

# SOUTHERN BLUEFIN TUNA IUU RISK ASSESSMENT

A PILOT STUDY CONDUCTED FOR CCSBT



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AIS	Automatic Identification System
AOI	Area of Interest
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organisation of the United Nations
GFW	Global Fishing Watch
ICCAT	International Commission for the Conservation of Atlantic Tunas
IMO	International Maritime Organisation
IOTC	Indian Ocean Tuna Commission
IRCS	International Radio Call Sign
IUU	Illegal, Unreported and Unregulated Fishing
MCS	Monitoring, Control and Surveillance
MID	Maritime Identification Digit
MMSI	Maritime Mobile Service Identity
NOAA	National Oceanic and Atmospheric Administration
NTD	New Taiwan Dollars
RFMO	Regional Fisheries Management Organisation
SBT	Southern Bluefin Tuna
SPRFMO	South Pacific Regional Fisheries Management Organisation
TMT	Trygg Mat Tracking
tRFMO	Tuna RFMO
WCPFC	Western and Central Pacific Fisheries Commission
WIO	Western Indian Ocean

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## Executive Summary

Illegal, unreported and unregulated (IUU) fishing of southern bluefin tuna (SBT) poses a threat to sustainable management of the stock. Anecdotal reports of SBT found on board unauthorised vessels, and reports of unauthorised vessel sightings in SBT areas, indicate that IUU fishing is occurring – however there is limited information regarding the identity, distribution and operations of vessels involved.

An analysis was conducted using AIS data, overlaid with vessel identity and ownership information, CCSBT and other RFMO catch data in order to try and identify vessel operations that could be considered high risk for SBT IUU.

An area of interest was defined by the CCSBT Secretariat, stretching from the mid-Atlantic to the southwest Pacific, based on CCSBT catch data and known presence of SBT. Analysis of AIS signals from this area identified 167 fishing vessels that operated in the area of interest, outside their EEZ, during 2017. The majority of these were tuna longliners so could be considered potentially high risk for SBT IUU.

However, all but one of the tuna longliners that were identified over AIS were authorised to the RFMO in whose area they were operating (IOTC, ICCAT or WCPFC). This, combined with the significant overlap in catch areas for SBT and other tuna species, presented a significant challenge for the identification of SBT IUU using AIS data.

### Vessel nationality and operations

The 167 CCSBT-unauthorised vessels were registered with 16 different flag States. Over half were flagged to Taiwan, and the next most significant flag States by vessel numbers were China and Seychelles. The majority of vessel operations took place in the Western Indian Ocean, with lower levels of vessel activity detected in the Atlantic, Eastern Indian Ocean and Southwest Pacific. Vessel presence and operations in the area of interest showed a marked seasonality, with the majority of vessel operations occurring in FAO Area 51 between mid-April and the end of August. This is coincident with the southward movement of vessels targeting IOTC species, which illustrates the challenge of detecting SBT IUU in this area.

Over 80% of vessels conducted between one and three fishing trips in the area of interest during 2017. A trip was defined as a discrete, continuous period of time spent in the area of interest during which some low speed hours (taken as a proxy for fishing operations) were included. Some fishing trips in the area of interest formed part of a larger fishing trip including time spent in external areas, and some trips occurred entirely in the area of interest, with port calls before and after. The most visited port was Port Louis, Mauritius. Other ports with significant numbers of visits included Suva, Fiji; Singapore; Cape Town, South Africa; and Kaohsiung, Taiwan. Vessels showed clear variation in their operating patterns. The majority operated in the Western Indian Ocean, using Port Louis for port calls. Other significant operating patterns included vessels that began their trip in Suva and fished east to west across the Indian Ocean; vessels operating in the Pacific, using Suva for port calls; vessels operating in the Atlantic, using Montevideo for port calls; and vessels operating in the Atlantic or Indian Oceans using Cape Town for port calls.

40 of the vessels were detected in at-sea encounters with refrigerated cargo vessels, all of which were authorised to the tuna RFMO in whose area they were operating. The majority of these encounters took place in the IOTC area. 64 of the vessels were detected in a potential 'tandem operation' with one or more CCSBT authorised vessel. Tandem operations included cases of two or more vessels

clearly operating together through the year, as well as vessels that operated in the same area for short periods of time, which had opportunity for an encounter at sea over ten or more days.

