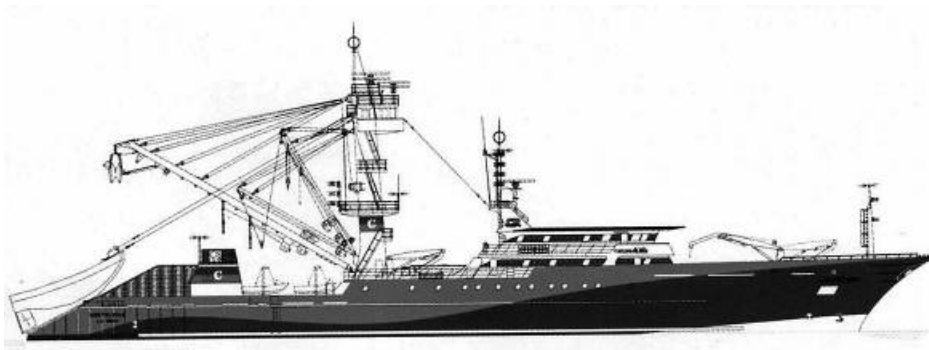




Project on new FAD designs to avoid entanglement of by-catch species, mainly sea turtles and acoustic selectivity in the Spanish purse seine fishery in the Indian Ocean



Alicia Delgado de Molina , Javier Ariz, Pilar Pallarés, Rosa Delgado de Molina and Santiago Déniz

Instituto Español de Oceanografía, Spain.
IPD, Spain.
Spanish Oceanographic Institute, Spain..

August 2005

Project on new FAD designs to avoid entanglement of by-catch species, mainly sea turtles and acoustic selectivity in the Spanish purse seine fishery in the Indian Ocean.

by

Alicia Delgado de Molina¹, Javier Ariz¹, Pilar Pallarés²,
Rosa Delgado de Molina¹ and Santiago Déniz³

Abstract

A Pilot Project executed by the company Albacora and monitored by the Instituto Español de Oceanografía (IEO⁴) is currently running in the Indian Ocean. Since the 15th May 2005 two purse seine vessels and two auxiliary vessels had started the operations on new FAD design to avoid entanglement of by catch species, mainly sea turtles, and acoustic selectivity.

The objective of the Pilot Project is to improve the selectivity and the bycatch incidence of the purse seine fishing on FADs where the impact on stocks of the most sensitive species (bigeye and yellowfin) and on the ecosystem (bycatches) is of certain concern.

Experiments will be undertaken with several prototypes of artificial floating objects and their performance will be analysed, to find a new technique that will reduce bycatches (particularly of sea turtles) without reducing aggregation capability of FADs for target species.

Acoustic data will be collected using up-to-date devices (sonar and scientific echosounders) and subsequently analysed to establish criteria that will provide information for an eventual reduction of juvenile catch of tropical tunas (yellowfin, and essentially, bigeye), based on possible acoustic selectivity.

The Pilot Project will have a duration of ten months . A month of preparation of protocols and observers' formation, six months (from 15th May until 15th November 2005) for data collection on board the vessels, and approximately three months for data analysis (15th November 2005 15th February 2006).

¹ Instituto Español de Oceanografía. PO Box 1373. 38080 S/C Tenerife. Spain

² Instituto Español de Oceanografía. Corazon de Maria, 8. 28002, Madrid. Spain

³ IPD. . PO Box 1373. S/C Tenerife. Spain

⁴ Spanish Oceanographic Institute

1. - Pilot Project → Definition

Following the EU Common Fisheries Policy to promote Responsible Fisheries, every year the Spanish Fisheries Administration allocate certain economic resources to finance Pilot Projects that will improve selectivity of fishing gears, investigate in new technologies that will reduce bycatch, explore new fishing grounds, etc.. Every year a series of projects covering various fishing issues, are presented to the Spanish Administration by several shipowners' associations or companies. The Administration chooses and finances the most interesting among them, based on a scientific report of viability and verified interest from the Spanish Oceanographic Institute.

The current Pilot Project is participated by the Spanish Fisheries Secretariat, the IEO and the company Albacora.

