Review of the Spanish Fish Aggregating Device Management Plan: implementation, evolution and recommendations.

by

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SUMMARY

This document aims to analyze the methodology applied for collecting information from logbooks for the Fish Aggregating Devices Management Plan undertaken by the Spanish Oceanographic Institute (IEO). The design of the FAD logbook, the quality of the information obtained and the level of accomplishment by the fleet are examined.

Data reviewed in this document comprises FAD logbooks submitted by the Spanish purse seine (PS) fleet with information on FAD activities conducted in the Indian Ocean during 2013 and 2014. Both sections of the logbook (Activity and Inventory) were reviewed separately with the purpose of identifying items where minor modifications could be performed in order to improve the data collection process, decrease the sources of error and better the overall quality of the data, as well as its posterior management and analysis.

This review process resulted in a series of recommendations in terms of template design and data entry guidelines. These guidelines will facilitate data input and validation and will increase the value of the data collected for monitoring and scientific purposes while keeping or lowering the amount of effort required from the fleet when performing this task.

Keywords

Purse seining, Logbooks, Fish Aggregating Devices

1. Introduction

The Spanish Ministry of Agriculture, Food and Environment, in close collaboration with the Spanish Oceanographic Institute (IEO) and the Spanish tropical tuna PS fleet organizations ANABAC and OPAGAC, laid down a Fish Aggregating Device Management Plan for its national fleet in 2010. An experimental and new template was designed by the IEO in 2010, with two main groups of information requested to the Spanish fleet in relation to FAD fishing: on one hand, the activity associated to each individual FAD is demanded, including a rough estimation of major species of bycatch; and on the other hand, the description of the characteristics for each specific FAD design is collected.

This FAD Plan was originally motivated by the Spanish fleet itself and is periodically being updated to improve the knowledge collected on this fishing mode and support a scientific-based advice for management of tropical tuna fisheries.

Several changes have taken place in the initial template of the FAD logbook (Delgado de Molina *et al*. 2014) with the collaboration and experience of both fishermen and scientists. Also, the information demanded by the different RFMOs increase each year, with important overlaps in the data collection. Thus, the FAD logbook used by fishermen should be flexible and adaptable to new demands and should provide adequate data validation mechanisms as well as be easy to handle in order to avoid human errors when entering data.

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In recent years three of the four tuna RFMOs managing tropical tuna fisheries have released Resolutions or Recommendations for the implementation of National FAD Management Plans: CMM 2008-01 (superseded by CMM 2015-01) by the Western and Central Pacific Fisheries Commission (WCPFC), Rec.14-01 (superseded by Rec. 15-01) by the International Commission for the Conservation of Atlantic Tunas (ICCAT) and Res. 13/08 (superseded by Res. 15/08) by the Indian Ocean Tuna Commission (IOTC).
While all of the RFMOs recommendations are similar, some have a more general approach, whereas others have a higher degree of specificity on the type and amount of data that needs to be collected in those FAD logbooks. Overall, the Spanish FAD Management Plan covers all the RFMO requirements and in some cases is beyond these minimum needs.
IEO is collecting FAD logbooks from the Spanish PS fleet since 2011. This laborious task is time consuming and need important support in terms of human resources to supervise, validate, and process information that finally will be investigated in accordance with the ultimate goals of the Management Plan: assessing the impact of the FADs on the dynamic and distribution of targeted fish stocks and associated species and on the ecosystem.
As previously stated, the Spanish PS fleet is currently providing detailed information on the FAD designs and the activity and bycatch related with FAD fishing. Besides covering the legal obligations of the Spanish Administration with RFMOs in terms of FAD use, the FAD logbook allows creating a basic framework to help developing scientific analysis on the biology, ecology and dynamic of some non-target species of the tropical tuna PS fisheries.
Up to date, significant progress has been made in the amount of homogenized information collected between vessels; but some work is still needed to harmonize the data completely.
Since 2012, IEO is providing data to the Spanish Administration about the number of FADs set in the three oceans by the Spanish fleet. For example, since 2013, the Spanish Administration provides the mandatory information requested to all CPCs by the IOTC: the number of FADs set by quarter by the Spanish PS fleet (Res 13/08 IOTC) (**Appendix 1**). Nevertheless, precise definitions on FAD effort, as an integral part of the fishing effort exerted by the PS fleet and all other activities associated to the use of FADs are not totally clear. To perform an accurate estimation of the FADs deployed and retrieved at sea, it is essential to implement a precise FAD identification system. Today, fisheries scientists have to deal with significant difficulties in FAD identification and record in terms of duplicities, inconsistencies or omissions in the activity and inventory when the data are investigated. In this document, we provide some discussion points on the design and terms used by the FAD logbook with two main goals: to provide precise guidelines to fishermen for improving data recording; and also facilitate to scientist the analysis of this information and cross-checking with other sources of information collected from the fleet (catch-effort logbooks and observer data).

2. Material and Methods

Since 2011, and under the framework of the Spanish FAD Management Plan, the Spanish PS fleet operating in the Atlantic, Indian and Pacific Oceans has provided information on all the FAD related activities occurring during fishing trips. A total of 52 vessels, from which 36 are purse seiners and 16 supply vessels, have regularly provided FAD logbooks to the IEO since the implementation of the Plan (**Table 1**).