### Areas of interest

AIS data was overlaid with CCSBT and IOTC catch data to identify areas (5° x 5° cells) that could be the focus for further investigation. Four areas of operation were identified as potentially of interest:

- Taiwanese longliners operating in cell 29 (Atlantic) in March and April, out of the ports of Montevideo and Cape Town. This operation was considered potentially of interest due to the high reported catch of SBT in cells adjacent to the south.
- Japanese longliners which operated briefly in cell 60, to the east of the Australian EEZ – in an area with high catch reported to CCSBT
- Several vessels (primarily Chinese flagged, also one Taiwanese and one Japanese) which operated in cells 50 and 17 in the Eastern and Central Indian Ocean, operating out of several different ports in the Pacific and Indian Ocean.
- Vessels operating in cells 35 and 36 – located to the southeast of the South African EEZ, in the Western Indian Ocean – during the southern hemisphere summer, when the majority of the tuna fleet is operating in areas further north. Several authorised vessels were identified operating in this area, as well as two vessels that were CCSBT-unauthorised during November and December (one flagged to Seychelles and one stateless or flag unknown).

### Conclusion

The trends in vessel nationality and port usage that were detected largely mirror trends in the wider tuna longline fishery, which means that care should be taken in extrapolating SBT IUU risk from the findings of this analysis. The study did identify limitations of relying on positional data to assess IUU risk in a fishery that has significant overlap with other fisheries targeted by the same vessels. However, the findings do provide useful insights into the geographic areas, ports and fleets that could be the focus of further investigation, using vessel level catch data, vessel inspection and other information sources to better understand the likely distribution of SBT IUU risk.

## Introduction

Illegal, unreported and unregulated (IUU) fishing of southern bluefin tuna (SBT) poses a threat to sustainable management of the stock. Anecdotal reports of SBT found on board unauthorised vessels, and reports of unauthorised vessel sightings in SBT areas, indicate that IUU fishing is occurring – however there is limited information regarding the identity, distribution and operations of vessels involved.

Automatic Identification Systems (AIS) data can help to shed a light on the identities and operations of fishing vessels operating in the Area of interest, and has the potential to help identify, and better understand, operations that present a risk of SBT IUU. The use of AIS data for fisheries monitoring and analysis does have limitations – not least because not all active fishing vessels transmit over AIS, and those that do may not transmit continuously. Nevertheless, a significant proportion of fishing vessels do transmit over AIS, making it a valuable source of information to help understand vessel and fleet operations and characteristics.

In this study, TMT analysed AIS data<sup>1</sup> overlaid with vessel identity and ownership data contained in TMT’s fisheries analytical system FACT, to identify fishing vessels not authorised to the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) that operated in the identified Area of Interest (AOI). Vessel operations were analysed to identify where and when in the AOI these vessels fished and their patterns of port usage. Vessel identity information was analysed to identify trends in vessel nationality and ownership, and non-compliance history. Finally, vessel tracks were analysed to identify any potential risk behaviour, including unauthorised transshipment at sea, potential cooperation between CCSBT-authorised and CCSBT-unauthorised vessels, and vessels with few or no visible port visits or authorised transshipments.

The AOI overlaps significantly with the catch distribution for other tuna species, which makes it challenging to distinguish between vessels that are legally targeting other tuna species and those that are illegally targeting SBT – in the majority of cases, these are likely to be the same vessels. In an attempt to identify any fishing activities that could be considered higher risk for targeting SBT, Indian Ocean Tuna Commission (IOTC) catch and effort data was overlaid with CCSBT catch data and vessel distribution (AIS data).

The analysis was conducted using one full year of AIS data (2017), covering an area of interest defined by the CCSBT Secretariat, based on aggregated catch data.

### **FACT: Fisheries Analytical Capacity Tool**

This analysis was conducted by overlaying analysis of AIS data with vessel identity, nationality and ownership data contained in TMT’s bespoke fisheries analytical system FACT. FACT contains a live database, which compiles information on the identities, operations, ownership and compliance history of commercial fishing vessels and the companies that own and operate them. It combines information from a range of public, private and subscription sources, including all publicly available Regional Fisheries Management Organisation (RFMO) authorised vessel lists, as well as information generated through TMT’s own work, and integrates analytical processes and algorithms to assist in the analysis of this data. For a demonstration of FACT please contact TMT.

