Review of the time-series (2016-2021) of catch-and-effort for Spanish purse seiners operating in the Indian Ocean

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Abstract

The documents presented by Blue Marine Foundation and carried out by the NGO OceanMind (2020[1], 2022[2]) suggest that, for the period between 2016 and 2020, the Spanish fleet has fished within the Exclusive Economic Zone (EEZ) of Indian Ocean coastal countries without any access agreements to their waters. Following these mentioned documents and being asked by the Spanish shipowners' associations of purse seine fleet, a revision and verification of the setting positions and other activities registered in the databases has been carried out. Focus has mostly been directed on nearly 10000 positions registered next to coastal countries in the mentioned period, typed out by the sampling staff from the fishing logbooks collected in the Indian Ocean from the year 2016 to the year 2021. This revision has been performed by comparing the registered positions in the logbooks and those registered in the local datasets and in official vessel monitoring systems (VMS) which have been mapping fishing activities for the period of study. All the positions were verified disaggregated (latitude and longitude points), as reported to the CPC by the vessels, including the revision of 2021 data.

The result of these verification process but for the period between 2016 and 2020 has already been reported as technical advisory reports in 2020 (IEO 2020[3]) and in 2022 (IEO 2022[4]). This document is a summary of both documents, including some more progress on the verification process.

Some wrong values were detected and have been corrected in keeping with the same criteria and supported by VMS positions, which have been adopted by many fisheries worldwide for compliance purposes.

The proposal of this verification was scientific, in order to find any biases in the position registration process and with the purpose of providing a new catch and effort data from 2016 to 2020 including these punctual corrections.

Several available EEZ layers were overlapped to approach a pool of data next to coastal countries to work with.

Key words: EEZ activities, Spanish purse seiners, logbooks, VMS

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

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

[3] IEO (2020) Technical Advisory Report P42008

[4] IEO (2022) Technical Advisory Report P42008

Introduction

The Spanish purse seine fleet is performing fishing activities in the IOTC Convention Area since 1984, with an average of 17 vessels per year (Báez et al. 2020).

During 1996 and 1997 a large scale research program, called ET, funded by the European Commission and coordinated by the IEO and ORSTOM (currently IRD), was conducted. At the end of this program a new sampling and statistical procedure to process the data was proposed in order to improve the accuracy of statistics in the Atlantic and Indian Oceans. This procedure was based on the collection of the logbooks and well plans during the unloading, and in the sampling at port under local agreements with the Seychelles Fishery Agency (SFA). The sampling team, coordinated by SFA and European staff, is in charge of transcribing the information contained in the logbooks to a common database following the instructions of IEO and IRD scientists.

In the period of study (2016-2021), two sampling teams and coordinators have tracked the fisheries' data produced by the fleet. One team, coordinated by SFA, worked to mid-2019 and the other, coordinated by IPD (Spanish office) worked from then on. Both teams under the revision of the IEO and the Spanish National Authority, and both with expertise sampling staff.

The original logbooks collected are transmitted to the IEO, where they are stored to support the databases. Every month, the sampling team also sends the common database (called AVDTH) to the IEO, where it is checked and stored. During this process, though there have been at least three levels of checking i) by the expertise staff typing out the information, ii) by the quality control of the database and iii) by the IEO, several mistakes of transcription can occur. The aim of this analysis is to detect those mistakes in sensible areas next to coastal countries and valuate the range of the bias.

Methods

Logbooks are collected in collaboration with fishing companies and covering 100% or nearly 100% of the fishing trips since 1984. For every trip, the sampling team located in Port Victoria (Seychelles) collects the date and geographic location of the sets reported by the crew in the logbooks, which are printed on paper and in a common format shared by the whole fleet. These logbooks also collect information about the type of set (Object or free schools), the raw species composition of the sets, the catch weight by species estimated and the activities performed (see Annex 1).

The sampling staff types out all the information from the logbooks in a common database (AVDTH) which is stored, checked and analyzed by the Spanish Institute of Oceanography (IEO).

