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MONITORING THE NUMBER OF ACTIVE FADS USED BY THE SPANISH AND ASSOCIATED PURSE SEINE FLEET IN THE IOTC AND ICCAT CONVENTION AREAS*J. Santiago¹, H. Murua², J. López² and I. Krug³*

The purse seine vessels of the Spanish ANABAC and OPAGAC fleet owners organizations agreed in late 2014 to freeze the number of DFADs by 1st of January 2016. According to that agreement, each purse seine vessel could use simultaneously a maximum of 550 Drifting Fishing Aggregating Devices (dFDAs) at any time of the year. This limit to be evaluated through the number of active instrumented buoys, which implicitly established the prohibition of the use of DFADs without buoys. This voluntary agreement also established that the verification of the volume of the daily active beacons used by each purse seiner would be carried out by the independent scientific body AZTI and sanctions were also included in the agreement.

Furthermore, in 2015 IOTC adopted the *Resolution 15-08 Procedures on a Fish Aggregating Devices (FADs) Management Plan* that sets the maximum number of instrumented buoys active and followed by any purse seine vessels at 550 at any one time (and 1100 acquired purchased annually). In 2016, *Resolution 16-01 on interim plan for rebuilding the Indian Ocean Yellowfin tuna stock in the IOTC area of competence* decreased the limit to no more than 425 daily active instrumented buoys per purse seine vessel (and 850 purchased annually).

Likewise, in November 2015 ICCAT adopted the *Recommendation by ICCAT on a Multi-annual Conservation and Management Programme for Tropical Tunas* [Rec. 15-01], establishing a provisional limit of no more than 500 instrumental buoys active at any one time for each fishing vessel.

Since September 2015 AZTI is carrying out the verification of the compliance with the different FAD limit measures adopted; initially as a voluntary agreement and later as agreed IOTC Resolutions 15/08 and 16/01 and ICCAT Recommendation 15-01. The procedure and mechanisms developed to verify the compliance are briefly outlined in the present document.

Method used for the verification

The basic information utilized to monitor the number of active buoys and, hence, verify the compliance with the limits, is provided by the instrumented buoys manufacturers. Currently, three are the companies that supply instrumented buoys to the Spanish and associated fleet (i.e. vessels belonging to the Spanish fishing companies but operating under other flags). By means of a sworn statement issued by these three companies, manufacturers provide daily information on the position and speed of each individual active buoy. Buoys are given unique identifier codes provided by the manufacturer that are associated to a single purse seine vessel, irrespectively of whether they are deployed by the purse seine vessel itself or by a supply vessel.

AZTI receives the buoy data directly from the manufacturers in a monthly basis with a two-month delay. This means that the first day of the information received in month m is the information of month $m-2$. Data is received in csv files, independently for each vessel, and contains daily records of all the active buoys managed by each individual vessel in month $m-2$. The information gathered in the csv files is: date [dd-mm-yy], time [hh.mm], individual unique buoy identified code [the format varies with the manufacturer, although it is always alphanumeric], latitude and longitude [expressed in degrees and minutes in decimal values] and speed [knots].

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The agreement considers the following definitions for instrumented buoys, depending on their situation and condition:

- Operational active buoy: a beacon that, after leaving the factory and passing through transit, has been registered and has the ability to transmit.
- Active buoy at sea: operational beacon transmitting position reports deployed at sea.
- Deactivation: action of de-registering an active buoy at sea by the buoy supplier company after the request by the ship owner due to loss, theft or any other possible cause.
- Reactivation: action of re-registering a beacon previously deactivated by the buoy supplier company after the request by the vessel owner (note that a buoy that has been deactivated at sea needs to pass at least one time by the fishing port before it is reactivated).

