



SUMMARY OVERVIEW OF BUOY DATA SUBMITTED TO THE IOTC SECRETARIAT FOR THE PERIOD JAN-JULY 2020¹

Abstract

The document compiles all GPS buoy data sets submitted to the IOTC Secretariat for the period January-July 2020. Data were submitted using [Form 3BU](#) on a monthly basis by the EU (France, Italy, and Spain), Japan, Mauritius and Seychelles following the requirements expressed by Para. 24 of Resolution 19/02. Information available on the vessels active in 2019 and authorized to operate within the IOTC area of competence in 2020 suggests that GPS buoy data may be missing for the purse seine fleets of Korea (2 purse seiners) and Kenya (6 purse seiners). Daily positions of operational buoys equipping the drifting floating objects monitored by the purse seine fleets provide a holistic view of the magnitude and extent of the use of buoys and FADs in the Indian Ocean. Between January and July 2020, the total daily number of operational buoys varied between 10,207 and 11,583, with each purse seiner monitoring an average of 250 buoys per day. Information available on the sharing of buoys between vessels shows that some of the buoys equipping floating objects occurring East of 75°E are shared among vessels from the same company. The spatial distribution of the satellite-tracked buoys shows the highest density in the purse seine fishing grounds of the Western Indian Ocean, between 10°S and 10°N and 40-70°E. Although the buoys numbers and spatial density pattern were relatively stable over January-July 2020, the buoy data give insight into the complex dynamics of FAD deployments and drift in the Indian Ocean.

Purpose

To provide participants at the 16th Working Party on Data Collection and Statistics (WPDCS16) with:

- A summary of the buoy position data sets submitted to the Secretariat since the 1st of January 2020;
- An overview of the magnitude and spatio-temporal extent of the use of satellite-tracked buoys attached to drifting man-made FADs and natural objects in the Indian Ocean purse seine fishery;
- A basis to stimulate discussions on the potential use of this novel buoy data set to quantify the contribution of buoys to the purse seine fishing effort at regional level.

Background

The IOTC Resolution [19/02](#) on “Procedures on a Fish Aggregating Devices (FADs) management plan” sets the maximum number of operational buoys followed by any purse seine vessel at 300 at any one time. Since the 1st January 2020, the Contracting Parties and Cooperating Non-Contracting Parties (CPCs) of the IOTC with fishing vessels using FADs have the obligation to report daily information on all active FADs monitored at sea with satellite-tracked buoys. The information to report to the Secretariat shall follow the structure and formats of the Form [3BU](#) and contain the date, instrumented buoy ID, assigned vessel and daily position of each monitored buoy, which shall be compiled at monthly intervals, and reported to the IOTC Secretariat with a time delay of at least 60, but no longer than 90 days.

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Materials & Methods

Fishing vessels

The IOTC Active Vessels List ([AVL](#)) for the year 2019 and the IOTC Record of Authorized Vessels ([RAV](#)) as available in November 2020 were used to determine the CPCs, flags and numbers of vessels expected to report buoy data from January 2020, assuming that purse seiners from Philippines, Indonesia and I.R. Iran do not use such beacons. This analysis is based on the information available in the RAV as the AVL for 2020 will only become available in the first quarter of 2021 following the provision of each CPC active vessels lists that have to be submitted to the IOTC Secretariat by the 15th February 2021.

In 2019, the Indian Ocean purse seine fishery was composed (for the fleets identified above) of a total of 46 large-scale purse seiners targeting tropical tunas on FADs, and using GPS buoys (**Table 1**). The RAV suggests that these purse seine fleets have been in operation during 2020, and that an additional fleet of six Kenyan purse seiners (45 m length overall) has started fishing in the western Indian Ocean in 2020 (**Table 1**). Although the vessels authorized to operate in 2020 exceed the number of vessels having operated in 2019 for Japan and the Republic of Korea, ancillary information received at the Secretariat indicates that each of these CPCs operated two purse seiners during the first semester of 2020.