Per year, the number of activities typed with geographical position is around 8000, including a media of 4000 sets (positive and null). The rest of the positions correspond mainly to navigation, searching and routes to/from ports. These ports visited mainly for unloading, repair services or crew relieves. In the period of study, the regular ports have been Port Victoria (Seychelles) and Diego Suárez (Madagascar)

From 2016 to 2021, the number of sets performed by the Spanish purse seiner vessels in the area of competence of the Indian Ocean Tuna Commission has been from 4000 to 5000 approximately. In order to have a significant pool of data geographically referenced to be verified, nearly 10000 positions (including sets, navigation, searching, positions at port...) were selected close to coastal countries to be verified. Table 1 shows, per year, the number of activities cross-checked with the original logbooks and the VMS positions, and the number of mistakes found and corrected.

Table1. Number of positions selected for checking vs. the number of total positions, showing the percentage selected from the total and the % of bias found in transcription for the total activities and the sets.

Year under study	No. of total positions in the Indian Ocean	% of sets positions in the database	No. of positions selected for checking	% of positions selected for checking	No. of positions with transcription mistakes	% of bias in the transcription of positions	No. of predicted wrong positions for the total database	No. of predicted wrong sets positions for the total database	% of bias in the transcription of sets positions
2016	6421	76%	2519	39%	6	0.24	15	11	0.17
2017	5588	76%	1854	33%	17	0.92	51	39	
2018	5696	80%	1488	26%	10	0.67	38	30	
2019	6301	80%	1493	24%	13	0.87	55	44	
2020	5969	77%	1506	25%	5	0.33	20	15	
2021	5401	79%	909	17%	-	0.00	-	-	
TOTAL	**35376**		**9769**		**51**	**0.52**			

Taking into account that the % of sets positions typed per year is between 76% and 80% of data, we can assume a 0,5-0,6% of bias in the transcription of these positions for the whole databases from 2016 to 2020 arising both from human errors made by captains and sampling teams. No mistakes were found in the positions selected for 2021, so this year is not taken into consideration (2021 data positions were checked with this method previously to their reporting to the IOTC).

Some examples of wrong typed positions found in the cross-checking with the VMS data are shown in figures 1 to 3. All the positions have been also contrasted with the original logbooks available. The positions were corrected for the same vessel, day and UTC time.

Figures 5 to 9 show the position of the total activities performed by the Spanish purse seiner fleet from 2016 to 2020 in the IOTC area of competence, year by year, focusing on the errors found and the results after their checking, for both raw data and data aggregated in 1°x1° squares.

Results and discussion

Assuming a 0.5-0.6% of bias in the transcription of the sets positions, we consider that the current process is strong though some more checking of database positions are needed, particularly for those next to coastal countries, in order to prevent misunderstandings.

We acknowledge the oversight in reporting the data to the IOTC and therefore deeply regret the consequences that this may have had to the industry.

We also thank the hard work done by the captains and the sampling staff, typing and reviewing every position.
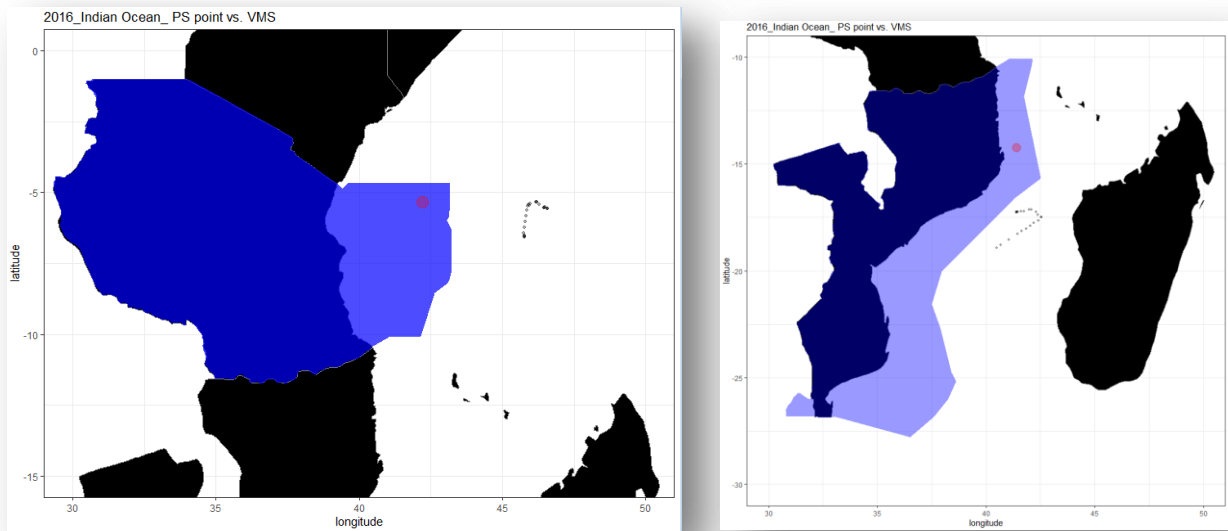
Figures

