Review of the time-series of catch-and-effort for Spanish purse seiners operating in the Indian Ocean: Preliminary Results

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1. Background

The document presented by *Blue Marine Foundation,* based on work carried out by the NGO *OceanMind* (2022[1]) suggests that, in the period from 2019 to 2020, the Spanish fleet has fished within the Exclusive Economic Zone (EEZ) of Indian Ocean coastal countries without access agreements to their waters. Specifically in waters of: India, Somalia and Tanzania. This report represents a follow up to previous information disseminated by Ocean Mind and its results have been broadly disseminated by the media, especially in the UK.

Following the publication of the first report, The Spanish Operators approached the *Instituto Español de Oceanografía* (IEO, Spanish Institute of Oceanography) to request a thorough review of the time-series of catch-and-effort data reported to the IOTC, noting that they had not received any notification from the Control Unit of the flag state, in charge of VMS Monitoring, over the said period, nor had it been any issue regarding the use of VMS by the fleet. In 2020, the IEO prepared an internal technical advisory report covering 2016-2019 (IEO 2020[2]), in response to a request from OPAGAC, whose skipjack fishery in the Indian Ocean was undergoing evaluation for MSC Certification.

The IEO is currently addressing such review, through the verification of logbook data against VMS data. The results of the review will be presented to the next meeting of the IOTC Working Party on Data Collection and Statistics (November 2022), and new datasets will be reported to the IOTC, where required.

The present document summarizes the results of the review that is being conducted by the IEO, considering the urgency of this matter and the fact that the claims on the reports published by Blue Marine/Ocean Mind are unfounded. r

2. Analysis of the Ocean Mind's document (2022[1])

The paper studies the reported public databases, which can be downloaded from the IOTC (Indian Ocean Tuna Commission, https://www.iotc.org/data/datasets/latest/CESurface) website. Between 2016 and 2020, OceanMind has identified catch and fishing effort of the Spanish freezer purse seine fleet in EEZs of 11 coastal countries.

The setting positions available in the IOTC are grouped in 1°x1° grids. For this reason, sets made on the high seas may be displayed in grids that overlap EEZs of coastal countries. In these cases, the OceanMind document (2020[3]) assumes three types of overlaps: (i) totally within the EEZ, (ii) at the EEZ boundary, when more than 50% of the grid is within the EEZ, and (iii) when less than 50% is within the EEZ.

According to the results of the paper, between 2019 and 2020 there was fishing activity by the Spanish fleet in the EEZs of 5 of the 11 countries studied (**Table 1**): India, Mauritius, Seychelles, Somalia and Tanzania.

Tabla 1. Reported Spanish fleet activity within the EEZs of 11 coastal countries, by year between 2019-2020, according to the OceanMind's document (2022[1]). Key: Yes, fishing activity reported according to Blue Marine; No, fishing activity not reported.

ZEE	2019	2020
Chagos	No	No
Union of the Comoros	No	No
Republic of India	Yes	No
Republic of Kenya	No	No
Republic of Madagascar	No	No
Republic of Mauritius	Yes	Yes
EUFrance (Mayotte & La Réunion)	No	No
Republic of Mozambique	No	No
Republic of Seychelles	Yes	Yes
Federal Republic of Somalia	No	Yes
United Republic of Tanzania	No	Yes