Table 1. Number of purse seiners available in the IOTC Active Vessels List in 2019 (AVL2019) and Registry of Authorized Vessels in 2020 (RAV2020) targeting tropical tunas and susceptible of using FADs

CPC code	Flag code	Flag	AVL2019	RAV2020
EU	ESP	Spain	15	15
EU	FRA	France	12 ^a	11
EU	ITA	Italy	1	1
JPN	JPN	Japan	1	10
KEN	KEN	Kenya	0	6
KOR	KOR	Korea_Republic of	2	7
MUS	MUS	Mauritius	3	3
SYC	SYC	Seychelles	13	13

^a One purse seiner changed flag from EU,FRA to MUS in early 2019

Buoy data pre-processing

IOTC Resolution 19/02 defines an operational buoy as “any instrumented buoy, previously activated, switched on and deployed at sea on a drifting FAD or log, which transmits position and any other available information such as echosounder estimates” (**Fig. 1**). Data sets of the positions of instrumented operational buoys were received by the IOTC Secretariat on a regular basis and were compliant with the requirements and structure of Form 3BU. First, 223 duplicates were removed from the original data set which included a total of 3,404,507 transmissions. Second, vessels and flags were formatted to comply with IOTC code lists. Third, following the methodology defined to deal with the reporting of buoys shared between purse seiners in some fleets (Maufroy and Goujon 2019), an individual weight of $1/(\text{number of sharing purse seiners})$ was assigned to each daily buoy position: therefore, the daily number of buoys monitored by each CPC was computed by summing the weighted number of buoys from all CPC-flagged purse seiners.



Fig. 1. Example of drifting human-made Fish Aggregating Device and its associated instrumented buoy (©ORTHONGEL-IRD/Yannick Baidai)

Results

Data submitted

The Forms 3BU submitted to the IOTC Secretariat cover most large-scale purse seiners that operated during the first semester of 2020. A total of 303 Forms 3BU, including information for buoys monitored by 45 purse seiners between January and July 2020, were submitted to the Secretariat by the EU (27 purse seiners), Japan (2 purse seiners), Mauritius (3 purse seiners), and Seychelles (13 purse seiners) (**Table 2**). As of November 2020, no buoy data have been received from the Republic of Korea and Kenya for their purse seine fleets: it remains to be confirmed whether the purse seine fleets of these two CPCs have been using their own instrumented buoys when fishing on schools associated with drifting floating objects.

Table 2. Total number of transmissions and buoys reported by the CPCs to the Secretariat during January-July 2020

CPC_CODE	MONTH	PS	TRANSMISSIONS	BUOYS
EU	Jan	26	351,685	9,268
EU	Feb	27	343,991	9,287
EU	Mar	27	356,311	9,099
EU	Apr	27	346,923	9,234
EU	May	27	342,163	8,806
EU	Jun	27	320,475	8,125
EU	Jul	27	310,207	8,011
JPN	Jan	2	2,981	109
JPN	Feb	2	1,233	60
JPN	Mar	2	139	15
MUS	Jan	3	27,991	893
MUS	Feb	3	26,475	848
MUS	Mar	3	33,404	958
MUS	Apr	3	35,190	958
MUS	May	3	37,155	991
MUS	Jun	3	39,929	905
MUS	Jul	3	44,036	1,039
SYC	Jan	13	110,364	4,494
SYC	Feb	13	107,381	4,606

CPC_CODE	MONTH	PS	TRANSMISSIONS	BUOYS
SYC	Mar	13	114,815	4,747
SYC	Apr	13	109,738	4,642
SYC	May	13	115,944	4,547
SYC	Jun	13	110,903	4,201
SYC	Jul	13	114,797	4,455

Data summary

The collation of the buoy data sets provides a holistic view of the extent of the current use of instrumented buoys in the Indian Ocean purse seine fishery. About 27,000 instrumented buoys transmitted information on the position of floating objects over January-July 2020, varying between a minimum daily number of 10,207 buoys and a maximum daily number of 11,583 buoys. Over the period considered, each purse seiner monitored on average 250 buoys each day. When available, details on buoy information sharing - which were derived from the association of one buoy to more than one purse seiner in the same day - showed the importance of cooperative fishing. In particular, the position of most buoys equipping a floating object drifting east of 75°E were shared within the vessels belonging to the same company to incentivize fishermen to go to these remote fishing grounds.