Figure 1. Graphical representation of two of the points checked in 2016 (in red) next to Tanzania versus VMS positions (points in black) for the same vessel and day.
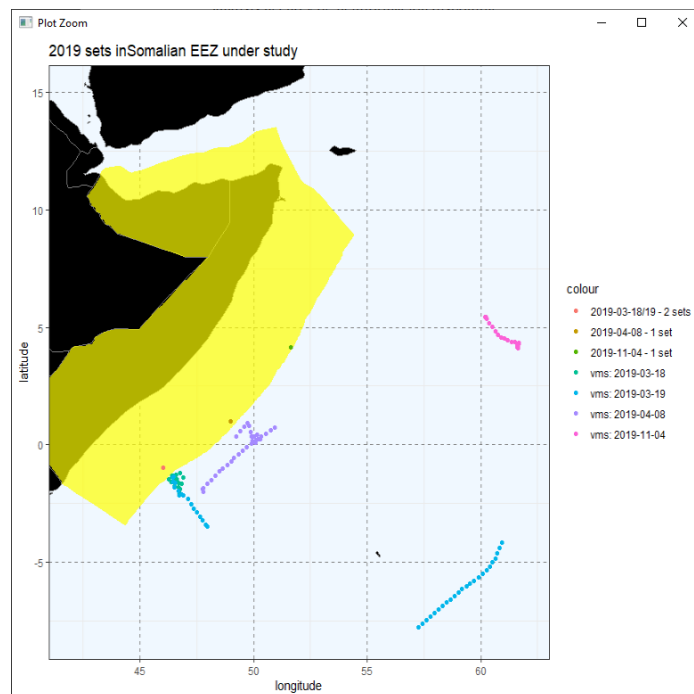