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<sup>1</sup> AIS data supplied by exactEarth

## Approach

An area of interest was defined by the CCSBT Secretariat, based on CCSBT catch and effort data. Static AIS data for all vessels that transmitted in the area of interest during 2017 was analysed in order to identify transmissions likely to be associated with fishing vessels. Vessel identity details transmitted over AIS were then cross-referenced with RFMO authorisations to identify transmissions associated with CCSBT-authorized vessels, and transmissions associated with vessels that fished in the area of interest but were not CCSBT authorised. These vessels were considered to be a potential risk for SBT IUU – their characteristics and operations were then analysed in order to identify trends that can improve understanding of IUU risk for SBT.

Throughout this report, the term ‘CCSBT-unauthorised’ is used to refer to vessels that operated in the area of interest during 2017 but were not authorised to CCSBT, for the entirety or part of their operations in the area. With one exception, all of these vessels were tuna longliners that were authorised to the RFMO for the area in which they were operating (ICCAT, IOTC, WCPFC), or they were other vessel types considered to be low risk for targeting SBT, based on probable gear type or target species derived from positional or authorisation information. Therefore, the use of the term CCSBT-unauthorised should not be taken to indicate that the vessels were operating without RFMO authorisation.

## The area of interest

The AOI was defined by the CCSBT Secretariat based on CCSBT catch and effort data for 2015 – 2017. The defined area consisted of all 5° x 5° cells south of 30°S where the catch rate was 3 or more SBT per 1000 hooks OR where reported catch rate was lower than 3/1000 but SBT are known to be present in significant numbers OR cells with low reported catch rate that occur within the general distribution of SBT as defined above.