Table 3. Summary of information submitted for the Indian Ocean purse seine fishery during Jan-Jul 2020

Descriptor	Value
Time period	2020-01-01 2020-07-31
Number of purse seiners	45
Number of buoy brands	4
Number of buoy models	11
Number of buoy transmissions	3,404,227
Number of active buoys	26,924
Mean number of daily monitored buoys for the fleet (80% CI)	10,957 (10,362-11,407)
Mean number of daily monitored buoys per vessel (80% CI)	250 (208-288)
Minimum daily number of buoy transmissions for the fleet	10,207
Maximum daily number of buoy transmissions for the fleet	11,583
Minimum daily number of buoy transmissions per vessel	2
Maximum daily number of buoy transmissions per vessel	855

Buoy numbers

The time series of daily numbers of buoys shows the predominance of EU instrumented buoys in the western Indian Ocean which represented on average 63% of the operational buoys of the purse seine fishery over the period January-July 2020 (**Fig. 2**). The total number of operational buoys by the EU decreased from a maximum of about 7,200 in February to less than 6,400 in July. The buoys used by Japanese purse seiners were only active over January-March and represent a very small component of the total buoys in operation in the Indian Ocean.

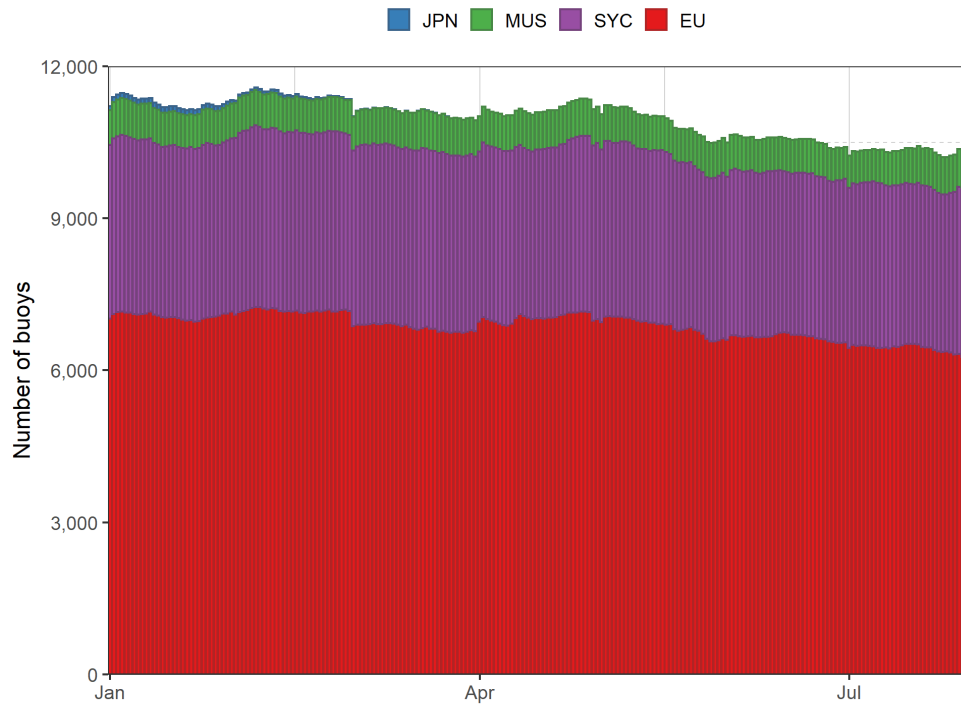


Fig. 2. Cumulative daily number of operational buoys in use in the Indian Ocean purse seine fishery during Jan-Jul 2020 for the CPCs having reported data to the Secretariat

The daily mean numbers of buoys used by vessel vary according to each CPC. The EU and Seychelles show similar levels of operational buoys in use over the period considered, i.e. 254 and 260 for the EU and Seychelles, respectively (**Fig. 3**). Each Mauritian purse seiner monitored on average 232 buoys per day while the Japanese purse seiners only used a maximum of 59 operational buoys per vessel per day.