Figure 2. 2019. Positions of the 4 sets checked in the Somali EEZ and status of the data according to the VMS records for the days checked.
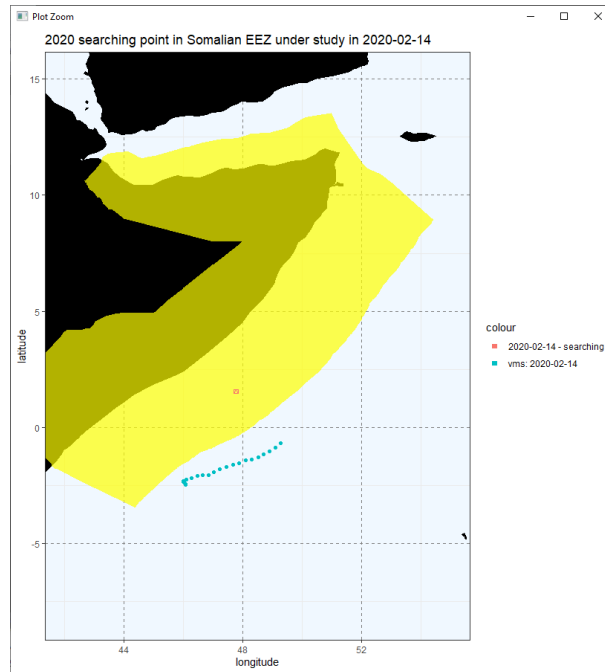
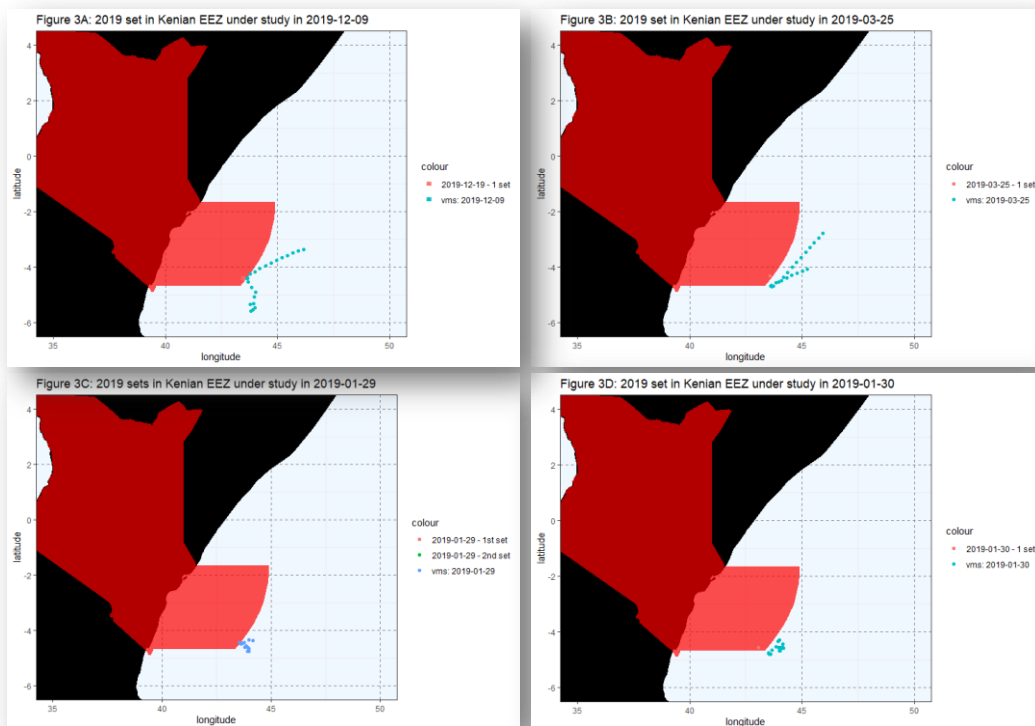**Figure 3.** Search position in Somali waters on 14-02-2020 (in pink) and positions of the VMS records on that day (in blue) for the same vessel.