The FAD logbooks comprise two main parts: Activity and Inventory. The first part collects the main variables involved in the use of FADs, including the bycatch species associated to the set, the type and ID of the buoy attached to the FAD, and the deploying, replacement, or retrieving activities related to the floating objects. The second part focuses on the material, characteristics, and structures of the FADs that are encountered or built during the fishing trip. The latest also includes information on the ID of the buoy that is attached to the FAD.

For the purpose of this work, that is, a thorough review of data collected in each section of the FAD logbook, a subset of data was used which comprises the FAD logbooks submitted by the

Spanish PS fleet for activities conducted in the Indian Ocean in 2013 and 2014. In total, 58,154 activity records, 121,144 object design and characteristic records and 120,798 buoy identification records from 22 different vessels (15 purse seine and 7 supply) were analyzed.

A vast amount of information has been collected to date thanks to the continuous submission of FAD logbooks by the Spanish fleet.
However, some minor modifications should be performed on the FAD logbook in order to improve the data collection process, decrease the sources of error and improve the overall quality of the data, as well as its posterior management and analysis.

In this study, we examined each of the fields in both the Activity and the Inventory forms of the current FAD logbook (**Figure 1 and 2**) in order to identify errors, inconsistencies and incongruences in the data collected. When errors were identified, we investigated possible solutions to mitigate them, which are presented in the Results section of this document.

Table 1. Spanish flagged vessels that provide data to the Spanish National Management Plan of FADs.