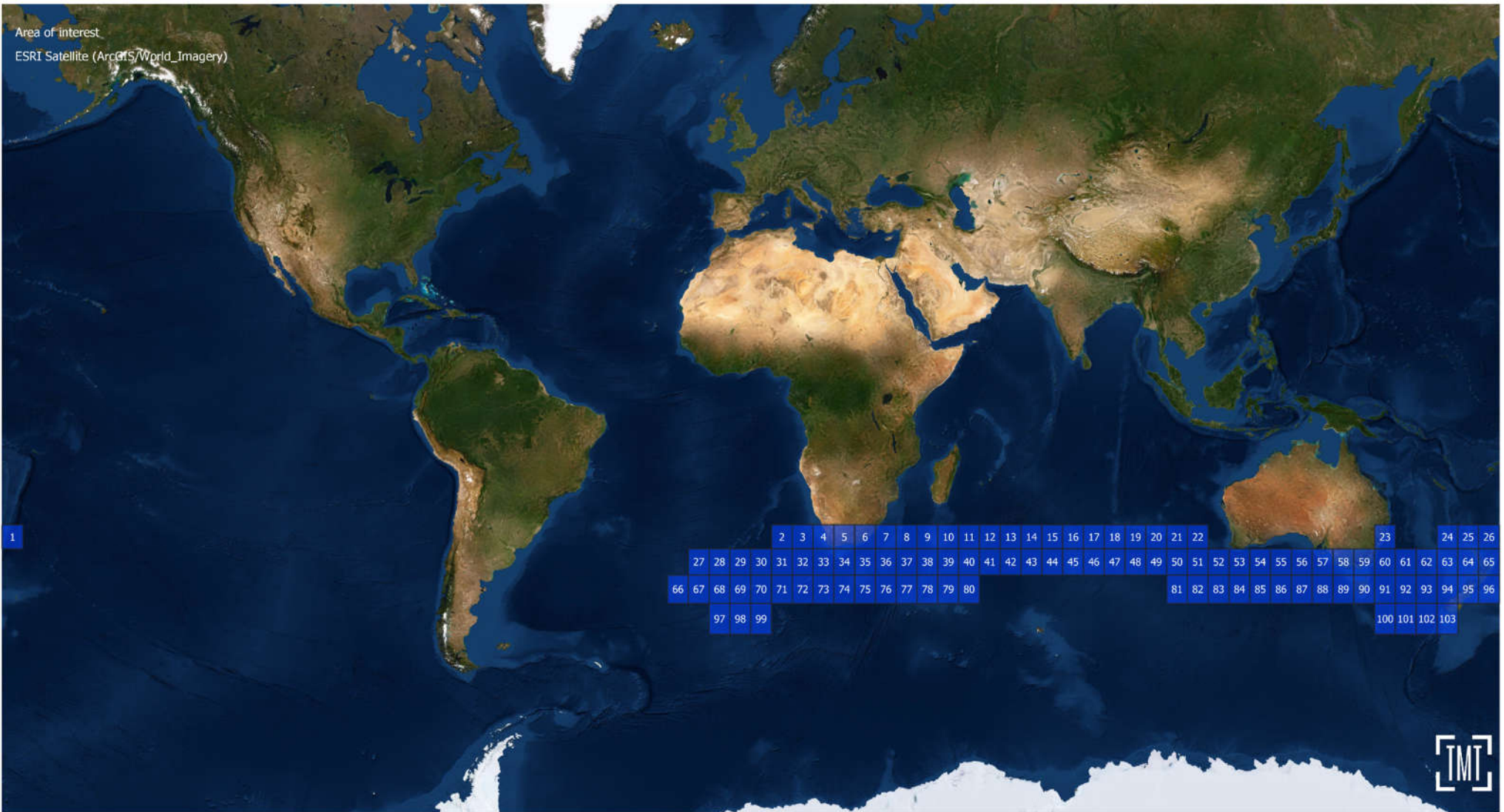


Figure 1: The area of interest, as defined by the CCSBT Secretariat



## Vessel identification

CCSBT Authorised and CCSBT-unauthorised fishing vessels operating in the area of interest were identified based on a three-stage process – initial identification of relevant (and non-relevant) vessels was done based on analysis of static (identity and vessel type) data transmitted over AIS by all vessels present in the area of interest during 2017. In the second stage of identification, AIS tracks of potentially relevant vessels were analysed in order to distinguish vessels which had fished in the area of interest (fishing vessels and reefers which appeared to have only transited the area en route to fishing grounds elsewhere were not considered relevant to the study). Finally, the static identity details transmitted by all potentially relevant vessels were cross-referenced with vessel identity, ownership and RFMO authorisation data using FACT, in order to identify vessels that were CCSBT authorised and those that were not.

### Stage 1

20,375 MMSIs<sup>2</sup> transmitted from the area of interest during 2017. In the first phase of vessel identification, 1389 MMSIs of interest were identified from this list using the following approach:

- All transmitted International Maritime Organisation (IMO) numbers were cross-referenced with the IHS Maritime SeaWeb vessel database to check recorded vessel type – Maritime Mobile Service Identities (MMSIs) were identified as potentially relevant or not relevant based on their vessel type
- All transmitted International Radio Call Signs (IRCS) and MMSI numbers were cross-referenced with FACT to identify IRCS and MMSI numbers associated with fishing vessels or refrigerated cargo vessels
- MMSI numbers were cross-referenced with a list of MMSIs associated with fishing-vessels in the years 2012-2016, published by Global Fishing Watch (GFW) in 2017.
- MMSIs that transmitted only shiptype 30 (fishing vessel) throughout 2017 were assumed to be fishing vessels
- MMSIs that were identified as relevant solely on the basis of the GFW list (which was assumed to be potentially outdated) or transmitted shiptype were subject to visual analysis of tracks to confirm their relevance.

A significant number of MMSIs were transmitting data that was insufficient or unsuitable for inclusion in the analysis. These were excluded at this stage, based on the following approach:

- Vessels that were not transmitting any static data over AIS (ie. no vessel identifiers) were generally excluded, unless they were clearly identifiable as a fishing vessel based on transmission of shiptype or the GFW list of fishing-vessel associated MMSIs (and visual analysis of tracks).
- Vessels that transmitted a very low number of total positions from the area of interest were excluded as data was insufficient to determine vessel activities. In some cases, these positions are likely to have resulted from transmission error (ie. a vessel outside the area

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<sup>2</sup> The Maritime Mobile Service Identity (MMSI) is a number that uniquely identifies vessels, and contains 9 digits. Part of the MMSI is a country code. These nine digits are sent in digital form over a radio frequency channel in order to uniquely identify ships, including through AIS transponders.

of interest transmitting an incorrect position, or a vessel inside the area of interest transmitting an incorrect MMSI).

- MMSIs that appeared to be used simultaneously by two or more vessels ('spoofed') were identified through a combination of manual track analysis and calculation of 'positional error' (defined as the number of occasions on which a vessel would have to have travelled at speeds greater than 100 knots between two sequential AIS transmissions). The majority of these were excluded on the basis that determining the identity and activities of vessel/s present in the area of interest would be too challenging for the purpose of this study. Some exceptions were made, where a fishing vessel track in the area of interest could be clearly identified.
- MMSIs likely to be associated with fishing gear were identified on the basis of names transmitted (names commonly associated with fishing gear include eg. AISBUOY, BUOY etc). These were not included in the analysis.