Figure 4. 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).
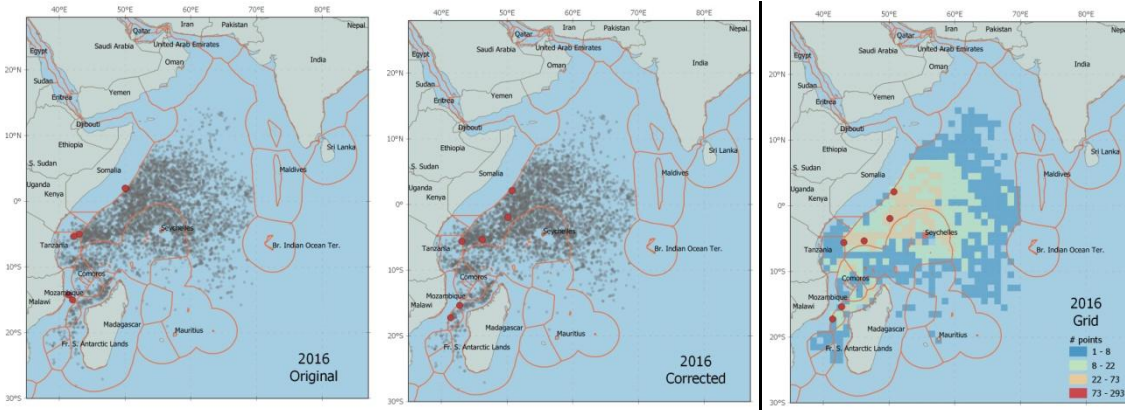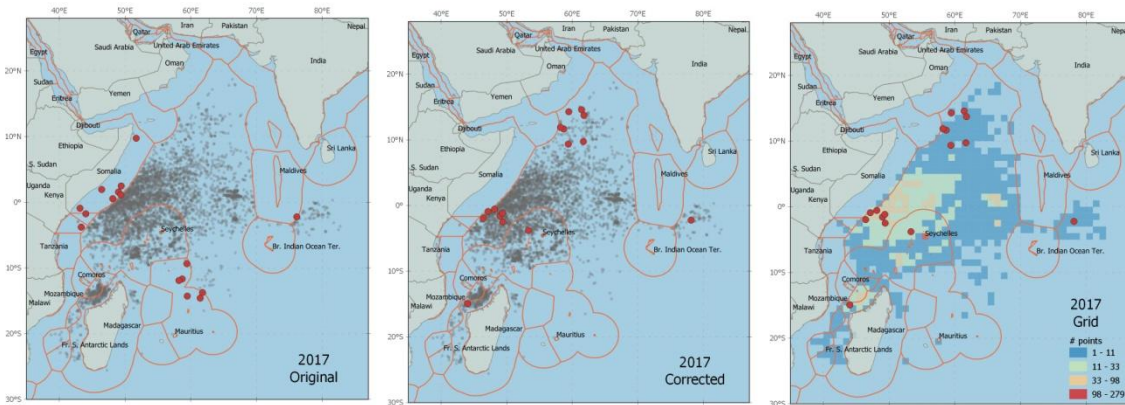
Figure 5. Activities positions (set, navigation, searching, at port…) registered in 2016 (in grey), including the 6 mistakes detected (in red) before (left) and after (center and right) the verification process.
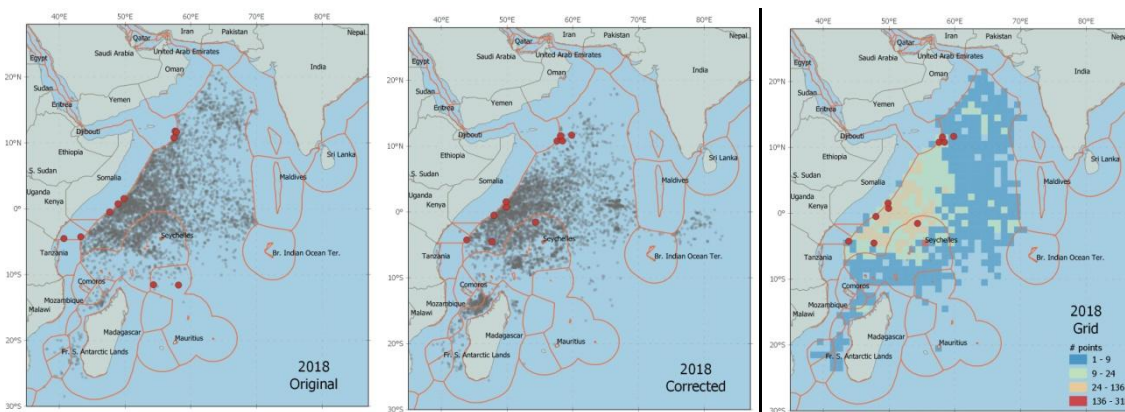

Figure 6. Activities positions (set, navigation, searching, at port…) registered in 2017 (in grey), including the 17 mistakes detected (in red) before (left) and after (center and right) the verification process.
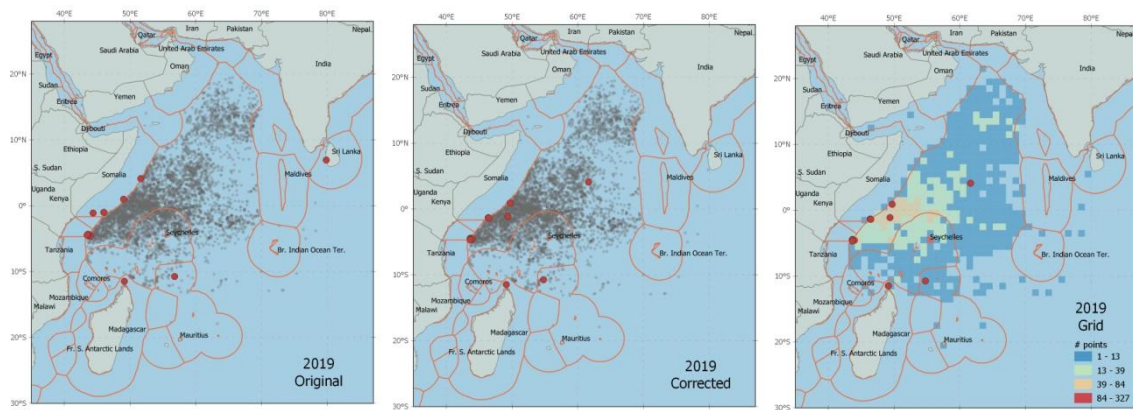

Figure 7. Activities positions (set, navigation, searching, at port…) registered in 2018 (in grey), including the 10 mistakes detected (in red) before (left) and after (center and right) the verification process.