3. Spanish data available from the IOTC 2019-2021

In order to verify the results of the OceanMind document (2022[1]), in a first step, the positions of the sets available for the Spanish fleet for the period 2019-2021 were mapped, and then collected in the CN.IEO-CSIC databases, to which the EEZ layer available from the IOTC website has been superimposed. **Figure 1** shows the positions of the sets that have been detected within the EEZ of third countries over the time-frame of the study, with the exception of those detected in Mauritius and Seychelles waters, for which fishing agreements exist. No set positions have been detected in Indian and Tanzanian waters.
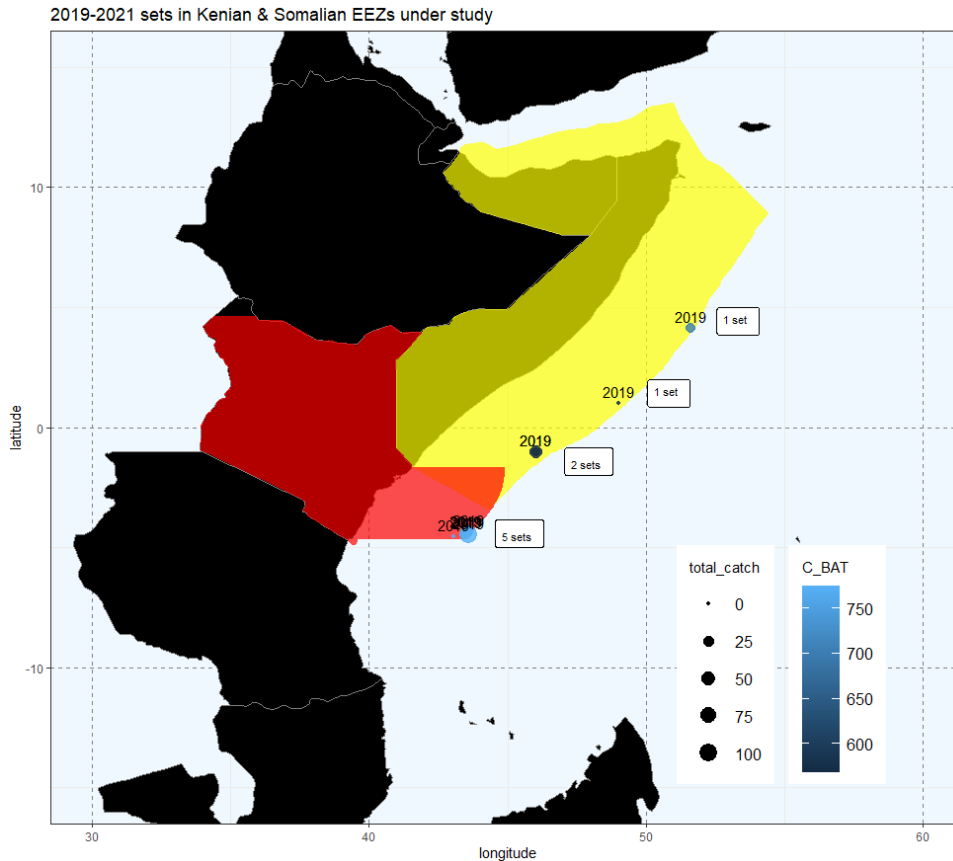
Figure 1. Set positions from 2019 to 2021, within the EEZ of third countries on the East African coast (Kenya and Somalia), available in the CN.IEO-CSIC databases. Each vessel code (C_BAT) is represented by a color gradation. The layers provided by the IOTC on its website (https://iotc.org/) were used to represent the EEZ boundaries. The diameter of the points is proportional to the recorded catch. Next to each point or set of nearby points, the number of sets they encompass is indicated.

In this first check, 9 registered positions corresponding to hauls in the Kenyan and Somali EEZs have been detected (**Table 2**).

Table 2. Number of hauls per EEZ analyzed, according to the CN.IEO-CSIC database, at the beginning of the verification process.

|	Año			
EEZ	2019	2020	2021	**TOTAL**
Kenya	5	0	0	**5**
Somalia	4	0	0	**4**
TOTAL	**9**	**0**	**0**	**9**

The data analyzed by the CN.IEO-CSIC originate from the catch estimates by the captains, set by set, and provided on printed sheets to the sampling team of the Information and Sampling Network (RIM) in the port of Victoria (Seychelles). These data are then digitized by the RIM staff, existing then two possible sources of errors: (1) those made by the captain during the transcription of his data, and (2) those made by the

RIM staff, when digitizing the information in the AVDTH ('Acquisition et Validation des Données de Peche au Thon Tropical'), i.e. the software used to store the information, and which connects the Access databases with the T3 . For this reason, in order to detect possible errors in the 9 sets over third country EEZs, in a second step, each set was compared with the available VMS (Vessel Monitoring System) positions. For this purpose, the VMS data corresponding to these vessels during the study period were requested from the Spanish General Secretariat of Fisheries (SGP). In addition, the position was verified with the fishing logbook (provided by the captains), through the trajectory of the vessel, i.e., previous and subsequent sets, which allows knowing whether or not it is in the same area.

