SPANISH FISH AGGREGATING DEVICE MANAGEMENT PLAN. PRELIMINARY DATA

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SUMMARY

This document analyzes the Fish Aggregating Device National Management Plan undertaken by the Spanish General Secretariat of Maritime Fisheries (Ministry of the Environment, Marine and Rural Affairs), in collaboration with the Spanish Institute of Oceanography (Ministry of Economy and Competitiveness), and presents preliminary data obtained in 2013 on the number of FADs deployed by quarter, number of active FADs by quarter, FAD characteristics, types and materials used in its construction and activities on objects and geographical distribution of these activities.

RÉSUMÉ

Le présent document analyse le plan de gestion national des dispositifs de concentration des poissons mis en place par le Secrétariat général espagnol des pêches maritimes (ministère de l'environnement et du milieu rural et marin), en collaboration avec l'Institut espagnol d'océanographie (ministère de l'économie et de la compétitivité) et présente des données préliminaires obtenues en 2013 concernant le nombre de DCP déployés par trimestre, le nombre de DCP actifs par trimestre, les caractéristiques des DCP, les types et les matériaux utilisés pour les construire et les activités sous des objets ainsi que la distribution géographique de ces activités.

RESUMEN

Este documento analiza el Plan de ordenación nacional de dispositivos de concentración de peces implementado por la Secretaría General de Asuntos Marítimos de España (Ministerio de Medio Ambiente, rural y marino) en colaboración con el Instituto Español de Oceanografía (Ministerio de economía y competitividad) y presenta los datos preliminares obtenidos en 2013 sobre el número de DCP plantados por trimestre, el número de DCP activos por trimestre, las características de los DCP, los tipos y materiales usados en su construcción, las actividades sobre los objetos y la distribución geográfica de estas actividades.

KEYWORDS

Atlantic Ocean, Tropical tuna, Purse seine, FADs, FAD number, FAD activity, By-catch species

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Introduction

Tuna purse seiner Fish Aggregating Device (FAD) fishery started around 1990 when various purse-seiner fleets began to attach buoys to natural floating objects to facilitate localization and retrieval, and to deploy artificial floating objects with buoys. This change in the fishing practices let to a rapid increase of the purse seiner tropical tuna catches due to an increase of fishing efficiency of the fleet. Currently, around 50% of sets made by these fleets on a worldwide scale are done using FADs; whereas this percentage is around 60 % in the Atlantic and Indian Ocean (Delgado de Molina *et al*., 2014; Chassot *et al*., 2013).

The tuna fishery over floating objects result in catches mainly composed by skipjack but also, in a lesser extent, by small yellowfin and bigeye in mixed schools. The catch of small bigeye (BET) and yellowfin (YFT) has arisen some concerns on Tuna Regional Fisheries Management Organizations (RFMO) Scientific Committees about the effects of those catches in their respective populations. This has led to a various initiatives, such as spatio-temporal closures, taken in different Tuna RFMOs in relation to the management of FAD fisheries. Moreover, specimens from other taxonomic groups (osteichthyan and chondrichthyan fish, and turtles) are also caught together with the target species. The dynamics of association and behaviour of the tuna and other species over floating objects is unknown and, thus, is considered a high priority line of research in the Tuna RFMOs. This will contribute and help to improve the selectivity, assessment and management of this type of fishing.

The Spanish purse seiner fleet in the Atlantic, Indian and Pacific Ocean has provided its fishery statistics from the beginning of this fishery, however, due to methodological difficulties when standardizing the catch per unit of effort (CPUE) of the purse seiners fisheries, the information provided has not been traditionally used in the stock assessment. This is not only a particular issue for the Atlantic but a general difficulty that all Tuna RFMOs are facing with (ISSF, 2012). An exception to this can be the recent PS CPUE index developed for bigeye juveniles on FADs which was used as recruitment index for bigeye (WPTT, 2013) in the assessment process, providing coherent information with the models used. During a recent workshop hold in 2012 to discuss the Purse seiner CPUE index standardization several recommendations, such as the use of FAD information for improving the CPUE standardization, were developed.

