type="checkbox"/>
	To another vessel or different company	<input type="checkbox"/>

Beacon Operation		
	Oper. 1	Oper. 2
Type of activity(T.14)	<input type="text"/>	<input type="text"/>
Type of Beacon (T.15)	<input type="text"/>	<input type="text"/>
Code of beacon	<input type="text"/>	<input type="text"/>
Brand (Make) of Beacon	<input type="text"/>	<input type="text"/>

Name of supply vessel (if associated)

Est. Size of shoal (if	
Tuna species	Est. Weight (tons)
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

Presence of sea turtles, sharks,		
Associated species	Status (T.16)	Number
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

Remarks :

Data verified (tick): ☐

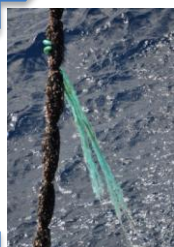
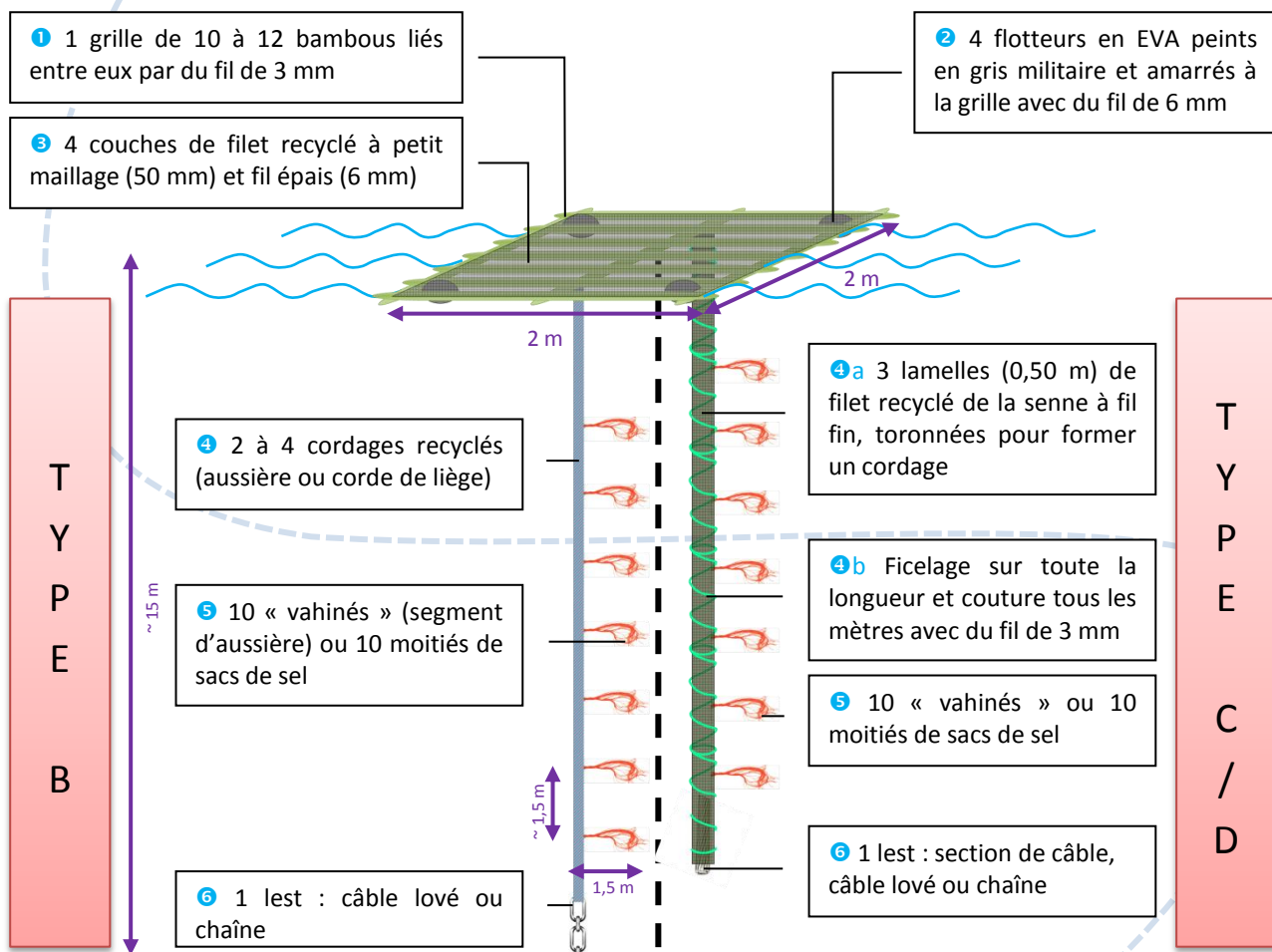