A number of MMSIs were associated with multiple different identifiers during 2017. Where a vessel transmitted multiple IMO or IRCS values, all values were run through the identification process described above. In cases where the process identified the MMSI with two or more vessel types, including at least one relevant type (fishing or related vessel) and at least one non-relevant type, AIS tracks were subject to visual analysis to determine the vessel's relevance. Variation in identifiers transmitted appears to have occurred for a number of reasons:

- Variation in the value manually entered into the AIS unit due to human error, eg. vessel name was misspelled and later corrected
- Variation in the value manually entered into the AIS unit due to change in vessel identifiers (eg. name change)
- MMSI reassigned from one vessel to another during the course of 2017
- MMSI being used simultaneously by two or more vessels ('spoofing' – see above)
- Variation in the value (name/IRCS/IMO) transmitted, resulting from data transmission error – which in some cases resulted in transmission of an invalid value and in some cases resulted in transmission of a value that was, coincidentally, a match for another vessel
- Variation in the MMSI transmitted resulting from data transmission error – this would result in one vessel being associated with another vessel's static identifiers for one or a handful of positions, causing that second vessel to appear to transmit from the area of interest for a limited number of positions (as distinct from spoofing where two or more vessels are consistently transmitting the same MMSI)

## Stage 2

2017 AIS tracks were generated for the 1389 MMSIs of interest and these were subject to visual analysis to assess their relevance. MMSIs were categorised as follows:

Relevant MMSIs:

- Vessels that fished in the area of interest (excluding categories listed below)

- Refrigerated cargo vessels (reefers) showing indications of possible operations (drift events) in the area of interest

#### Non-relevant MMSIs:

- Vessels flagged to South Africa/Australia/New Zealand (based on Maritime Identification Digit (MID) series) which were active only in their own Exclusive Economic Zone (EEZ)
- Vessels transiting through the area of interest
- Vessels transmitting from port only
- Vessels with insufficient positions or spoofing, where it was not possible to determine the nature of their activities in the area of interest

#### Stage 3

For each of the 1389 MMSIs of interest, the vessel identifiers that were transmitted most frequently over AIS (most frequently transmitted name/IMO/IRCS per MMSI) were cross-referenced with vessel identity and authorisation data contained in FACT. 1214 out of 1389 vessels were identified through this process, and cross-referenced with RFMO authorisations where relevant.

#### Results

Based on the vessel identification process outlined above, we identified the following:

- 277 vessels that were CCSBT authorised throughout 2017
- 66 vessels that were CCSBT authorised for part of 2017, of which 48 were fishing in the area of interest, outside their EEZ. Of these, 9 were identified that fished in the area of interest outside the period of their CCSBT authorisation and were included in the list of CCSBT-unauthorised vessels (see below)

167 MMSIs were identified with vessels that fished in the area of interest during 2017, outside their EEZ, and were not CCSBT authorised. These vessels are referred to as CCSBT-unauthorised vessels and were considered to be a potential risk for IUU fishing of SBT. They included the following:

- 150 vessels that fished in the CCSBT area, outside their own EEZ, which had been authorised to a tuna RFMO but not authorised to CCSBT at any point in 2017
- 9 vessels that were CCSBT authorised for part of 2017 but fished in the area of interest (outside their EEZ) outside their CCSBT authorisation period
- 2 vessels that were never authorised to any tuna RFMO but were identified as (potential) longliners based on information contained in FACT, and which fished outside their own EEZs in the area of interest
- 5 vessels that were never authorised to any tuna RFMO and were not identified as potential longliners by FACT but where manual inspection of tracks confirmed that they were fishing outside their EEZs in the area of interest
- 1 vessel which could not be identified from any sources other than AIS but was included as tracks indicated that it likely fished outside its EEZ in the area of interest

## Findings

### Vessel identities, nationality and ownership

Vessel identities transmitted over AIS were cross-referenced with vessel identity and ownership information contained in FACT, in order to ascertain the likely 2017 flag State and ownership nationality of the 167 CCSBT-unauthorised vessels.

Over half of the CCSBT-unauthorised vessels (56%) were flagged to Taiwan, with the second largest group (28) flagged to China. 15 vessels were flagged to Seychelles, and fewer than ten vessels each were registered with 13 other flag States, although subsequent analysis identified that vessels flagged to Australia, New Zealand, France, Cook Islands, South Africa and Falkland Islands were low risk for illegal fishing of SBT, based on the gear type/target species indicated by their operating patterns (see below).