Thus, the debate on FAD fishing, in terms of improving data collection which can contribute to improve the selectivity, stock assessment and the knowledge of their effect on the populations, is been taking place since the development of this mode of fishing. During recent years, the Tuna RFMO Scientific Committees discussions has recommended that there is a urgent need for a more comprehensive, standardized and routine data collection on the use on FADs and, thus, several tuna RFMOs have agreed resolutions whereby all parties are required to establish FAD management plans. In the particular case of the International Commission for the Conservation of Atlantic Tunas (ICCAT), Recommendation 13-01 establishes that CPCs having vessels fishing on FADs (including support vessels) shall collect and report a FAD information including a sections of (i) FADs inventory, where the number of FADs per vessel, characteristics and identifiers of the different FADs, efforts to mitigate bycatch, institutional agreements, etc., are included and (ii) of FAD activities (FAD logbook) where FADs fishing activities are recorded. Moreover, Recommendation 13-01 promotes the design of non-entanglement FADs. The information contained in Recommendation 13-01 shall be submitted to ICCAT in the usual aggregated levels for the PS fishery statistics from 2013 onwards.

The purpose of the agreed FAD management plan is to gather information and monitor the FAD fishery which will contribute to understand better the effect of this fishery on the tropical tuna populations, to improve the CPUE standardization of this fishery, to contribute to the mitigation of non-target and juvenile BET and YFT catches and, hence, to provide a better management framework for the tuna and ecosystem sustainability when considering in conjunction with the data provided by other countries and fisheries.

Although the FAD management plan resolution has been agreed in ICCAT in 2011 and amended in 2013, in light of the discussion hold by different Tuna RFMOs, the Spanish Ministry of Agriculture, Food and Environment, in close collaboration with the Instituto Español de Oceanografía and the Spanish tropical tuna purse seine fleet organizations, laid down a Fish Aggregating Device Management Plan for its national fleet in 2010 which has been running since then. 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.

The Spanish management plan is binding for the tuna purse-seine and support vessels operating in all three oceans and flying the Spanish flag. Moreover, ANABAC/OPAGAC has also agreed to collect the information laid down in the Spanish FAD Management Plan for the purse seiners and support vessels flying associate flags starting in 2012 (which are not presented in this document).

The objective of this document is to present the contents of the Spanish FAD Management Plan and to provide preliminary data about participating vessels, FAD characteristics, number of FADs deployed, FAD fishery activity and spatial-temporal distribution, and non-target species catches.

FAD Management Plan for the Spanish tropical purse-seine fleet

The prevailing fisheries regulations include several requirements that justify the implementation of a national FAD management plan for the tropical tuna fleet, such as the United Nations agreement on the conservation of fish stocks, the FAO code of conduct for responsible fisheries and Council Regulation (EC) No. 2371 on the conservation and sustainable exploitation of fisheries resources, etc. Moreover, the four Tuna RFMOs in which the tropical purse seiner fleet operates adopted several requirements that oblige the different administrations to monitor the FADs. In particular, the objectives of the Spanish Management Plan are:

- To produce a register of floating objects and their characteristics,
- To improve information collection,
- To improve knowledge of FAD catch composition,
- To further knowledge of FADs and their impact on the ecosystem,
- To establish mechanisms for information exchange between scientists and administrations.

In addition, the plan will facilitate compliance with a series of regulation of the UN doctrine on the marking of fishing gear (including FADs).

The application of such a plan by all members that practice fisheries over floating objects will provide the Tuna RFMOs managing these resources with important information about the number and characteristics of the FADs deployed, retrieved and remained in the fishery, catches of target and non-target species, and would allow to follow individually each object: lifetime, trajectory, catches, etc.

Preliminary analysis of the Fish Aggregated Management Plan Information

Since the implementation of the plan in 2010, information started to be collected vessel by vessel by each quarter for the Pacific, Atlantic and Indian Ocean in 2011. Information has been collected for a total of 41 vessel operating in the three oceans during this period with 56045 records registered up to now.

The information collected is very exhaustive, valuable and needs to be further analyzed for scientific purposed. However, in this preliminary phase, the development and fine-tuning of the data format was the priority since the data presented for 2011 and 2012 were in different formats (pdf, excel, word) which are currently being converted to the new format implemented in 2013. This task is very time-consuming as the information contained in the initial records needs to be validated. Thus, the information provided below only represents data for 2013.

Table 1 shows the name of the Spanish purse seiners (12) and support vessels targeting tropical tunas in the Atlantic Ocean which have provided FAD data in 2013. In this Table, 2 Spanish flagged vessels which were not active in 2013 are not included.