DCP NON-MAILLANT OCÉAN INDIEN



COMMENT ÉVITER LE MAILLAGE DES ANIMAUX ?

- ✓ Supprimer les battants de filet sur les côtés
- ✓ Tendre au maximum les couches de filet pour supprimer le flou.
- ✓ Coudre les couches de filet ensemble pour interdire l'accès entre elles.
- ✓ Coudre les couches de filet aux bambous.



COMMENT RENFORCER LA PRISE AUX COURANTS ?

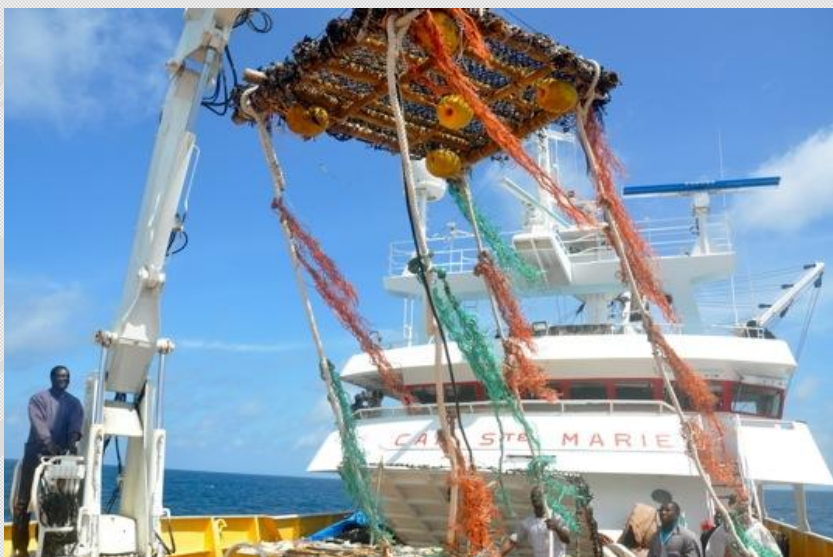
- ✓ Par des « vahinés » ou des sacs de sel qui permettent d'agrandir la surface de la structure immergée pour jouer le rôle d'ancre flottante (renforcement de la prise aux courants) et le rôle de refuge (augmentation des niches et interstices).



