Preliminary data obtained from supply logbooks implemented by the Spanish fleet since 2004

by

Sarralde Roberto[1], Alicia Delgado de Molina[1], Javier Ariz [1] and J. Carlos Santana [1]

SUMMARY

We present a preliminary analysis of the data obtained from supply logbooks distributed to supply vessels providing support for the Spanish purse-seine fleet or associates in the Indian Ocean from late 2004. These data contribute to a better understanding of such activities, little known to date, and complement those found by observers on board. 83 campaigns were registered for 11 supply vessels, with a total of 4484 days at sea, during which details were provided about operations carried out by this fleet.

KEYWORDS

Supply vessels, Indian ocean, Tropical tuna, FADs, floating objects.

[1] Centro Oceanográfico de Canarias
Instituto Español de Oceanografía
P.O. Box 1373
38080 Santa Cruz de Tenerife
Islas Canarias. Spain

INTRODUCTION

Supply boats are vessels that work alongside the tuna purse-seine fleet, providing support for all kinds of activities and contributing to improving fishing performance. These vessels are 35-40 m long, with 650-1600 hp and 7-10 crew members. They are often reconverted bait boats.

The main activity of this fleet is to produce objects, deploy them and carry out a follow-up, although they also indirectly provide relief for the fishing vessels by transporting provisions, the injured, tackle and so on. When they detect an object with fish, they notify the purse-seiner/s (normally one, occasionally two) they are associated with in order for them to undertake the fishery.

Estimating the increased purse-seine fishing effort due to fish aggregating devices (FADs) is fundamental. Several trials have been carried out in purse-seiners, based on data from fishing logs or from objects, in both the Atlantic and Indian Oceans (Pallarés *et al*, 2007; Artetxe *et al*, 2003). However, this is the first experiment using logbooks for following up the activities of vessels supporting purse-seiners. Until now, the only source of data about supply vessel activity came from observers on board, whether for commercial fishing or pilot actions, with scant coverage. Despite the existence of a preliminary estimation of the contribution made by these boats to the purse-seiners' effort, based on observer data, in the Atlantic ocean (Pallarés *et al*, 2001) and Indian ocean (Arrizabalaga *et al*, 2001), their activity is quite unknown, which makes it extremely difficult to assess the contribution made by these support vessels to the overall purse seine effort.

MATERIAL AND METHODS

From late 2004, on the recommendations of the Scientific Committee of the IOTC (Resolution 01/05), activity books have been provided to all vessels supporting the Spanish purse-seine fleet operating in the Indian Ocean (Delgado de Molina *et al*, 2005). In this way, data about the activities of this fleet are continuously obtained, thus improving the coverage of those collected by observers.

The Spanish Fisheries Office in the Seychelles has distributed supply logbooks to supply vessels and is carrying out a follow-up and collection. These logbooks are completed voluntarily by the captain. When the boat returns to Port Victoria (Seychelles), the completed sheets are collected and subsequently processed by the Spanish Oceanographic Institute (IEO).

The fact that this fleet puts into port infrequently—many vessels operate under a flag of convenience—has hampered distribution of the supply logbooks, but fortunately the response has been positive in most cases. Only one vessel refused to complete them. The quality of the information supplied largely depends on the skipper, with some vessels providing precise details about their activities, while others barely give any.

Figure 1 shows one of the supply logbooks, including all the necessary information.

All the information collected has been processed in an ACCESS database.

In the event of a buoy being transferred, the code used corresponds to a visit, whether it is an unknown or own object. If it is an own object, both the code of the buoy found and that of the newly deployed are registered. In the event that it is an unknown object, only the code of the new buoy is given.

If an artificial or natural object is marked with a buoy, the type of object in question is noted down under observations.

For the purpose of calculating activity duration, activities that only take place once a day (exploring, en route, breakdown…) are multiplied by the number of days registered and by 24 to discover the total number of hours. For activities that occur more than once a day (deployment, visits, calls to the purse-seine), the percentage of occurrence is calculated and multiplied by the number of days and by 13 (daytime hours). The 11 nighttime hours are added to the navigation code.

RESULTS

The estimated number of supply vessels working in collaboration with the Spanish purse-seine fleet in the Indian Ocean in recent years is given in **Table 1** (Delgado de Molina *et al*,, 2007). Since 1999, the year in which follow-up on this fleet began, the number has gradually increased, reaching a maximum of 15 in 2004 and settling at 13 in 2005 and 2006.