Table 2 shows the number of active FADs used by Spanish purse seiners and support vessels by quarter in the Atlantic in 2013. Due to confidentiality reason the order of the vessels in **Table 2** does not correspond with the numbers in **Table 1**. The yearly average number of active FADs used by Spanish purse seiners and support vessels was 5144 in 2013 which corresponds in some extent with the total number of FADs deployed by the Spanish fleets (5964) (**Table 3**). An average of 429 active FADs per year is followed by each purse seiner. However, it should be taken into account that the number of active FADs can be overestimated as some active FADs are followed by more than one vessels and, thus, can be double counted.

The number of actives FADs followed by vessels, including purse seiners and support vessels, varies between 70 and 991.

With regard to the seasonality of the use of FADs, the number of active FADs are lower in the first quarter which coincide with yellowfin free school fishery season.

Table 3 shows the number of FADs deployed by Spanish purse seiners and support vessels by quarter in the Atlantic Ocean in 2013. The number of deployments is greater in trimester 2 and 3 (around 1600 FADs) whereas is lower in trimester 1 and 4 (around 1300 FADs). The average yearly number of FADs deployed by Spanish flag vessels (including purse seiner and support vessel) is around 400 and 500 if only purse seiners are considered.

In **Figure 1** the different activities does on FADs/objects by the Spanish fleets in 2013 are shown. The activities covered, in order of importance, are deployment, visit a FAD, set on FADs, FAD retrieval, FAD buoy change and setting a buoy to a natural object.

Figure 2 shows the geographic distribution of all activities done with FADs by the Spanish fleet (purse seiner and support vessels) in 2013, whereas in **Figures 3 and 4** show the location of FAD seeding and FAD sets reported in the FAD management plan in 2013, respectively.

The Spanish FAD Management Plan collects also information about the non-target species catch and their fate (i.e. release alive or dead) in the FAD fishery. **Table 4** shows the non-target species catch and their fate for the most important vulnerable species (sharks and turtles) in 2013. Although this data are very preliminary and should be validated by observer programs, it implies a progress as is directly facilitated by the fleet and can improve the observation coverage.

Moreover, the FAD plan also includes the collection of information about the FAD characteristics and materials used in their construction in order to assess whether the fleet uses non-entanglement FADs. **Figure 5** shows the materials use in the construction of FADs. **Figure 6** presents the percentage of the different FAD used by the Spanish fleet in 2013. Although the percentage of the traditional FAD with the net hanging underneath is around 25 %, it is worth noting that most of the FADs deployed in 2013 (around 60 %) are non-entangling FADs. The definition of non-entangled FAD agreed by the fleet refers to FADs (i) with the surface structure of the FAD not covered, only covered with non-meshed material or with a maximum mesh size of 3 cm-s; and (ii) with the sub-surface component made from non-meshed materials such as ropes or canvas sheets or using netting rolled up and securely tied in to “sausages” with nets of maximum 3 cm-s. At the beginning of 2012 the Spanish fleet started to substitute the traditional FAD by non-entangling FAD. The initial non-entangling FAD design has evolved and currently a great variety of surface structure, sub-surface structure, “sausages”, floating materials, different material, etc., is used. This information is very detailed and difficult to obtain and analyse using the information provided in the FAD management plan.

Conclusions

As it was mentioned before, in recent ICCAT meetings a proper measure of effective fishing effort definition for fishing on FADs is needed. This is a key point to define a standarized CPUE index of abundance for the purse seine fishery to be accepted as a representative measure of real abundance of juveniles of tropical tunas. The information collected in the Spanish Fish Aggregated Management Plan will be fundamental to investigate new measures of effort for PS fleet and, hence, for the tropical tuna PS CPUE standarization. Also, the collaboration between EU PS fleets is needed to better understand the effect of fishing on FADs on the populations of the whole PS fleet as well as with other countries to assess the overall effect of the FAD (drifting and/or anchored) in the populations.

During this period the goals of the Spanish Management Plan have been successfully achieved regarding to produce a register of floating objects and their characteristics, to improve information collection, to improve knowledge of FAD catch composition, to further knowledge of FADs and their impact on the ecosystem, and to establish mechanisms for information exchange between scientists and administrations.