Figure 8. Activities positions (set, navigation, searching, at port…) registered in 2019 (in grey), including the 13 mistakes detected (in red) before (left) and after (center and right) the verification process.
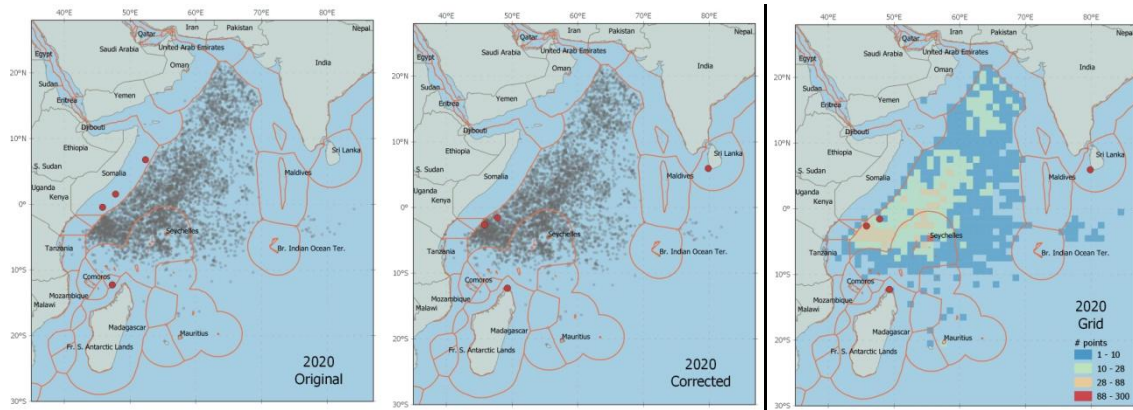

Figure 9. Activities positions (set, navigation, searching, at port…) registered in 2020 (in grey), including the 5 mistakes detected (in red) before (left) and after (center and right) the verification process. Two of them were positions at port.
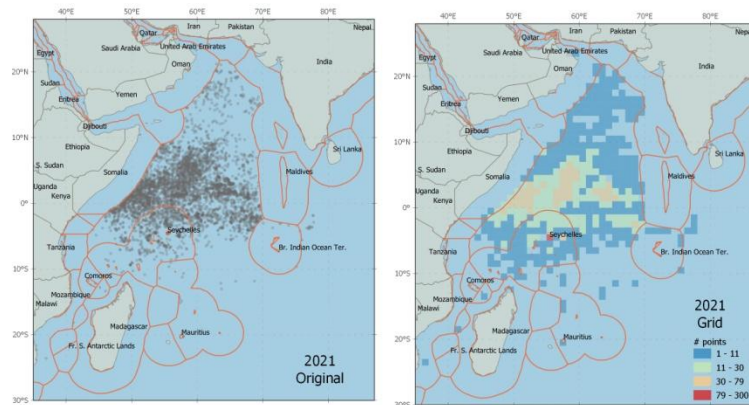

Figure 10. Activities positions (set, navigation, searching, at port…) registered in 2021 (in grey) for the raw data (left) and aggregated in 1°x1° grids (right).

References

Báez, J. C., M. L. Ramos, M. Herrera, H. Murua, J. L. Cort, S. Déniz, V. Rojo, J. Ruiz, P. J. Pascual-Alayón, A. Muniategi, A. P. San Juan, J. Ariz, F. Fernández, and F. Abascal. 2020. Monitoring of Spanish flagged purse seine fishery targeting tropical tuna in the Indian ocean: Timeline and history. Marine Policy 119:104094.

Marsac, F., A. Fonteneau, and A. Michaud, editors. 2017. L'or bleu des Seychelles : Histoire de la pêche industrielle au thon dans l'océan Indien. Page L'or bleu des Seychelles : Histoire de la pêche industrielle au thon dans l'océan Indien. IRD Éditions, Marseille.