Table 2 shows the number of campaigns processed per vessel (numbered from 1 to 11), the total and mean number of days, and the minimum and maximum number of days of campaign duration per vessel and in total. Records exist from November 2004 to March 2007. A total of 83 campaigns have been recovered, with a total of 4484 days at sea. The mean duration of the campaign was 54 days, the shortest being 8 days long and the longest 124 days. The duration of the campaign is measured from the moment the vessel leaves port to the moment it returns. Campaign duration was variable, owing to the nature of the supply vessels, the main reasons for entry into port being to refuel, change the crew or for breakdown, although campaigns may also be interrupted to transport an injured person, or to collect material, etc.

Figure 2 presents a graph containing the days processed per vessel, and **Table 3** outlines the coverage of the activity sheets recovered per year from November 2003 to February 2007. In 2006, 50% of the supply vessels' days at sea were recorded, and the percentage is expected to be higher this year.

This fleet moved within the following geographical limits: 18ºN (Arabian Sea), 18ºS (Mozambique Channel), 72ºE (Maldives/Chagos) and to the W, the African continent.

According to behaviour, we can identify two types of supply vessels: those that spend most time anchored over a seamount, and those that navigate in a similar way to the purse-seiners. Two vessels have been identified as belonging to the first type and, for the moment, there is little information about them, since they spend most of their time anchored to seamounts and rarely put into port. The fishing sheets recovered until now have come from 11 supply vessels belonging to the second type—navigating in close collaboration with purse-seiners.

Figure 3 shows the duration of the various activities undertaken by these support vessels. Navigation (with or without searching) takes up 62% of time at sea, visiting objects 22% and deployment 11.5%.

160 cases of buoy replacements—changing an old buoy for a new one—were recorded. In most cases, an own buoy was placed on an unknown object that had been found.

101 found artificial/natural objects were recorded as being marked with buoys. Most of the natural objects found were logs, while artificial objects were usually ropes, corks, nets and plastic materials.

In the cases where captains estimated the size of the school, the mean size of the school associated to an object was 11.2 tons, and the largest was calculated at 200 t.

The code for **Notifying purse-seiner** and **Arrival of purse-seiner** was only noted down in 41 cases. Despite the fact that this is one of the codes that gives an idea of the direct effectiveness of supply vessels on fishing, it is one detail that captains seem reluctant to give. When they call a purse-seiner because they have detected fish, they normally wait and "look after" the object until the purse-seiner arrives.

The technology used for the FADS is developing very quickly, and the majority of buoys currently in use are satellite or, to a lesser extent, radio-buoys (MID in the table).

A typical satellite buoy contains a GPS satellite receiver and a transmitter, a thermometer to measure water temperature, a system to gauge the state of the batteries and a microprocessor to control these systems. Buoys are operated externally by means of a magnet, which, when activated, confirms operation by sending a position signal. Every 8 hours the buoy sends data about position, temperature, battery voltage, identification and time via satellite. Using the *Immarsat* equipment on board, the vessel automatically calls the server and then enters the access codes to download the information. The buoy is deactivated when the magnet is passed again.

Radio buoys transmit through a radio frequency received by the equipment receiver, but largely depend on good transmission conditions and are less accurate. As a result, despite being cheaper, they are gradually being used less and less.

Buoys may include a sounder for detecting and estimating fish underneath to a depth of up to 400 m. This type of satellite buoy with a sounder is rarely used by supply vessels because of high cost.

Table 4 outlines the number of buoys deployed per type, and **Figure 4** shows percentage of use of each type of buoy. The most frequently used satellite buoy is the ZUNIBAL (in 52.7% of all cases), followed by SATLINK buoys (52%). MID radio buoys stand at 6.8%.

The reason for using one type of buoy or another is determined by economic or technical matters, such as the presence or otherwise of GPS, solar panels or rechargeable batteries. Supply vessels generally use several types of buoys and alternate their use.

Table 5 outlines the number of buoys visited, deployed and collected per boat and the total. Of a total number of 2034 buoys deployed, 711 were collected without fish and were visited 2825 times in total.

Estimating the percentage of the FADs recovered by the purse-seiner (enabling us to calculate the percentage of buoys lost) is difficult since purse-seiners do not usually note down operations involving collaboration with supply boats.