Number of Boats	Type
36	Purse seine
16	Supply
52	Total

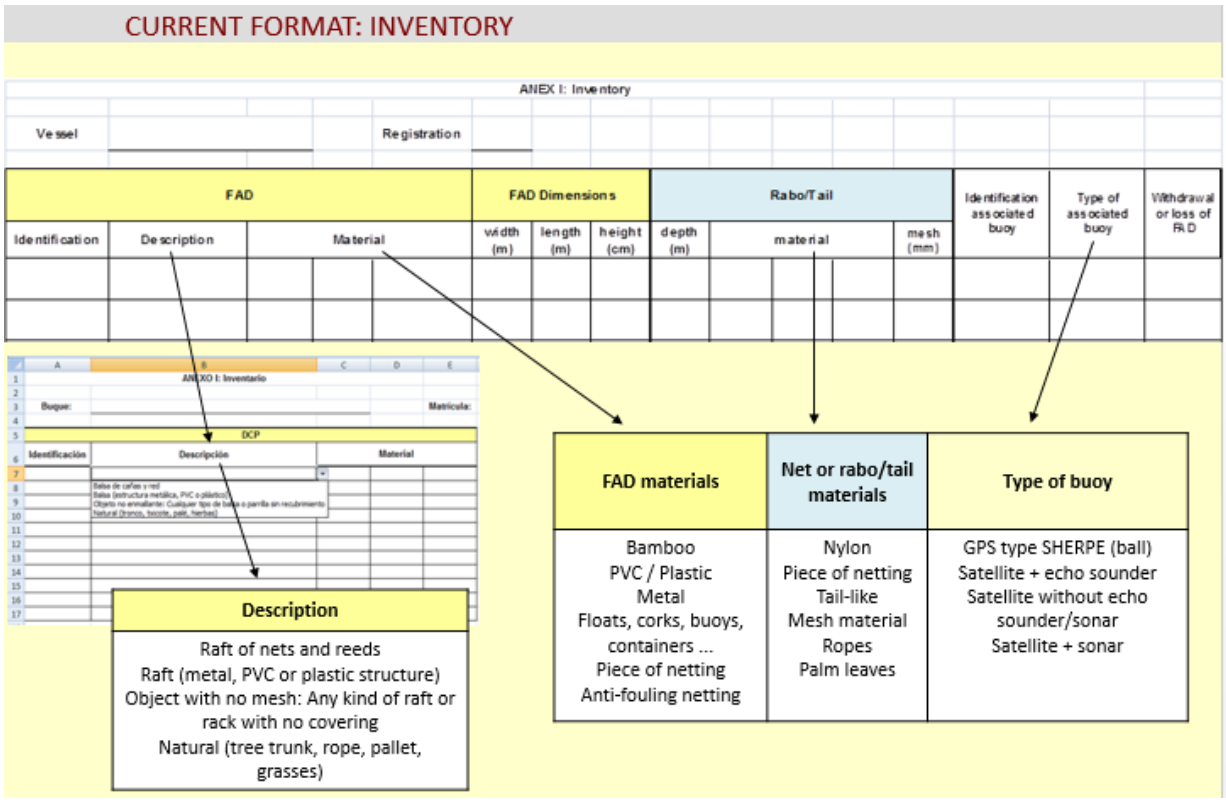

Figure 1.FAD Logbook – Inventory section

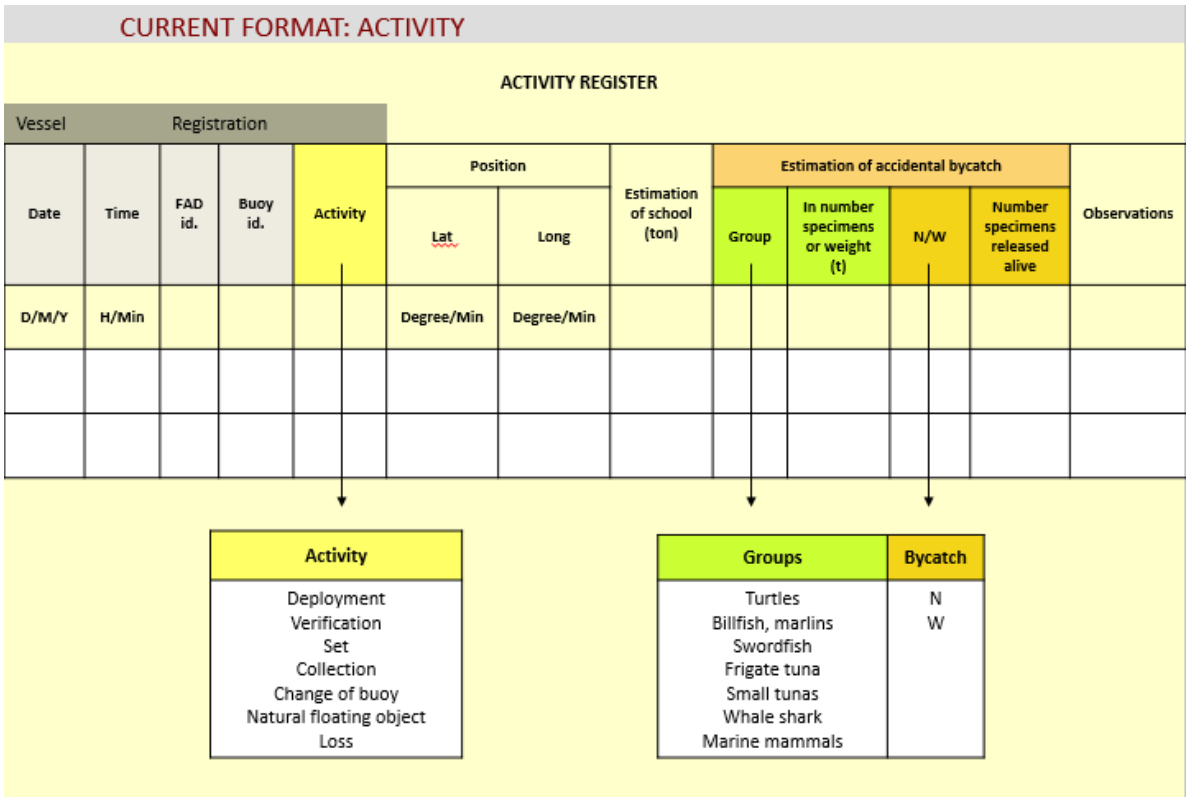

Figure 2.FAD Logbook – Activity section

3. Results

Connection between Activity and Inventory: Buoy ID code

The code that identifies each buoy appears in two fields in the logbook. It is part of the information collected in the Activity form and the in the Inventory form (if the FAD has a buoy associated, which is the most common event). A first exploration of the collected data showed that a unified criterion is needed to fill the buoy ID code field in both forms.

Two main types of buoy codes are being registered in the FAD logbook, corresponding to two different ways of identifying buoys. Currently, echo-sounder buoys are easily identified by the manufacturer´s unique alphanumeric ID code. Furthermore, new buoys are equipped with solar panels covered by a plastic case with the manufacturer's ID easily visible inside. If recorded properly in the FAD logbook, this ID code allows to remotely identify not only the manufacturer but also the type and model of the buoy. However, buoys are usually re-coded and tagged by fishermen for their own use, which could be misleading because it serves as a second way of identifying buoys. Depending on the company and the fishing crew, fishermen mark buoys with a particular sequence such as 01, 02, 530, 20012, 20013, etc., followed by the name of the vessel that owns it. This extra mark allows fishers an easier buoy exchange when they are in the fishing port.

The problem arises when the same buoy is identified with two or more different codes (i.e., manufacturers', fishers') when different activities on FADs are introduced in the logbook. In some instances, the same buoy appears with different codes typed in by the same vessel in the activity and inventory sections, even though they refer to the same event. This type of inconsistencies prevent the correct monitoring of buoys activities and consequently difficult posterior analysis, such as an accurate estimation of the number of buoys used by the fleet at different time windows.

As the manufacture´s ID is unique, and is not usually exposed to abrasion, we recommend collecting this code in detrition of the handwritten one, being this ID the authoritative code to be introduced in the template to identify the buoy. Nevertheless fishermen can continue using their internal nomenclature for their own organization of the activity on FADs. If necessary, that information could be introduced in the comments column of the Activity form.
As a measure to avoid input of erroneous buoy codes, the ideal FAD logbook should not allow the user to enter buoy codes with less than 6 characters, as the shortest manufacturer codes consisted of one letter plus 5 digits "AXXXXX". If this measure had been applied, the number of non-manufacturer buoy codes in the studied dataset would have decreased from a 23% of the records to a 7% of the total (10,029 records over a total of 42,972) (**Fig. 7**). Still, some not universally unique buoy codes would remain, but this measure would prevent the entry of a large number of buoy codes that would not serve as unique identifiers.