The data presented in this document should be considered preliminary as the data is currently being analysed. In that sense, some of the numbers of FAD deployment and active FADs can be revised in the future because some of the vessels of the same company are sharing FADs and, thus, some of the FAD information can be double counted. In any case, the information presented here is very valuable since it is, in our knowledge, the first time that such information provided systematically by the fleet is presented in TunaRFMOs. This will allow to analyse the data collected, discuss the usefulness of the data collected and, if needed, refine the data requirement needed for the assessment of FAD fisheries in the populations. The data presented here showed that on average 500 FADs were deployed by Spanish purse seiners in the Atlantic in 2013 and that in total 5964 FADs were deployed by Spanish flag vessels.

With regard to the data on FAD characteristics and materials it is expected that the fleet will shortly adopt a 100 % use of non-entangling FADs as ANABAC/OPAGAC agreed a Code of Conduct of Best Practices for their Spanish and associated flag vessels, which includes the use of non-entangling FADs. Currently, the use of non-entangling FADs is around 60 %. The use of non-entangling FADs will reduce the "ghost" mortality of sensitive species such as turtles and sharks.

Acknowledgements

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

Boat	*Type*
Agurtza Berría	Supply
Albacora Quince	Purse seiner
Albóniga	Purse seiner
Egaluze	Purse seiner
Juan Ramón Egaña	Purse seiner
Kurtzío	Purse seiner
Mar de Sergio	Purse seiner
Matxikorta	Purse seiner
Playa de Bakio	Purse seiner
Txirriñe	Purse seiner
Txori Berri	Purse seiner
Txori Urdin	Purse seiner
Zahara Dos	Supply
Zahara Uno	Supply
Zuberoa	Purse seiner

Table 2. Number of active objects, by boat (purse seiner and supplies) and by quarter, in the Atlantic Ocean during 2013. The boat number does not correspond to the numbering in **Table 1** by issues of confidentiality.

PS + Supp	*Quarter 1*	*Quarter 2*	*Quarter 3*	*Quarter 4*
1	**no data**	333	49	408
2	471	470	682	447
3 + 4	133	359	352	584
5	20	93	134	**Indian**
6	**Repair**	142	193	299
7	445	738	779	690
8	**no data**	160	133	302
9	35	143	192	95
10	30	83	89	79
11	139	257	189	127
12	211	187	261	260
13	937	929	1061	1036
14	839	838	1047	882
15	447	586	527	652
TOTAL	**3707**	**5318**	**5688**	**5861**

Table 3. Number of FAD deployed by quarter and total in the Atlantic by the Spanish flagged fleet (purse seiners and support vessels) in 2013.

	Quarter 1	*Quarter 2*	*Quarter 3*	*Quarter 4*	*Total*
Deployment	1290	1685	1595	1394	5964

Table 4. The incidental capture of non-target sensitive species and their fate reported by quarter in the Spanish FADs Plan data.

	Quarter 1		*Quarter 2*		*Quarter 3*		*Quarter 4*	
	Catch (number)	*released alive*	*Catch (number)*	*released alive*	*Catch (number)*	*released alive*	*Catch (number)*	*released alive*
Turtles	57	57	59	59	77	77	59	56
Sharks	217	86	311	161	108	84	192	163
Whale Shark	1	1	1	1	-	-	-	-
Billfishes	101	22	97	36	62	7	121	11
FRI/LTA (tons)	104	-	50	-	14	-	105	-