2. - Introduction and background

The Spanish tuna purse-seine fleet operates in tropical waters in the three major oceans, targeting for skipjack and yellowfin tunas, with annual catches of 250,000 t. These catches are obtained with the two classical fishing modes of the purse seine gear: using artificial floating objects and on free schools. Both set types result in catches of the same species (yellowfin, skipjack and bigeye); however, there are differences in the species and size composition, as well as in the quantity and species that constitute the associated fauna.

Fishing with free schools or with natural floating objects was traditional until the appearance of fishing over artificial floating objects, that was developed from the mid eighties until the early nineties, depending on the ocean. Currently, the catches obtained with every type of fishing are around 50% (considering catches from the Atlantic, Indian and Eastern Pacific Oceans). Since the development of large scale fishing over artificial floating objects the type of FAD used (bamboo raft with hanging nets) has not varied substantially, which is not the case for detection systems or the type of localizer buoy used with FADs (from radio beacons until satellite tracking buoys). Although the fishery over floating objects has increased purse-seine efficiency and subsequently the catch (particularly of skipjack), the use at large scale of FADs had effects on the fishery that were unusual prior to their introduction. On one hand, catches of numerous associated species (especially in certain space-time strata) including sharks, turtles and other fish species (none of which are useful species for purse-seine fisheries); and on the other side, the presence and of juveniles yellowfin and bigeye tunas on the catch (non-target of this fishery and infrequently caught in free school).

The impact of this fishing mode on the ecosystem and the exploitation profile of tunas generated, have meant that fishing over floating objects with buoys or FADs has become a cause for concern for the different RFMOs (Regional Fishing Management Organization) responsible for assessing and managing tuna stocks.

The RFMOs have provided recommendations about the need to increase knowledge about this fishing mode, with a view to assessing its real impact on stocks and to implement appropriate management measures.

3. - Objectives

This pilot project mainly aims to make progress in improving the fishing mode on FADs, where the impact on stocks of the most sensitive species (bigeye and yellowfin) and the ecosystem (bycatches) is a concern.

For that objective, experiments will be undertaken with several prototypes of artificial floating objects and their performance will be studied. The aim is to find a typology that will result in reducing to the extend possible bycatch (particularly of turtles) without reducing concentration capacity of FADs for target species. And experiments on acoustic selectivity, trying to use the equipment frequently installed on board purse seine vessels to try to improve selectivity of tunas.

4. - Innovations of this Pilot Project

It is the first time that design of new artificial floating objects will be used in an experimental project. The new FAD design are friendly with turtles and other species that concentrate under FADs and get entangled in nets hanging from floating objects, while also maintain the attraction capacity of FADs for tropical tunas that concentrate around them. The new designs will totally avoid elements that could produce any source of entanglement and will be constructed with an array of different materials, trying to use biodegradable materials to avoid the effects of ghost gears.

It will, for the first-time, use of acoustic techniques in an experimental project, aimed at discriminating tropical tuna species and sizes associated with artificial floating objects. The objective of this part of the Project is two-fold: a) to examine the aggregation criteria of the different species and sizes and b) to discover school composition prior to the set. Both objectives converge with the final objective, which is to achieve a reduction in catches of non target species and juveniles specimens of tropical tunas; in short, to improve purse seine selectivity.

5. - Geographical area and duration

The Indian Ocean is the area where the Spanish purse seine fleet has bigger catch. The experimental period on board the vessels has been chosen to coincide in time with the most productive season for FAD fishing in the Western Indian Ocean, i.e. from May until November.

6. - Methodology

The pilot project will be carried out from two Spanish tuna purse seiners (Albacán and Albacora Quince) and two Spanish supply vessels (Zahara Tres and Taraska).

The vessels used in the experiment will perform different tasks. There are two teams, each one composed of a purse seiner and a supply vessel. The mission of one of the teams will focus on following up objects designed to reduce incidental catch of associated species, mainly turtles. The catches obtained with "classic" objects will be placed and examined simultaneously in order to confirm the effectiveness of the new objects. As example two experimental FADs in Figure 1.

The mission of the second team is essentially to collect acoustic data, using the echosounders and sonars installed in both the purse seiner and support vessel, and to validate that information with intensive sampling of the catch taken by the purse seiner at the time of the unloading of the catch in port. As example an tuna ecogram is in Figure 2.

Tasks are separated so as to reduce acoustic data collection to just two vessels (second team), since extensive and complex equipment is required for data storage and treatment. Data collection for the FAD experiments will be taken by the four vessels involved in the experiment.