However, some buoys prior to 2012 do not use transparent cases, as they are not equipped with solar panels. This could difficult, in a sense, the direct visual identification of the buoys but fishers have access to all their buoys information (and ID codes) in their computers in the bridge of the vessel in real time. Thus, fishers could still identify the buoy easily. Another issue would be when encountering not owned buoys. In that case, a comment could be introduced in the column prepared to do so, specifying something like "buoy non-identifiable by ID, handwritten code = XXXX". All this improvements, if applied, could allow crossing FAD logbook data with other data sources, like, for example, observers' data, who have recently been encouraged to collect the ID provided by the manufacturer.

Review of Activity fields

General
In some instances, duplicate records are generated when logbooks include information on past quarters that had already been submitted. Duplicate records constituted 3% of 2013 activity records. In 2014 there were no duplicate records, so the total percentage of duplicates in the studied dataset is 1% (**Fig. 7**)

FAD identification
Similar to the problems encountered when analyzing existing buoy codes, FAD codes collected in FAD logbooks do not always serve the purpose of identifying each FAD the Spanish PS fleet interacted with. We often found codes that consist in a series of numbers from 1 until 80,000, which are often duplicated when different vessels are using the same series of numbers for their own FADs. We recommend the use of the manufacturer code of the first buoy attached to the object as identifying code, when the object has a buoy attached. However, if this code is used, changes of buoy must be clearly recorded in the form (see: *Change of buoy* below). Ideally, another possible option is to clearly mark FADs with a non-erosive and non-abrasive material, such as small metal plates or similar, with some vessel code at the beginning for identification. We realize that this might not be a very effective method, especially when the FAD starts to lose its original structure. Further studies should analyze the best way to solve the issue of a correct continuous FAD identification, to be applied in conjunction with the buoy ID identification procedure mentioned a few lines above.
We note that buoy manufacturer codes are included in some cases in the object identifying code (16% of activity records). In other cases, codes reflect the vessel name plus a numerical code. This type of code can only be used as unique identifier if that code is available and visible on the object, so future activities can be correctly attributed to that same object.

Discussions on best methodology to mark FADs should be continued among all stakeholders so as to determine a plausible way of marking FADs that would suit their needs.

FAD Deployment

Some inconsistencies were found with the deployment information collected in the FAD logbooks. For instance, it is quite usual to find two deployment activities associated to the same buoy code without any information on any other activity associated to that buoy code.

Deployment → ? → Deployment

Different issues could have happened when a situation like this is found. For example, the ID of the buoy could have been wrongly collected or the FAD could have been set by a not-owner vessel who recorded a different buoy code and then deposited the buoy at port. It is obvious that the non-owner vessel wished to remain anonymous. Confidentiality of vessels is guaranteed in the FAD logbook, and also in the CE logbooks. Thus, declaring a re-deployment of the same buoy with proper specifications in the Comments column or declaring a set on an external buoy with the initial code ID should not be a problem between vessels. This is a key point to properly track the buoy's life. We recommend to add a drop-down list of possible ports where a buoy could be found and then re-deployed.

In order to make data recording less burdensome, we found that it would be convenient to add an extra option to the dropdown menu for activity that read "set+deployment", so the user would not have to choose between one and the other when both are conducted at the same time.

In general, clearer guidance on how to fill the FAD logbook would be needed to prevent the user from entering data that does not allow for proper FAD/buoy monitoring. Another aspect that might result in higher quality data is not requesting the user to notify when FADs/buoys are "external", this is, belong to other vessels/ companies.

Change of buoy

When the registered activity is "Change of buoy", it is not clear if the buoy code registered in that same record corresponds to the buoy that has been removed or to the buoy that has been attached to the object when replaced. This information is sometimes added under the Comments field, but if no extra information is entered in that field, it remains unclear. For that reason, we recommend adding a new column to the form showing the code of the old buoy, so that both codes can be collected and it is possible to track buoys after they have been replaced. The code of the new buoy would be stored under the main field for buoy code identifiers.

In total we found that 96% of records containing change of buoy activities do not specify if the recorded code corresponds to the buoy being replaced or the new buoy attached to the object, and the remaining 4% shows that information under the Comments column, in a non-standardized format.

The additional column where users can input the old buoy code would probably result in a higher level of completion for this type of activity records, plus it would greatly improve the quality and value of the data.

Estimation of bycatch

The information declared in the estimated species of bycatch section is unclear. Sometimes, the number under "Number of specimens released alive" is greater than the number of individuals captured (**Figure 2**). This error could be avoided filling bycatch cells in this order: first the column of bycatch individuals caught and second, the column of individuals released alive to the sea, limiting the range of this column between 0 and individuals caught. Another option would be adding a third column:

Estimated bycatch
Total individual caught – individual dead – released alive

The errors detected in these columns could be due to the fact that the number of individuals caught corresponds only to number of individuals dead, instead of being the sum of alive and dead individuals caught.

More inconsistencies have appeared in some rows where bycatch is recorded although no fishing activity was involved, such as changes of buoy, deployments, setting buoys on natural objects, FAD checking, or FAD retrieval from the sea.
Thus, it must be specified when these columns of estimated bycatch have to be filled; in this case, only when an activity associated with a fishing set happens. Species under the FAD detected but not captured due to the lack of fishing operations could be incorporated in the template in an additional field:

Observed individuals

related to activities different than fishing sets.