In order to identify records that do not correspond to active beacons at sea different filters are applied to the data:

- Records outside the Convention Areas [Atlantic Ocean: $-100 > \text{longitude} > 20$; Indian Ocean: $20 > \text{longitude} > 120$]
- Records on land: two conditions are required, 1) the position of the record overlays a land mask (shapefile <http://www.naturalearthdata.com/downloads/10m-physical-vectors/10m-land/>) and 2) speed = 0 knots.
- Records of operational active buoys that are onboard the vessel before deployment: speed > 4 knots.
- Records of deactivated buoys: The buoys manufacturers fill with NAs those that have been deactivated during the month of reference. Therefore, those records with NA values are excluded.

AZTI has put in place additional control mechanisms, if necessary, that include: random examination onboard purse seiners and supply vessels at port to check buoys that have previously been deactivated and retrieved on deck (and are, thus, able to be reactivated and used again), crosschecking the first activation of the buoy with VMS vessel position, comparisons with the information recorded in the FAD logbook and with the information collected by the observers onboard, among others.

Preliminary results

Some examples of the results of the verification are shown in **Figures 1 and 2**. **Figure 1** shows the daily evolution of the number of active buoys at sea of one vessel of the Spanish and associated fleet between September 2016 and January 2017 in the Indian Ocean. This trend illustrates the effect of the transition from Res. 15-08 to Res. 16-01 in the IOTC convention area. **Figure 2** shows the average daily density of FADs used by one of the vessels in the Indian Ocean in January 2017, by $1 \times 1^\circ$ statistical square. According to ICCAT Recommendation 16-01 CPCs shall ensure that this type of information is submitted for the bulk of the fleet every year to ICCAT.



Figure 1. Example of the evolution of the number of active buoys used by one vessel of the Spanish and associated fleet between September 2016 and January 2017 in the Indian Ocean. Limits adopted in Resolutions 15-08 and 16-01 are also shown.

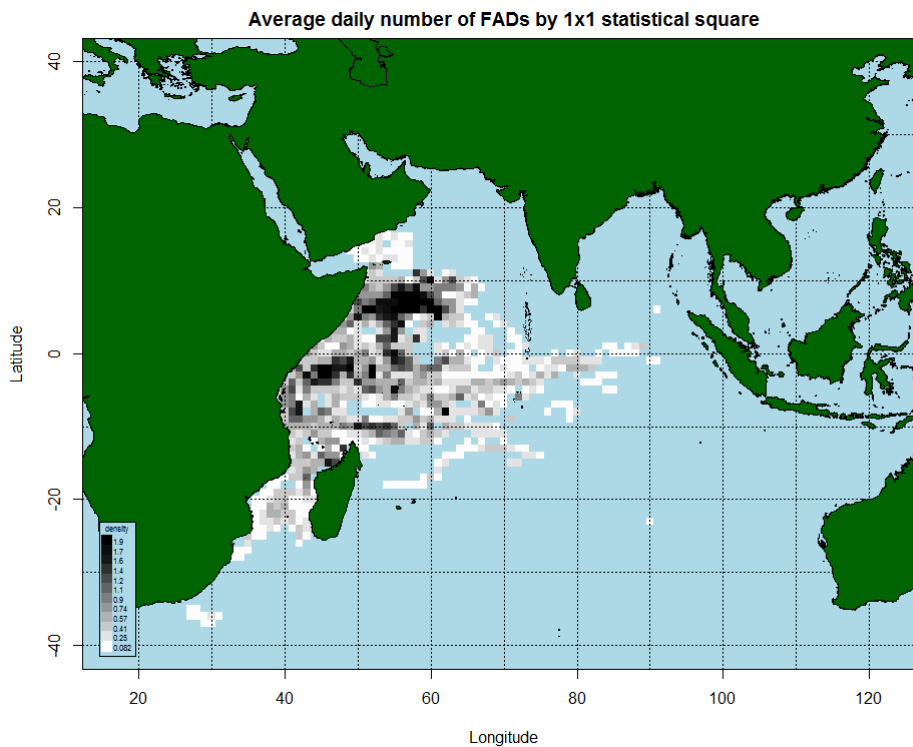


Figure 2. Average daily density of FADs used by one vessel of the Spanish and associated fleet in the Indian Ocean in January 2017, by 1x1^o statistical square.