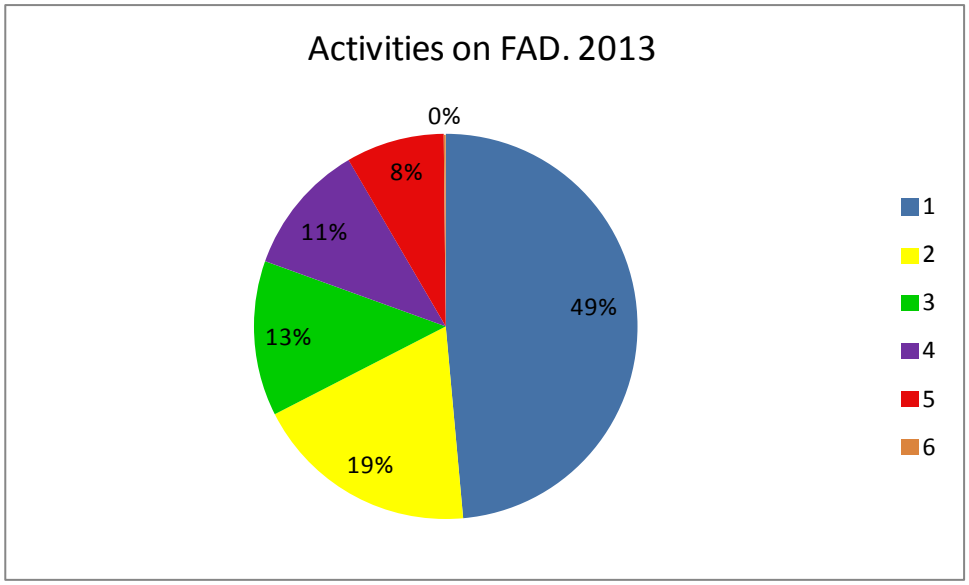

Figure 1. FAD activities done by the Spanish flagged vessels in the Atlantic Ocean in 2013. 1: deployment; 2: visit; 3: fishing set; 4: retrieval; 5: change buoy; 5: fix a buoy in a natural object.

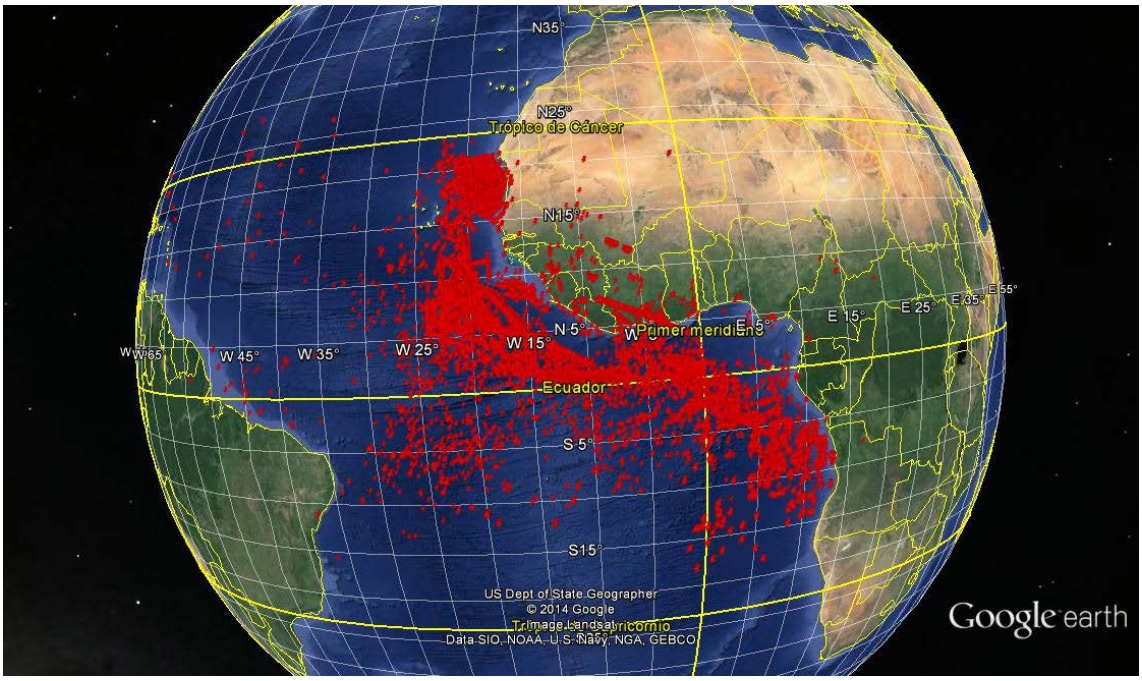

Figure 2. Geographical distribution of all activities performed on objects.