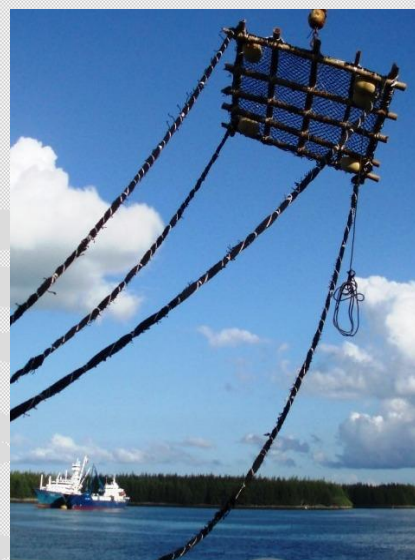


EXEMPLES DE DCP NON-MAILLANT OI

TYPE B



TYPE C/D



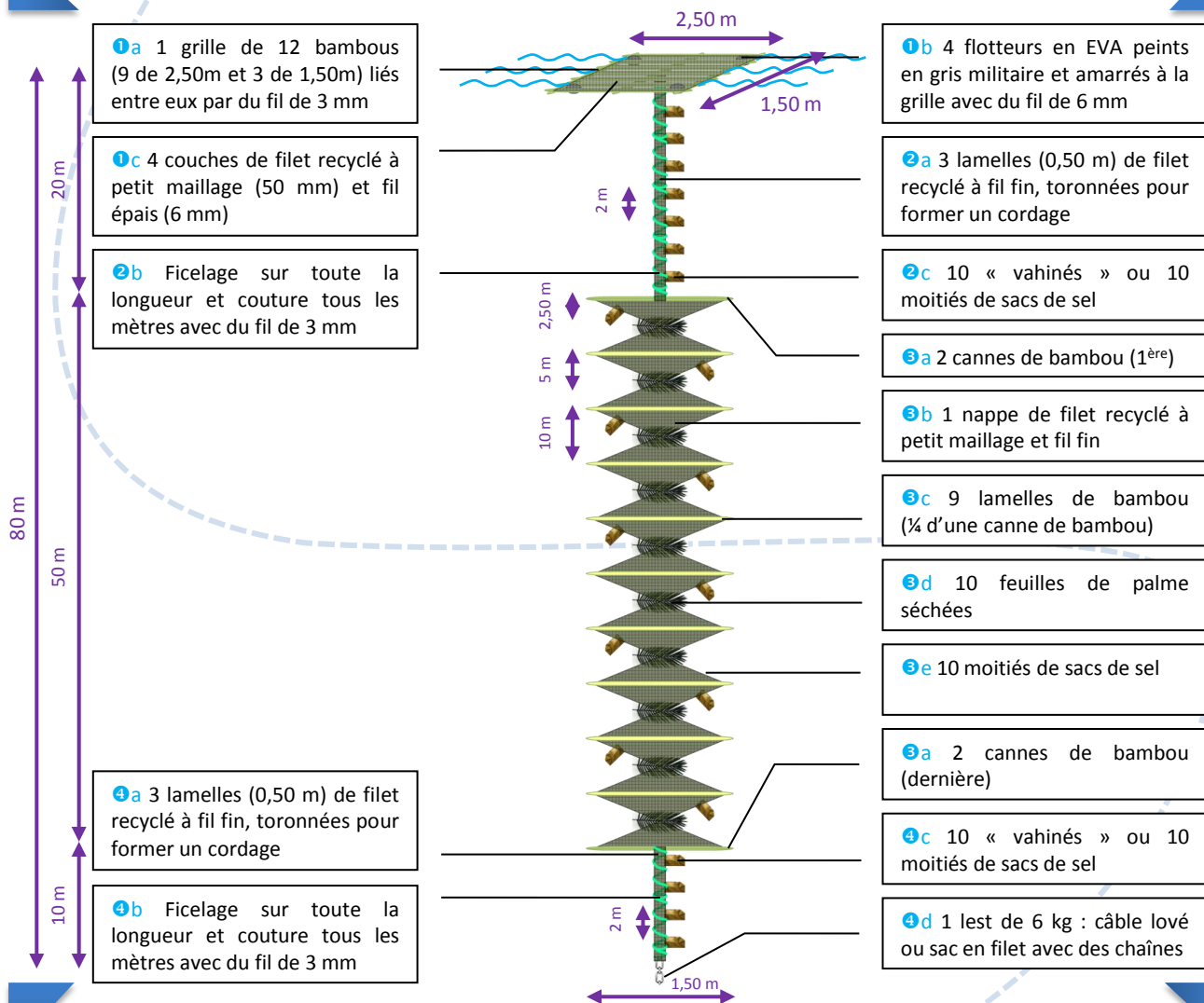


DCP NON-MAILLANT OCÉAN ATLANTIQUE



COMMENT ÉVITER LE MAILLAGE DES ANIMAUX ?

- ✓ Supprimer les battants de filet sur les côtés
- ✓ Tendre au maximum les couches de filet pour supprimer le flou.
- ✓ Coudre les couches de filet ensemble pour interdire l'accès entre elles.
- ✓ Coudre les couches de filet aux bambous.



COMMENT RENFORCER LA PRISE AUX COURANTS ?

- ✓ Par un panneau jouant le rôle d'ancre flottante (courant de sub surface)
- ✓ Par des « vahinés » ou des sacs de sel qui permettent d'agrandir la surface de la structure immergée pour jouer le rôle d'ancre flottante (renforcement de la prise aux courants) et le rôle de refuge (augmentation des niches et interstices).