The pilot project will be carried out in two three-month stages. After the first stage, the four observers will be changed by other four, and the activities may be revised and adjusted if necessary.

The acoustic devices are those normally used by the vessels since, in principle, the results of this type of scheme must be immediately applied to the fishing sector. The only changes introduced have been to improve data storage to facilitate subsequent treatment. Equipment calibration from the purse seiner and the supply vessel from the second team is required to standardize the data collected in the two vessels.

During trips, the observers collect extensive information about all the vessel's activities and store information from the echosounder and sonar in precise locations. To this end, they are equipped with a series of forms that can be divided into three groups:

1. Vessel Activity (and fishing sets data)
2. FAD data
Form that will collect information associated to the experimental and traditional FADs, recording set time of the FAD, visit time and fishing activity.
3. Acoustic Data
 - a. Echosounder data form: used to note data for each sounder recording.
 - b. Sonar data form: used to note data for each sonar recording.

Each vessel has a different protocol for collecting general data and acoustic sampling data, depending on whether the team is dedicated to acoustic data collection or not and to whether it is a purse seiner or support vessel.

Data analysis will be carried out in the following 3 months, and results are expected by February 2006.



Figure 1.- Example of experimental FADS using in Spanish Pilot Project

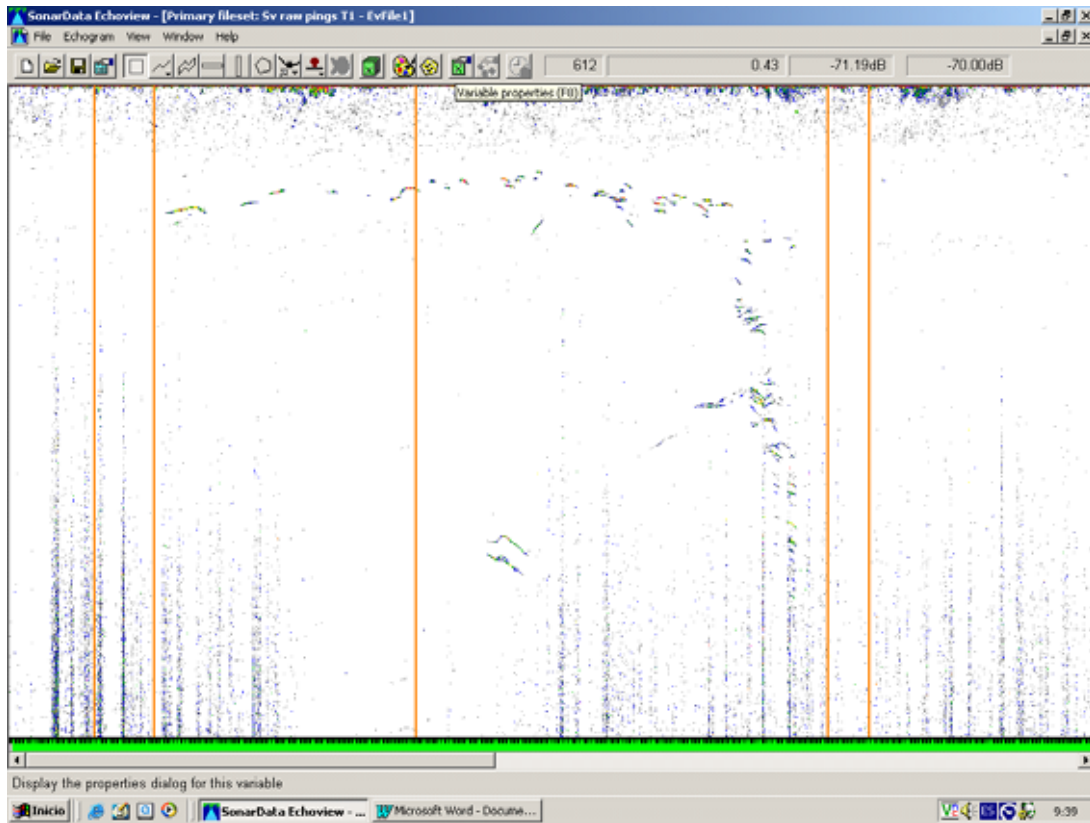


Figure 2.- Tuna echogram obtained in Spanish Pilot Project on acoustic selectivity.