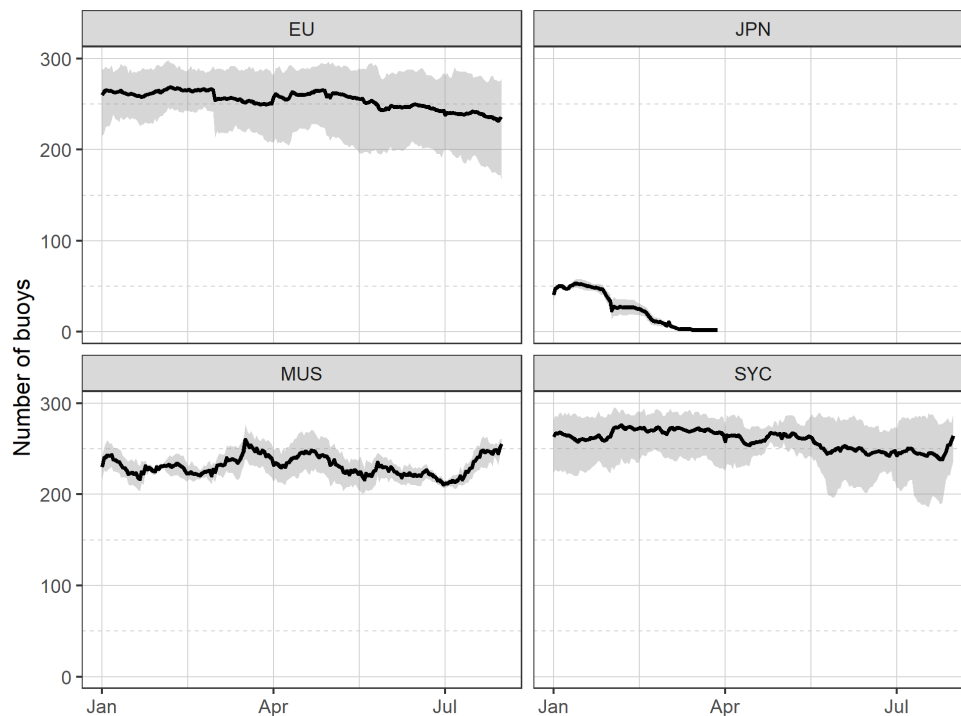
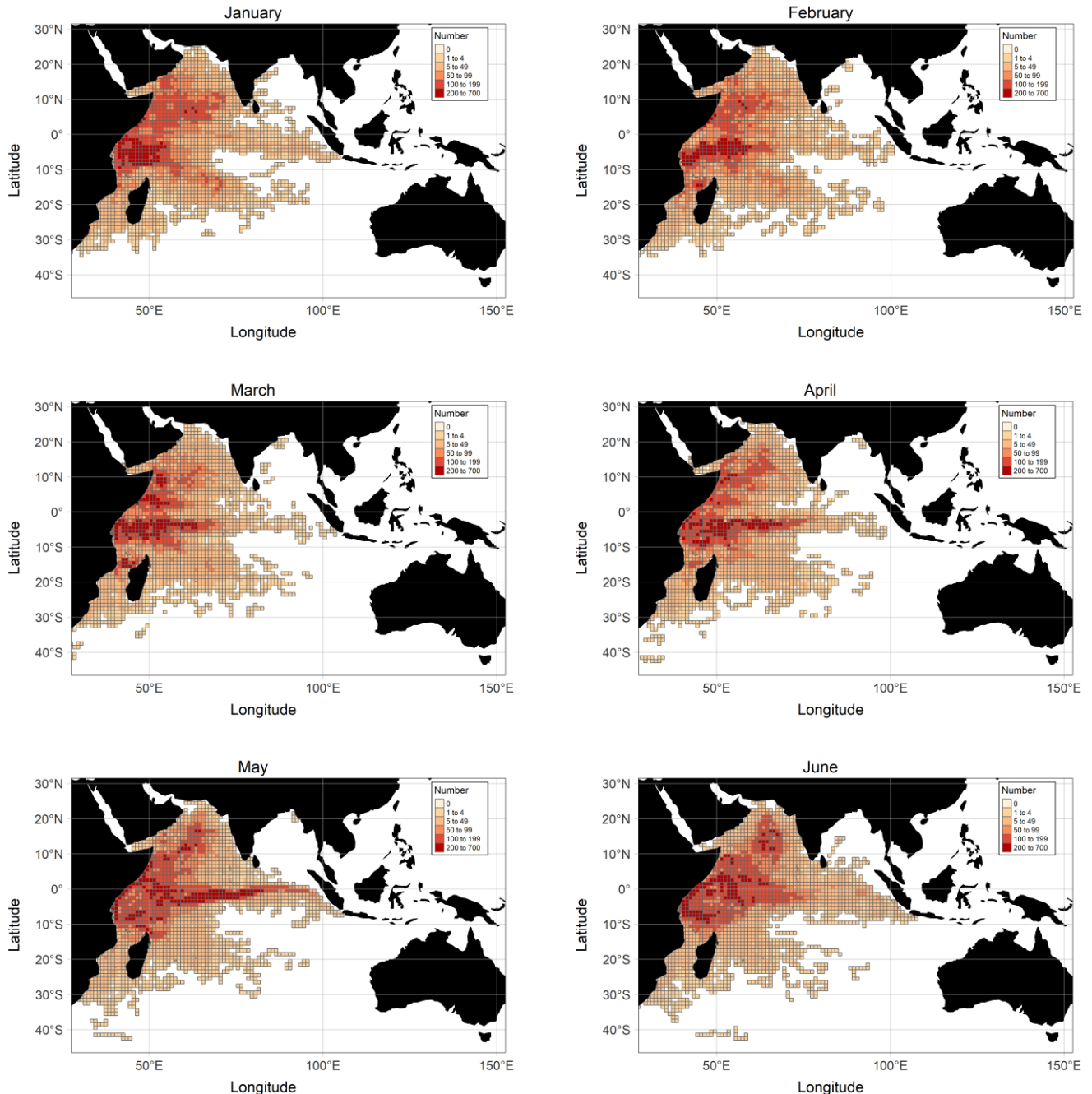