Finally, after analyzing the available information point by point, contrasting the position of the 9 sets on EEZs between 2019 and 2021 (**Figure 1**), it has been observed that the positions, although they coincide with the records in the logbooks, they are not consistent with the trajectories of the corresponding VMS positions. The positions typed in our data base coincide with those recorded in the logbooks, so the possible source of error is in the transcription of the data on board.
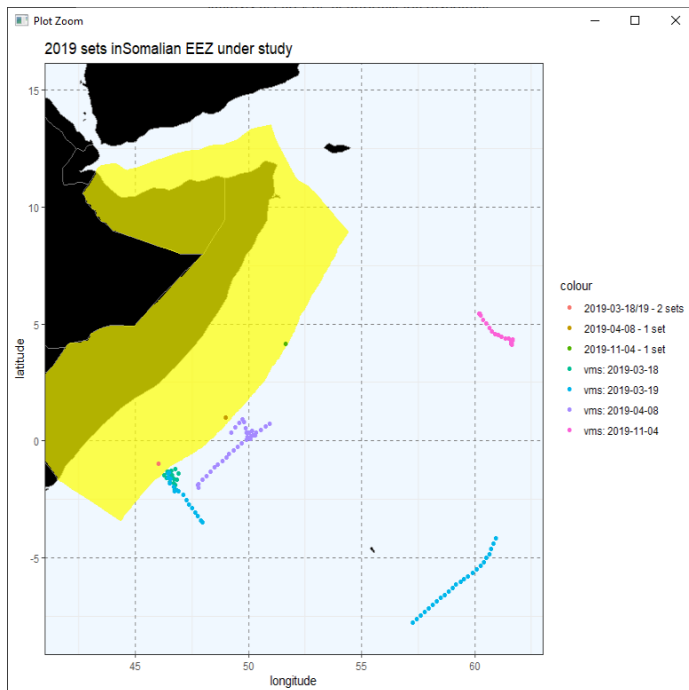
Figure 2. Positions of the 4 sets checked in the Somali EEZ and status of the data according to the VMS records for the days checked.
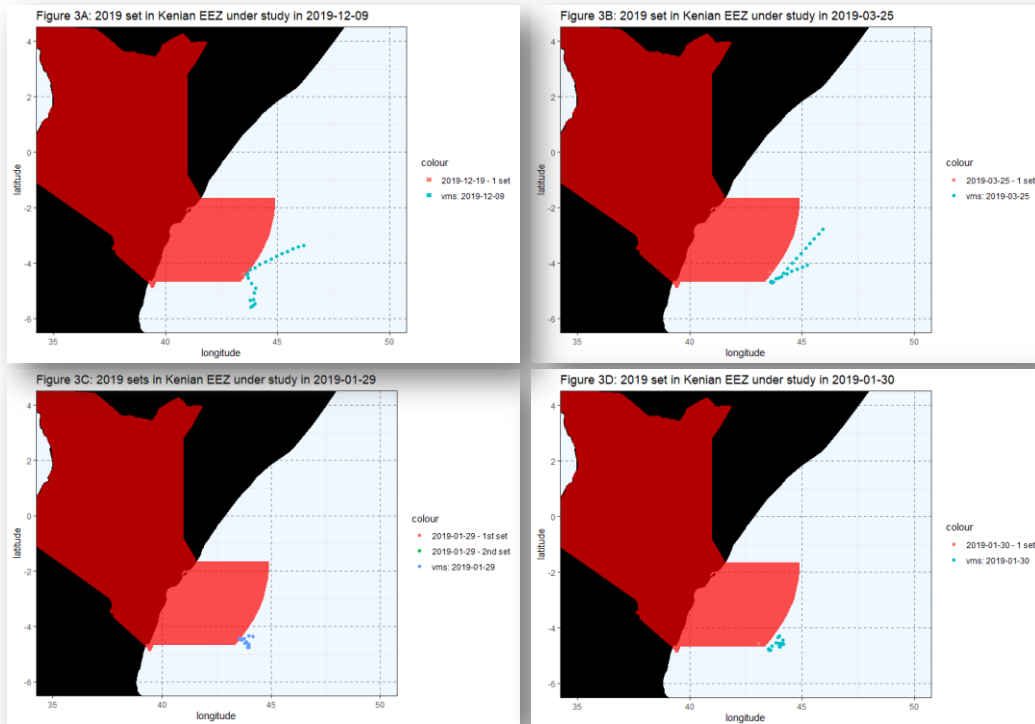
Figure 3. Positions of the 5 sets (in pink) checked in the Kenyan EEZ (in red) and status of the data according to the VMS records of the days checked (in blue).

With reference to positions that are not consistent with the near and mean VMS data for the day (**Figures 2 and 3** - points within the yellow and green zones), **Table 3** compares these positions with the ship's trajectory (the before and after positions recorded in the VMS databases) and suggests the correct position.

It is important to note that the Spanish MCS requires that all purse seiners install a tamper-proof Blue Box for the recording of VMS data, with the existing systems recording the position every other 10 minutes, with reporting to the Control Unit set at one-hour intervals. This means that the Control Unit may interrogate the VMS to acquire all VMS recordings should it require it. This is in contrast with purse seine fishing sets, which have a minimum duration of about 1.5 hours. Considering that the VMS is always active, any unauthorized trespassing of EEZ boundaries or fishing set would not go undetected, leading to timely follow-up by the Control Unit. No such events were recorded over the period under consideration.