Flag	Number of vessels	Notes
Taiwan	95	
China	28	
Seychelles	15	
Malaysia	6	
Vanuatu	6	
France	3	Sources indicate that these vessels are primarily engaged in fisheries for toothfish, so they are not considered high risk for SBT IUU
Japan	3	
New Zealand	2	Sources indicate that these vessels are engaged in bottom fisheries, so not considered high risk for SBT IUU
Australia	1	Sources indicate that this vessel is engaged in bottom fisheries, so not considered high risk for SBT IUU
Cook Islands	1	Sources indicate that this vessel is likely a trawler, so not considered high risk for SBT IUU
Falkland Islands	1	Sources indicate that this vessel is likely a trawler, so not considered high risk for SBT IUU
Fiji	1	
Oman	1	
South Africa	1	Sources indicate that this vessel is primarily engaged in fisheries for toothfish, so it is not considered high risk for SBT IUU
Spain	1	
United Kingdom	1	
Unknown	1	Deregistered by Tanzania in January 2017

Table 1: 2017 flag States of CCSBT-unauthorised fishing vessels operating on the high seas in the area of interest

Analysis of owner nationality, based on company addresses and other contact details contained in FACT, found that an even larger proportion of the total vessels were likely to be under Taiwanese ownership. 111 vessels, including 13 vessels that were flagged to Seychelles and four vessels that were flagged to Vanuatu, were owned or operated by companies using Taiwanese contact details. It is likely that the list contained additional flag of convenience vessels, with owner nationality that differed from their flag State - further research into vessel ownership would be required to confirm this.

Vessel ownership was analysed, based on information contained in RFMO authorised vessel lists, IHS and other available sources. This indicated that the majority of CCSBT-unauthorised vessels were owned by individuals or companies that were named as the owner or no more than one or two of the 167 vessels. This reflects trends in the available ownership information for the wider tuna longline fleet, and the Taiwanese fleet in particular, and it is possible that further research could reveal common beneficial owners for a number of these vessels.

Several companies were identified that were listed as the owner of three or more vessels on the list. These are listed in 2 below.

<b>Company</b>	<b>Nationality</b>	<b>Vessels owned</b>	<b>Operating pattern</b>
Weihai Changhe Fishery Company, Ltd.	China	7 Chinese flagged longliners	6 vessels fished east to west across the Indian Ocean, starting their voyage in Suva, Fiji. 1 vessel fished in the Pacific, operating out of Suva, Fiji
Kha Yang Marine Sdn Bhd	Malaysia	6 Malaysian flagged longliners	All vessels fished in the Indian Ocean, operating out of Port Louis, Mauritius
Shandong Lidao Oceanic Technology Stock Co Ltd	China	6 Chinese flagged longliners	All vessels fished in the Pacific, operating out of Suva, Fiji
Shenzhen Shenhui Pelagic Fishery Co Ltd	China	5 Chinese flagged longliners	All vessels fished in the Indian Ocean, operating out of Port Louis, Mauritius
Jiangsu Yuan You Pelagic Fishery Co Ltd	China	3 Chinese flagged longliners	All vessels fished in the Indian Ocean, operating out of Port Louis, Mauritius

*Table 2: Companies that were listed as the owner of three or more of the 167 CCSBT-unauthorised vessels*

### Distribution and fishing operations

AIS tracks for the 167 CCSBT-unauthorised vessels were analysed to identify their areas of operation. For the purpose of aggregate analysis, vessels were considered likely to be engaged in fishing operations when they travelled at speeds below 7 knots outside of port areas – henceforth referred to as ‘low speed hours.’ Both low-speed hours and presence hours (presence in an area, travelling at any speed) were analysed to understand vessel distribution and operating patterns. There are a variety of reasons why a vessel might travel at low speed, including transshipment, bunkering and vessels holding position outside ports, and similarly vessels are likely to travel at speeds above 7 knots

during some parts of fishing operations. Nevertheless, low speed was considered to be a useful proxy to understand fleet-level distribution of fishing activity.

#### Where were they operating?

The 167 vessels were present on AIS in the area of interest for a total of 425,457 hours during 2017. Over 65% (286,418) of these total presence hours were identified as low speed hours. Vessel presence hours and low speed hours were not distributed evenly across the whole AOI, with concentration of vessel activity in particular cells and Food and Agriculture Organisation (FAO) fishing areas.