Table 6 shows calculations of the mean number of operations with buoys per vessel. The average number of objects deployed per day is 0.6, and the average number of objects visited is 1.1.
Generally speaking, deployment is carried out on one or two consecutive days, with approximately one hour separation between each (8-10 miles distance).

Four vessels recorded a single activity per day and have not been used when calculating the number of buoys deployed/visited and the mean number of objects deployed or visited.

Table 7 gives the maximum number of visits to FADs per vessel in one day and the maximum number of deployments undertaken in one day. The maximum number of visits to objects in one day was 9, while the maximum number of objects deployed in one day was 14.

Once the supply vessels become familiar with the supply logbooks, and with the help of staff at the Spanish Fisheries Office in the Seychelles emphasising the scientific objective of these logbooks, information collection is expected to become routine.

Once supply logbooks are put into full effect in supply vessels, they will provide a source of data that will contribute to a better understanding of the behaviour of these boats that support the purse-seine fishery and should be included in standardizing the fishing effort over objects in IOTC assessments of stocks of tropical tuna species.

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Table 1. Number of supply vessels associated to Spanish purse-seiners by year.

Year	Supply
1999	6
2000	7
2001	5
2002	8
2003	8
2004	15
2005	13
2006	13

Table 2. Number of campaigns recovered, total number of days and mean campaign duration, and minimum and maximum duration per boat and in total.

Vessel code	n_trips	n_days	Average days	Min-max
1	6	417	70	9-122
2	7	403	58	55-62
3	15	759	51	20-118
4	10	457	46	8-63
5	8	344	43	9-61
6	8	595	74	8-123
7	2	96	48	23-73
8	17	745	44	10-63
9	3	290	97	45-124
10	2	218	109	95-123
11	5	160	32	23-51
TOTAL	**83**	**4484**	**54**	**8-124**

Table 3. Coverage of days at sea recovered per year.

COVERAGE	%
2004	11,9
2005	27,7
2006	50,3

Table 4. Number of buoys deployed per type and in total from November 2004 to February 2007.

Buoys	Number
SATLINK	473
SERPE	154
ZUNIBAL	997
D+	132
RYOKUSE	9
MID	128
TOTAL	**1893**

Table 5. No. of buoys visited, deployed and collected per vessel and in total.

Vessel code	Visited	Deployed	Collected
1	458	288	61
2	394	502	122
3	593	315	158
4	384	236	74
8	579	348	119
9	264	277	119
11	153	68	58
Total	**2825**	**2034**	**711**

Table 6. Average FADs deployment and visiting by day and vessel and in total.

Vessel code	Deployment average by day	Visit average by day
1	0.7	1.2
2	1.2	1.3
3	0.4	1.0
4	0.5	1.0
8	0.6	1.2
9	0.4	0.5
11	0.4	1.3
TOTAL	0.6	1.1

Table 7. Maximum number of FADs visited per day and maximum number of FADs deployed per day and vessel and total.

Vessel code	Max FADs visits per day	Max FADs deployed per day
1	3	5
2	9	4
3	6	14
4	5	10
5	1	
6	2	3
7	2	2
8	8	14
9	5	5
10	3	4
11	7	5

Vessel name

Captain

			FADs deployment	FADs visit	Anchored seamount	Calling to PS	PS arriving	Crew change	Others	Purse-seine name	School estimation (t.)	Bouy code		Buoy type	
Date	**Position**	**Time**	**Activity**							**In case of fishing**		recovering or visiting	deploying		**Comments**

Figure 1. Supply logbook sheet.

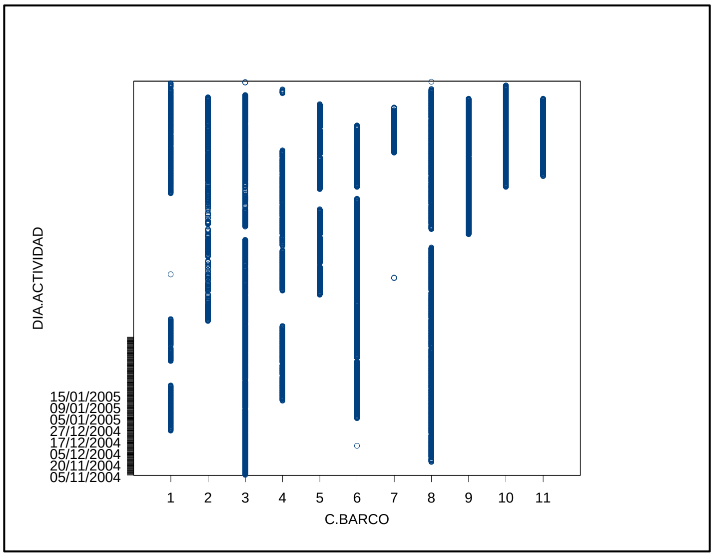

Figure 2. Days recovered per vessel (November 2004 – February 2007).