Table 3. Positions not consistent with the VMS data nearby, and compared with the trajectory (previous and subsequent sets). In addition, the information has been cross-checked with the information obtained in the FAD (Fish Aggregating Devices), activity logbooks that are delivered to the CN.IEO-CSIC every quarter by all the Spanish tropical purse seine fleet fishing in Indian Ocean waters.

| Initial EEZ	Register Number	Date	Time GMT	Registered Position	Previous time	Previous Position	Next time	Next Position	Mean Position (day)	Reassigned Position	Reason	Final EEZ
				Base de datos CN.IEO-CSIC			Datos VMS					
Somalia	1	18/03/2019	04:10	-1.00 46.00	03:19	-1.46 46.27	04:19	-1.34/ 46.39	-1.56 46.58	-1.33 / 46.38	Matches the position recorded in the DCPs notebook and is consistent with the VMS trajectories.	International waters
Somalia	2	19/03/2019	03:32	-1.00 46.00	03:30	-1.38 46.46	04:31	-1.39 46.46	-2.36 47.07	-1.37 / 46.45	Matches the position recorded in the DCPs notebook and is consistent with the VMS trajectories.	International waters
Somalia	3	08/04/2019	03:30	1.00 / 49.00	03:19	0.92 / 49.72	04:19	0.92 / 49.73	0.40 49.99	0.92 / 49.70	Coincides with the position recorded in the DCPs logbook and is consistent with VMS trajectories	International waters
Somalia	4	04/11/2019	02:15	4.13 / 51.62	01:47	4.19 / 61.62	02:47	4.13 / 61.63	4.69 61.01	4.13 / 61.62	Matches the position recorded in the DCPs notebook and is consistent with the VMS trajectories.	International waters
Kenya	5	09/12/2019	12:40	-4.40 43.47	11:51	-4.39 43.66	12:51	-4.39 43.65	-4.40 44.34	-4.38 / 43.65	Matches the position recorded in the DCPs notebook and is consistent with the VMS trajectories.	International waters
Kenya	6	25/03/2019	11:15	-4.30 43.58	10:49	-4.68 43.65	11:50	-4.69 43.67	-4.09 44.51	-4.68 / 43.65	Matches the position recorded in the DCPs notebook and is consistent with the VMS trajectories.	International waters
Kenya	7	30/01/2019	Unknown	-4.55 43.05	Unknown	Unknown	Unknown	Unknown	-4.55 44.05	-4.55 / 44.00	Consistent with VMS trajectories (all day positions are near 44º00'E).	International waters

In addition, 2 positions have been detected, located in Somali EEZ waters, which correspond to unfished searches and also do not match the nearby VMS data (**Figures 4 and 5**):

Table 4. Inconsistent positions with nearby VMS data, and compared to trajectory (anterior and posterior sets).