26 of the 103 5° x 5° cells saw no vessel presence on AIS by CCSBT-unauthorised vessels during 2017 – these cells were distributed approximately evenly across FAO areas 47 (Southeast Atlantic), 57 (Eastern Indian Ocean) and 81 (Southwest Pacific). By contrast, CCSBT-unauthorised vessels were present and had low speed hours in all of the cells that occurred in FAO area 51 (Western Indian Ocean). Low speed hours were recorded in almost every cell where CCSBT-unauthorised vessels were present, with only 27 cells recording zero low speed hours.

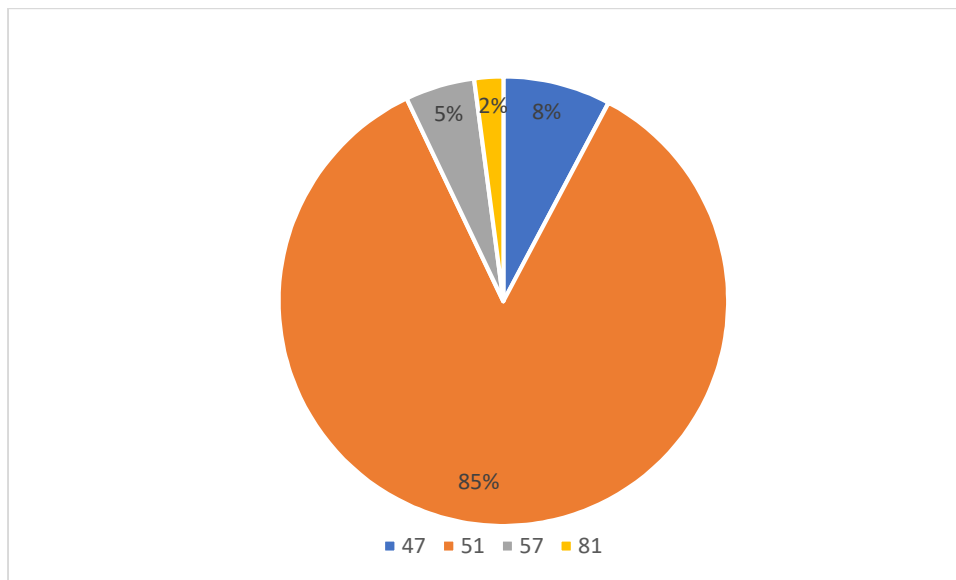


Figure 2: Distribution of low speed hours by CCSBT-unauthorised vessels, across FAO areas

The majority (over 80%) of vessel presence and low speed hours occurred in cells located in FAO area 51. The remainder occurred in FAO area 47 (8%), area 57 (5%) and Area 81 (2%). Vessel presence was not evenly distributed within fishing areas. Approximately 50% of all low speed hours occurred in five cells, all located within FAO area 51.