The column weight/number contains errors easily detectable due to differences in magnitude. Weight is usually a small decimal number while number should be integers. Further validation of these fields could also imply the use of accurate length-weight relationships for the different bycatch species considered, based on current equations used in the observer program.

In total, 76 records with errors on bycatch registration were found, which represent a 1% of the total.

Another aspect related to the bycatch section of the logbook is the species identification. There are currently ten types of bycatch species identified in the FAD logbook:

Cod_grupoEspecies		
identificador	**descripción**	**codigo**
1	Tortugas	
2	Agujas, marlines	
3	Pez espada	
4	Melvas/ Bacoreta	
5	Bacoretas	
6	Tiburón ballena	
7	Mamíferos marinos	
9	Tiburones	
10	Otros peces	

We recommend to aggregate all tuna species different from yellowfin, skipjack, bigeye and albacore tuna in a new category “other tunas”, since these species are not protected species. As some of the shark species are of special relevance, we propose to extend the list of sharks differentiating between silky shark, hammerheads, oceanic whitetip and other sharks.

Once the FAD and buoy marking issues discussed above are solved, collecting bycatch information in the FAD logbook might seem unnecessary and redundant, as it is

currently being recorded by observers. However, prior to making that modification, data collected in FAD logbooks must be perfectly harmonized with data from observer programs at a set by set basis, so bycatch information collected by observers can be easily attributed to each set in the FAD logbook. Nevertheless, it is not completely true that information on bycatch would be redundant in the FAD logbook. Monitoring the bycatch in the FAD logbook is guaranteed as it is information provided by the vessel itself and it is not conditioned to the implementation of regular observer programs, more variable depending on external circumstances (for instance, in the Indian Ocean, there were no observers on board during 2009-2014 due to the piracy in Somalia). This issue will need further discussion among stakeholders.

Review of inventory fields

Description of FAD

Figure 3 shows the distribution of FAD types according to FAD descriptions recorded in the form. In some instances, the same object appears in different Inventory records with different descriptions associated to it, at times even changing from entangling to non-entangling. This drives us back to the problem of the FAD coding. Each company uses its own coding for FADs and sometimes the same code may have been assigned to a different object by different vessels. The change in FAD type may be due to vessels changing the FAD design to abide by newer RFMO resolutions that require the use of non-entangling FADs (IOTC Res. 13/08, ICCAT Rec.14-01). However, only when unique FAD identifiers are available it will be possible to monitor what each FAD's real design type is.

This incongruences in type of FAD have been detected in 14% of the records in the Indian Ocean in 2013 and 2014, with a maximum of five different descriptions associated to the same FAD code. We recommend showing a warning message when the user tries to enter FAD codes that were already registered in the inventory with a different type description associated. If the same FAD has been transformed from entangling to non-entangling (or suffered any other modification), the user should write this under Comments.

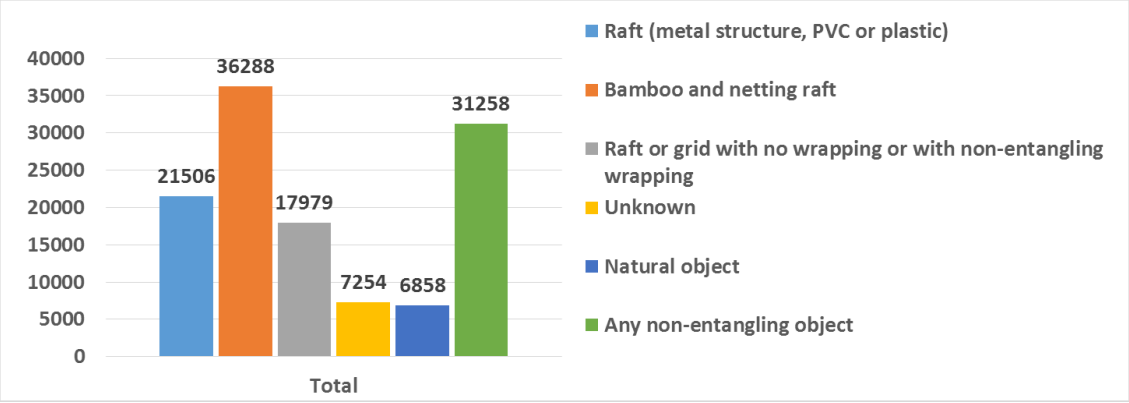

Figure 3. Distribution of FAD types reported by the Spanish PS fleet in the IO 2013-2014

FAD materials

FAD materials are sometimes incompatible with the type of FAD recorded under FAD description. For instance, we found records of natural objects with metal, PVC or canvas listed as FAD materials; or non-entangling FADs with netting as main materials

(**Fig. 4**). This incompatibilities can be prevented by permitting the selection of only those materials that match the FAD description entered by the user, and by providing clear visual guidance (pictures) that permits the user easily identifying the correct FAD type and FAD materials when filling out the FAD logbook.