Fig. 3. Daily mean number (solid black line) of operational buoys in the Indian Ocean monitored by each purse seiner during Jan-Jul 2020 for the CPCs having reported data to the Secretariat. The grey area indicates the 80% confidence interval computed from the purse seiners of each CPC

Buoy location

The spatial distribution of the satellite-tracked buoys shows the highest density in the purse seine fishing grounds of the Western Indian Ocean, between 10°S and 10°N and 40-70°E (**Fig. 4**). Although the buoy spatial density patterns were relatively stable over January-July 2020, the buoy data show some specific features that provide insight into the spatial dynamics of purse seine effort. For instance, the density increases in the Mozambique Channel between February and April when the purse seiners operate in the area (**Fig. 4**). Also, the density increases in the Northwestern Indian Ocean during the months of April-June following major deployments off the coasts of Somalia. The floating objects follow the major seasonal currents and drift along the equator from March to May to reach the coasts of Indonesia.



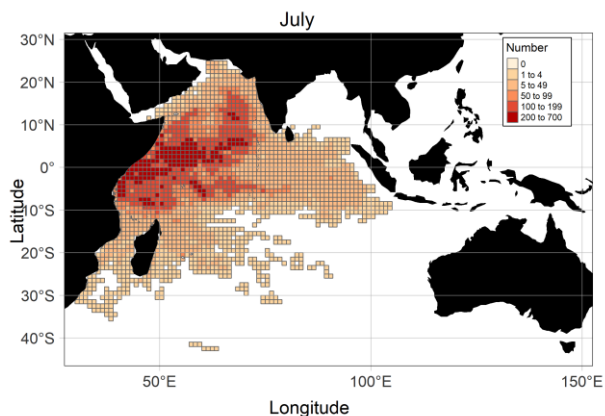


Fig. 4. Monthly density map of the number of distinct operational buoys by 1°x1° grid in the Indian Ocean purse seine fishery between January and July 2020

Conclusions

Buoy data sets provided by four CPCs following the Form 3BU provide key information on the spatio-temporal dynamics of purse seine fishing effort in the Indian Ocean. This data set managed at the Secretariat provides a new and rich source of information at regional scale and the first of its kind available for a tuna RFMO. Catch and effort data for the year 2020, which will become available in the summer 2021, should provide a better understanding of the relationships between FAD distribution and purse seine fishing success.

References

Maufroy A, Goujon M (2019) Methodology for the monitoring of FOB and buoy use by French and Italian tropical tuna purse seiners in the Indian Ocean. In: IOTC Proceedings. San Sebastian, Spain, 21-26 October 2019, 23p