| ZEE inicial | Nº registro | Base de datos CN.IEO-CSIC | | | | Datos VMS | | | | Posición reasignada | Razón | ZEE final |
		Fecha	Hora	Posición registrada	Hora anterior	Posición registrada anterior	Hora posterior	Posición registrada posterior	Posición media VMS (día)			
Somalia	8	01/05/2019	08:00	-1.10 / 44.37	07:32	-1.09 / 49.43	08:32	-1.10 / 49.25	-1.05 / 48.80	-1.10 / 49.37	Matches the position recorded in the DCPs notebook and is consistent with the VMS trajectories	International waters
Somalia	9	14/02/2020	08:00	1.55 / 47.78	07:35	-1.52 / 47.89	08:36	-1.61 / 47.67	1.81 / 47.20	1.55 / 47.78	Consistent with VMS trajectories (no positions to the north this day).	International waters
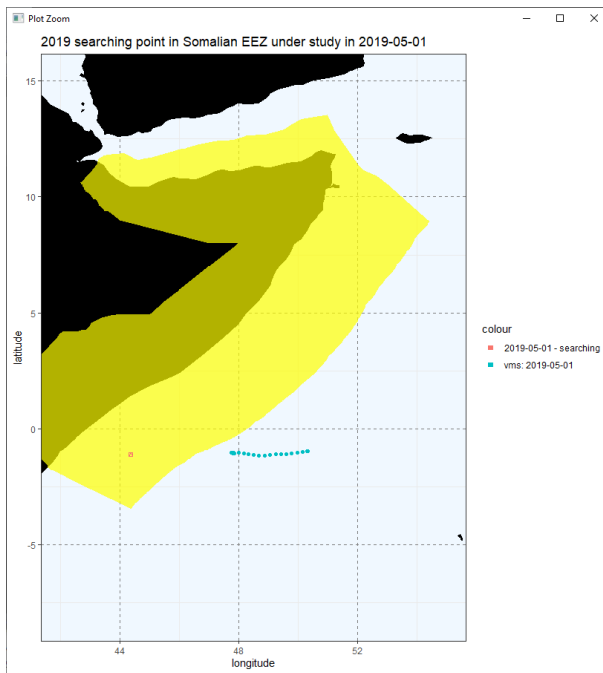
Figure 4. Search positions in Somali waters on 01-05-2019 (in pink) and positions of VMS records on that day (in blue).
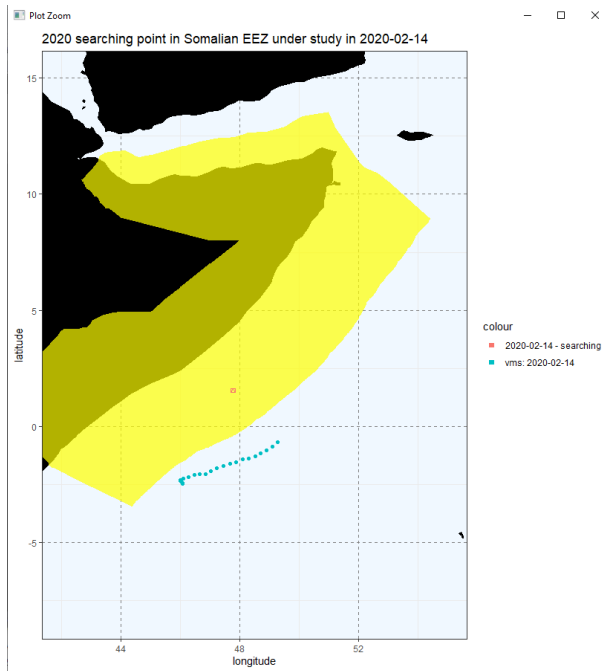
Figure 5. Search positions in Somali waters on 14-02-2020 (in pink) and positions of the VMS records on that day (in blue).

In 2021, no fishing has been detected in EEZs of coastal countries in the Indian Ocean, with the exception of those in the waters of Mauritius and Seychelles.

Table 5 summarizes the status of the data after the verification process.

4. Discussion

The assumptions made in the OceanMind document (2022[1]) tend to overestimate the number of sets on EEZs of third countries, as in the case of India or Tanzania, where no sets reported in our databases have been detected. On the other hand, the above-mentioned document does not indicate the origin of the EEZ layer used, since there could be variations depending on the waters considered. In this sense, the zoning layer of EEZ waters, and recognized as valid by the SGP-EU, has been used to verify the positions of this document.

5. Conclusions and further steps

1) Once all set positions in EEZs of coastal countries in the Indian Ocean have been verified, it is intended to forward a new dataset back to the SGP, for onward transmission to the IOTC through DG-Mare.
2) Review the entire historical series following the same methodology.
3) Present a paper showing all the changes in the next meeting of the working group of data collection and statistics

The IEO will also incorporate cross-verification of logbook and VMS data as part of its regular work, prior to the submission of new data to the IOTC.

Table 5. Fishing activity of the Spanish fleet reported within the EEZs of the 11 countries analyzed between 2019-2021, according to the OceanMind document (2022[1]) and as a result of verification by CN.IEO-CSIC. Key: Yes, reports fishing according to the document analyzed; No, does not report activity. In parentheses, the number of sets.

ZEE	2019 *OceanMind*	2019 CN.IEO-CSIC	2020 *OceanMind*	2020 CN.IEO-CSIC	2021 CN.IEO-CSIC
Chagos	No	No	No	No	No
Union of the Comoros	No	No	No	No	No
Republic of India	Yes	No	No	No	No
Republic of Kenya	No	No	No	No	No
Republic of Madagascar	No	No	No	No	No
Republic of Mauritius	Yes	Yes	Yes	Yes	Yes
EUFrance (Mayotte & La Réunion)	No	No	No	No	No
Republic of Mozambique	No	No	No	No	No
Republic of Seychelles	Yes	Yes	Yes	Yes	Yes
Federal Republic of Somalia	No	No	Yes	No	No
United Republic of Tanzania	No	No	Yes	No	No

6. Notes and References

1. OceanMind (2022). IOTC Catch-effort assessment, and AIS usage by flag-states in the Western Indian Ocean, 2016-2020. IOTC-2022-S26-INF09.

2. IEO (2020) Technical Advisory Report P42008

3. Ocean Mind (2020). Effort assessment foreign-flagged vessels in coastal state Exclusive Economic Zones. IOTC-2020-CoC17-INF02.