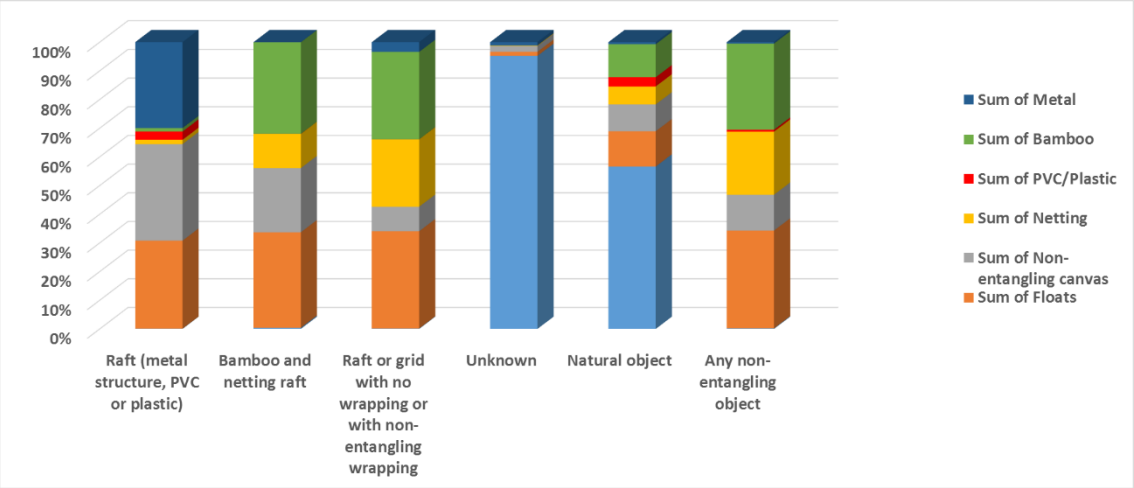

Figure 4. FAD materials distribution by FAD type as shown in the FAD Description field in Inventory.

Dimensions of the FAD

Some inconsistencies appear in the FAD width (m), height (cm) and length (m) measures, including many outliers in the distributions:

While all length values registered range from 0.5 to 50 m (probably because the measure registered includes net length), a fraction of the FADs present width values larger than 3 meters (<1%). Some FAD records (90%) have height values of more than 1 meter, probably also because net length is recorded instead of the actual object height.

These are some examples of inconsistencies that could be easily prevented using data input restrictions in the form, allowing the user to input values within a reasonable range.

Dimensions of FAD appendages

More likely ranges appear for the depth of the underwater structure and mesh size of the net used to build it, although we recommend applying range restrictions to the data entered in this case too, which should meet the required metrics per field.

FAD appendages materials

Figure 5 shows distribution of FAD appendages materials by FAD type. After this first exploration of the data, no errors were found in this section of the Inventory.

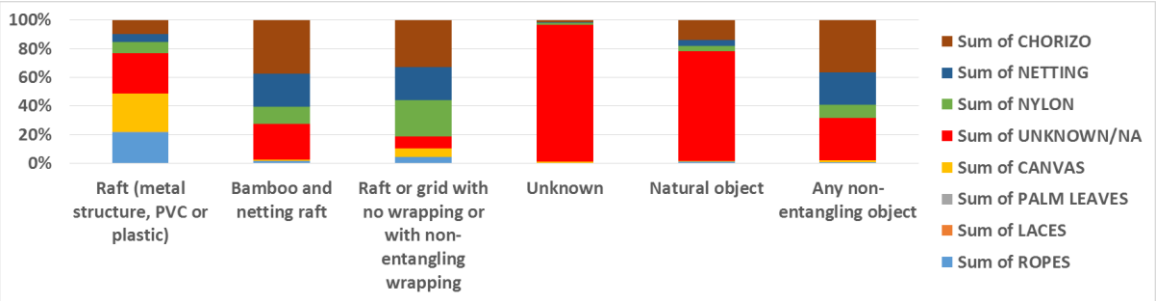

Figure 5. FAD appendage materials distribution by FAD type.

Associated buoy description

As with FAD descriptions, in the case of their associated buoys the similar errors have been detected where different types are assigned to the same buoy code. This type of incongruence appears in 3% of the data in the Indian Ocean in 2013 and 2014. Nevertheless, in this case, errors are easier to detect because almost 100% of the buoys belong to only two types of buoys: Satellite + echosounder and Satellite with no echosounder/sonar (**Figure 6**).

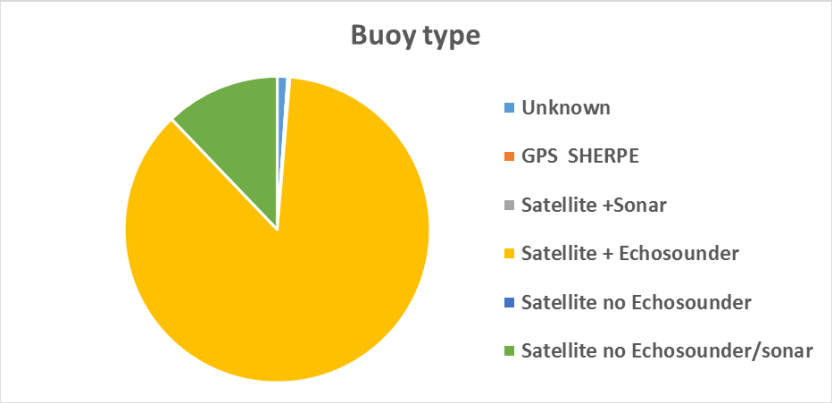

Figure 6. Distribution of buoy types.