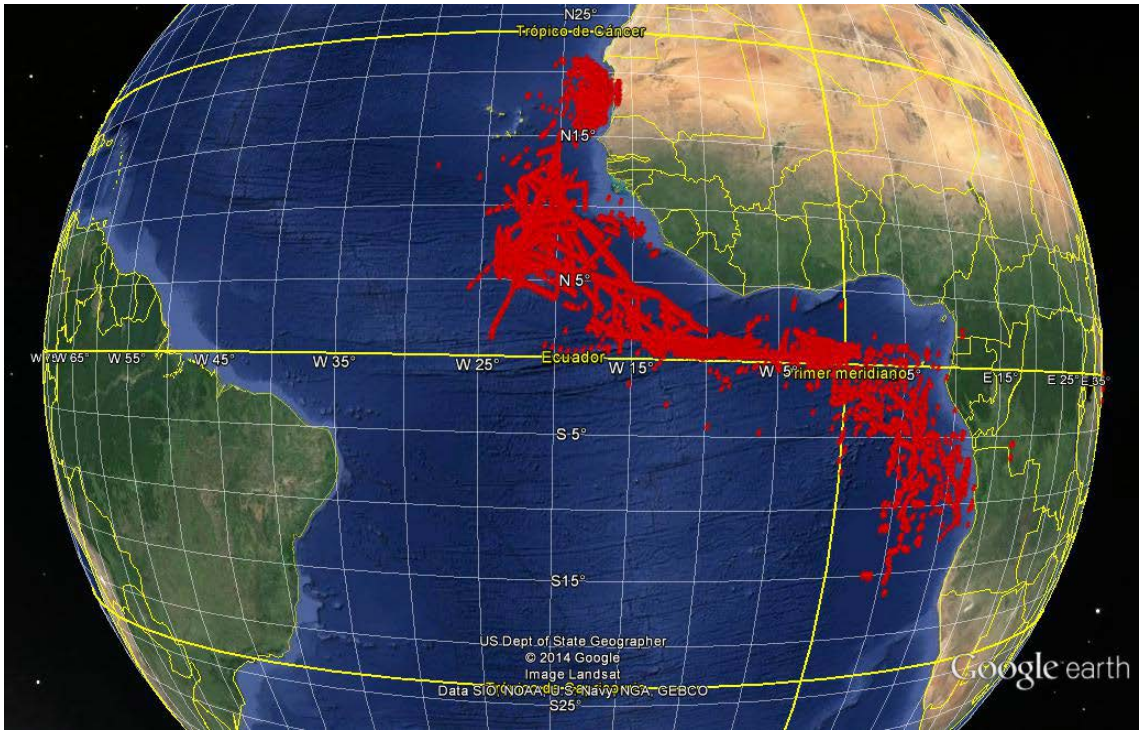

Figure 3. Location of FAD seeding in 2013.

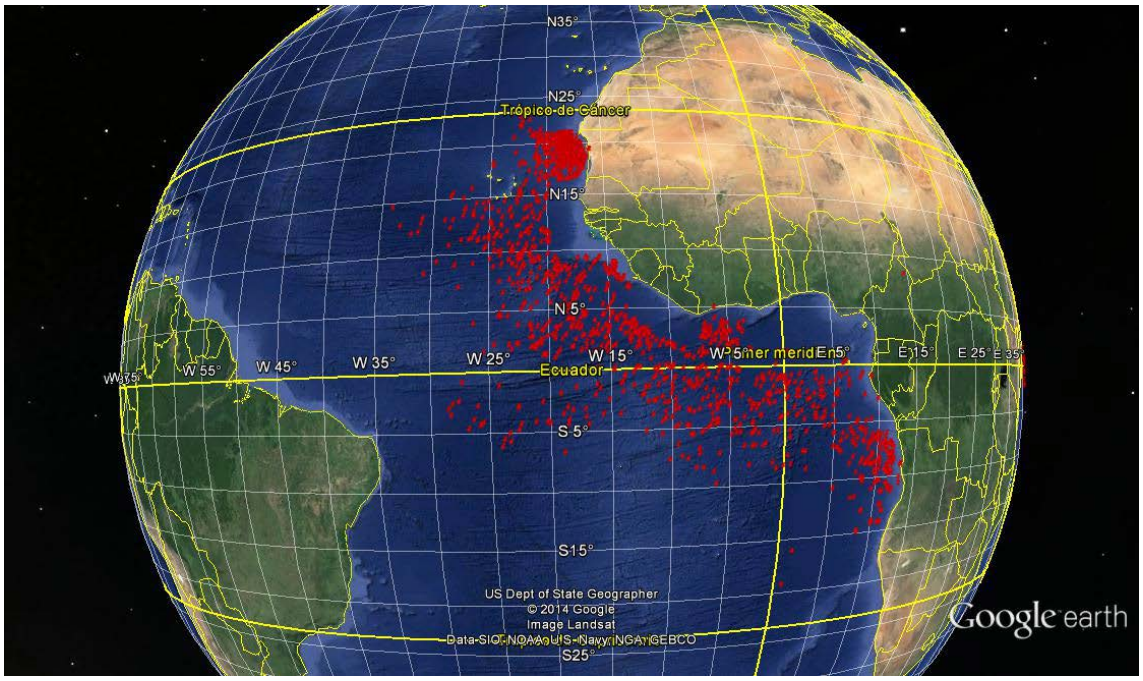

Figure 4. Geographic location of sets on FADs reported in 2013.