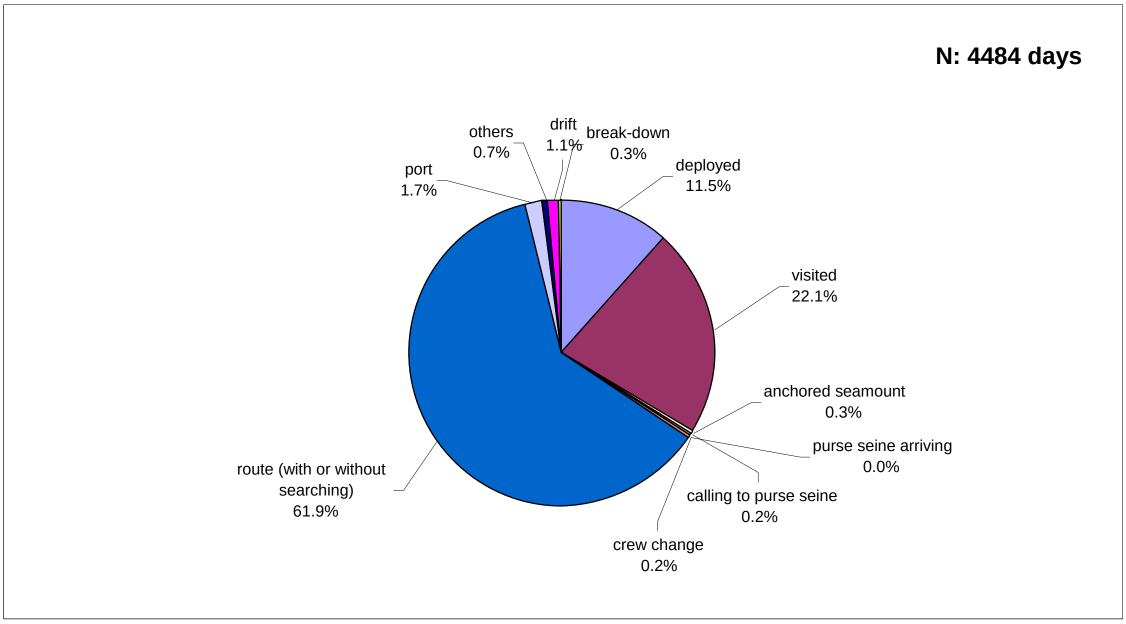

Figure 3. Time used per type of activity in percentages.

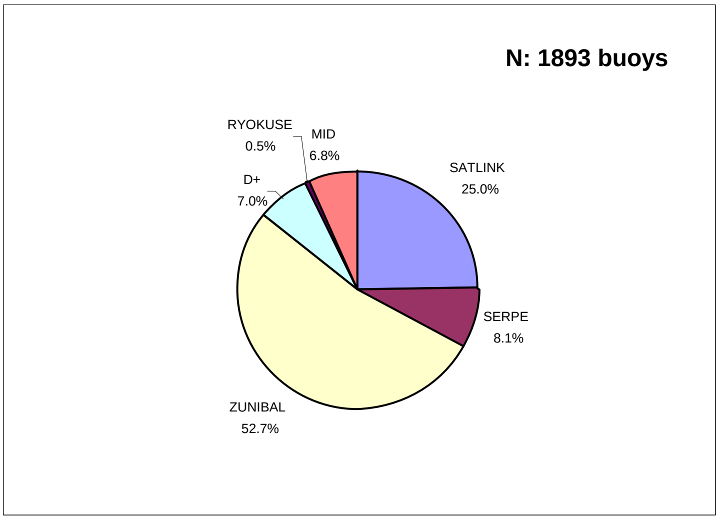

Figure 4. Ratio of buoys deployed by type