Of the currently available types of buoys identified in the FAD logbook, we propose deleting ”GPS SHERPE” and “Satellite + Sonar” because they are obsolete. If a vessel happened to interact with one of those buoys, its nature should be specified in the Comments field of the Activity form.

Potential improvement of data collected

Figure 7 summarizes the percentage of records where errors were found and the percentage of which could be avoided by applying to the FAD logbook form the recommendations described in this work (**Table 2**).

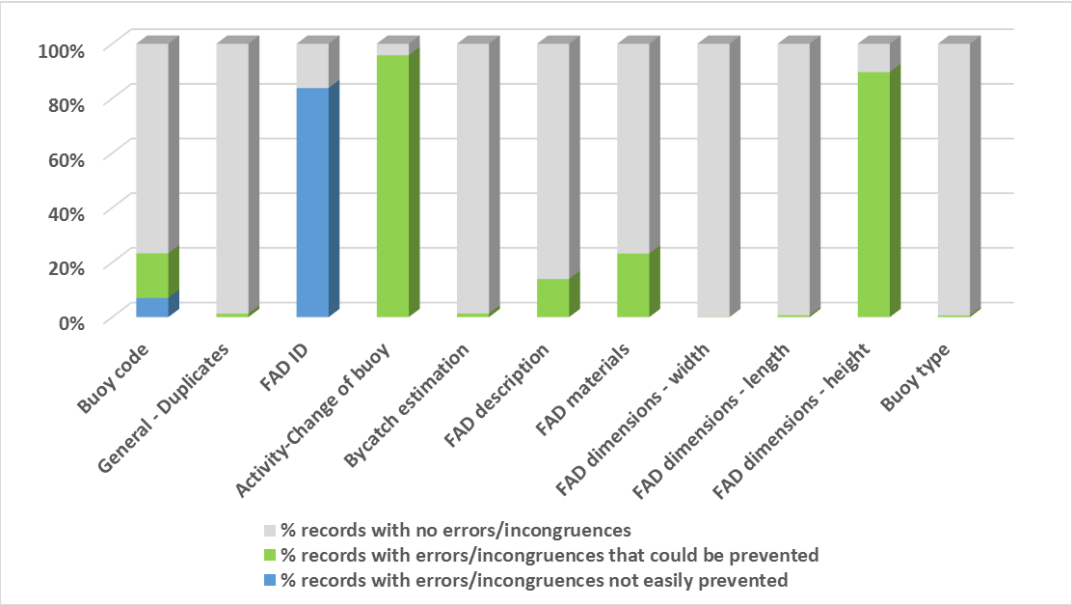

Figure 7. Distribution of buoy types.

Table 2. Summary of recommendations and potential decrease of errors

		ACTIVITY					INVENTORY							
	Buoy code	General - Duplicates	FAD ID	Activity-deployment*	Activity-Change of buoy	Bycatch estimation	FAD description	FAD materials	FAD dimensions - width	FAD dimensions - length	FAD dimensions - height	FAD append. Dimensions	FAD append. Materials	Buoy type
Total number records analyzed	42972	58154	121144	--	3049	5714	45776	149381	121144	121144	121144	--	--	120798
Number records with errors/incongruences	10029	728	101515	--	2921	76	6383	34709	206	826	108565	--	--	773
Number records with errors/incongruences that could be prevented	7013	728	?	--	2921	76	6383	34709	206	826	108565	--	--	773
% Records with errors/ incongruences	23%	1%	84%	--	96%	1%	14%	23%	0.2%	1%	90%	--	--	1%
% records with errors/incongruences that could be prevented	16%	1%	?	--	96%	1%	14%	23%	0.2%	1%	90%	--	--	1%
Recommendation	Length > 6 char	User cannot enter data already submitted	Use 1st buoy manufacturer ID or another unique ID. FAD marking.	- Add extra dropdown option "Deployment + set" - Clearer guidance to fill out form - No need to identify "external" FADs/buoys	Add column for old buoy when activity = change of buoy	- Released alive must be greater than total caught - No decimal values if "Number" - Bycatch only if act = "set"	Warning message if user tries to enter different FAD type for a FAD code already registered	User cannot enter FAD materials that do not match the FAD description	Do not accept values > 3m	Do not accept values > 3m	Do not accept values > 1m	Apply reasonable range restrictions	--	User cannot enter different buoy type for a buoy code already registered
*Difficult to quantify records with incongruences related to deployments/ other activities														

4. Discussion

In this document we have shown an exhaustive review of the template used to fulfill the FAD logbook. Some changes are very easy to implement in the Excel table that fishermen use following some guidelines. These are, for instance, to modify the drop-down lists to make the options that fishermen can choose more accurate, connect both Inventory and Activity fields with the FAD and the buoy codes; to establish limits in the dimensions on the FADs description; restrict fields to some alpha numeric characters, integers, decimals, number of characters, etc; add some pictures of types of FADs o bycatch species; add a drop-down list with possible ports where a buoy is collected and after that re-deployed or make a better use of the Comments column.