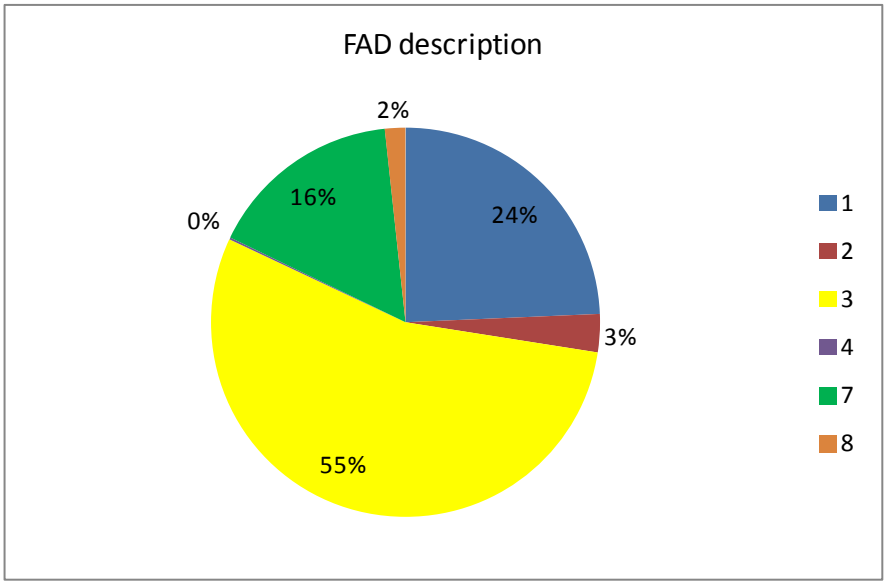

Figure 5. FAD characteristcs. 1: Surface structure with nets and bamboos; 2: Surface structure of metallic or PVC material; 3: non-entangling FAD (see definition in the text); 4: natural object; 7: unknown; 8: surface structure without net coverage or non-entangling coverage.

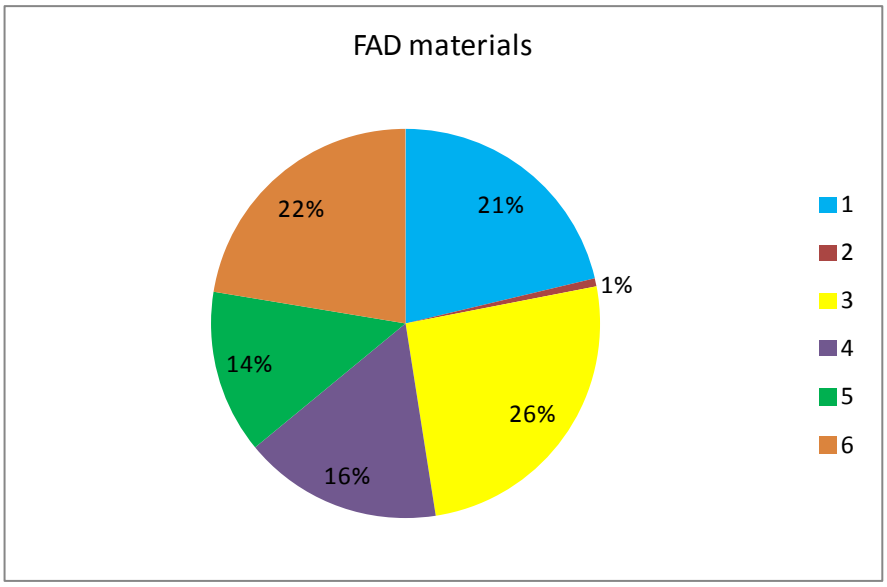

Figure 6. Materials use in the construction of FADs. 1:_bamboo; 2: PVC or plastic; 3: metallic; 4: floats, cork, buoys; 5: net material; 6: non-entangling material (ropes/canvas).