Other modifications need be deeply discussed between scientists and fishermen, like the important issue of the FAD and buoy ID. Errors in these fields lead to invalidate many records in the FAD logbooks.

As scientists, our task is to provide fishermen a clear guidance-protocol for the correct completion of the form. Once the proposed changes to the forms are accepted, clear guidance should be drafted that will accompany the FAD logbook form to facilitate the recording of data and avoid potential errors derived from a lack of understanding of what information is required in each field. This guidance should be as much simple and visual as possible as fisherman are right when they complain about the amount of time they spend filling redundant information between catch-effort and FAD logbooks, taking into account that 100% of Spanish PS trips are also monitored by the observer program.

In the absence of a software developed to introduce this information, an Excel template that could be easily imported to an Access database is suggested to allow the exchange of different sources of information, especially logbooks on catches and effort and observers programs. Further developments in this field should be carried out to easily automatize logbook filling, as well as to allow the creation of an extensive dataset, dedicatedly thought to be related among them. A proper validation of the FAD logbook in the future will rely on the cross-checking of each FAD set identified in the catch-effort logbook and each event associated to bycatch identified in the observers registers.

Finally, this document aims to provide some feedback to the excellent work that fishermen are carrying out. Fluent communication between stakeholders needs to continue: fishermen, scientists and administration. Annual national meetings will provide the continuity and updating of the FAD Management plan. Also, maintaining the confidentiality of vessels in the posterior analysis of the FAD data is essential to guarantee cooperation and accomplishment. Ultimate coordination between EU FADs management plans should be discussed, as both Spanish and French fleets follow the same protocol for data processing in the logbooks formats in the Atlantic and Indian Oceans.

Spanish Administration provides support to the FADs Management Plan as it is the ultimate responsible of accomplishment of the RFMOs requirements; but there is still much work to do in the fields of data management, validation, data processing and harmonization of different sources of information in which the administrations should reinforce their active participation in the framework of the Spanish Strategic Plan of Tropical Tunas.

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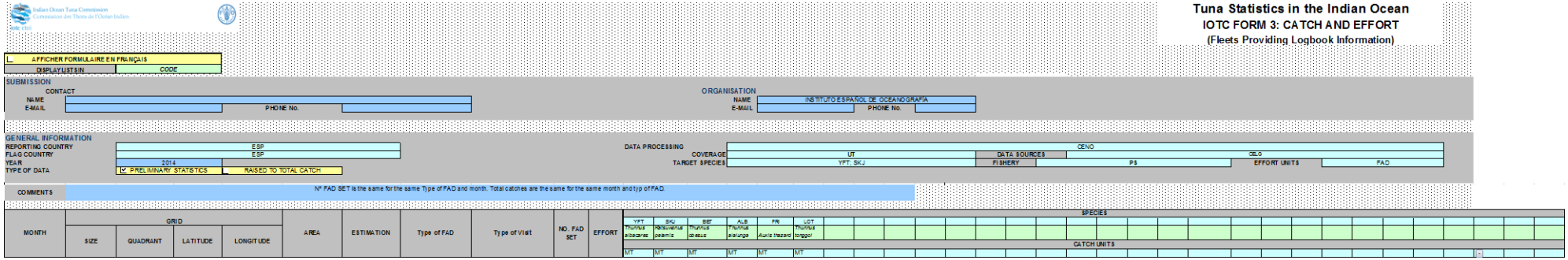
Appendix 1. Mandatory Form 3FA1 that all CPCs in IOTC must submit with number of sets deployed by the purse seine fleets by quarter.



Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien

Tuna Statistics in the Indian Ocean
IOTC FORM 3: CATCH AND EFFORT
(Fleets Providing Logbook Information)

AFFICHER FORMULAIRE EN FRANÇAIS
DISPLAY LIST IN: CODE

SUBMISSION
CONTACT
NAME
E-MAIL
PHONE No.

ORGANISATION
NAME: INSTITUTO ESPAÑOL DE OCEANOGRAFÍA
E-MAIL
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GENERAL INFORMATION
REPORTING COUNTRY: ESP
FLAG COUNTRY: ESP
YEAR: 2014
TYPE OF DATA: ☑ PRELIMINARY STATISTICS | RAISED TO TOTAL CATCH

DATA PROCESSING: CENO
COVERAGE: UT | DATA SOURCES | CELO
TARGET SPECIES: YFT; SKJ | FISHERY | PS | EFFORT UNITS | FAD

COMMENTS: Nº FAD SET is the same for the same Type of FAD and month. Total catches are the same for the same month and typ of FAD.

MONTH	GRID				AREA	ESTIMATION	Type of FAD	Type of Visit	NO. FAD SET	EFFORT	SPECIES																										
	SIZE	QUADRANT	LATITUDE	LONGITUDE							YFT Thunnus albacares	SKJ Katsuwonus pelamis	BET Thunnus obesus	ALB Thunnus alalunga	FR Auxis thazard	LOT Thunnus tonggol																						
											CATCH UNITS																												
											MT	MT	MT	MT	MT	MT																						