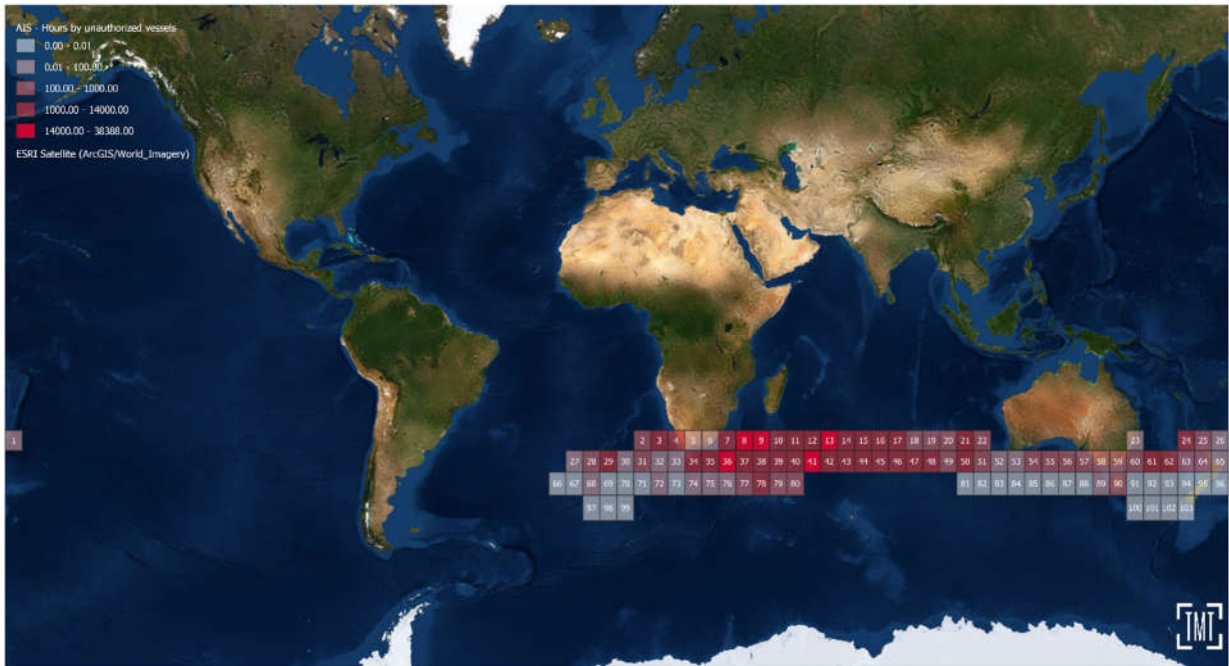


Figure 3: Distribution of low speed CCSBT-unauthorised fishing hours, with the five highest cells highlighted

When were they operating?

Within FAO area 51, low speed hours showed a marked seasonality with the majority occurring between mid-April and the end of August. Low speed hours in FAO area 57 also showed marked seasonality – with the majority occurring between early February and mid-April. Low speed hours in FAO areas 47 and 81 were more evenly distributed throughout the year, although there were peaks in the Atlantic in late March and Pacific in late May.

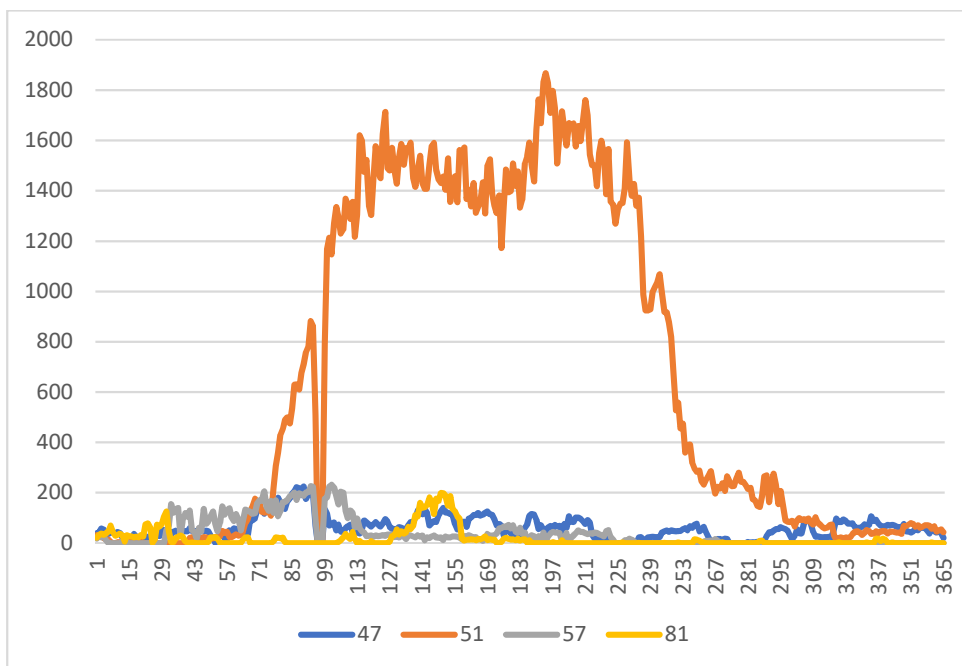


Figure 4: Total number of low speed hours in the area of interest by CCSBT-unauthorised vessels through 2017 - per FAO area



### How were they fishing?

Vessel operations inside the area of interest were defined and analysed in terms of ‘fishing trips.’ For the purpose of this analysis, a fishing trip was defined as a discrete, continuous period of time spent in the area of interest during which some low speed hours were included. If a vessel operated in the area of interest, departed the area and then re-entered, this would be counted as two fishing trips, regardless of whether or not the vessel had called in to port in the interim. However, in order to reduce the number of very short ‘trips’ generated when a vessel was operating close to the boundary of the area of interest, and repeatedly dipping in and out, a 36hr follow-on threshold was used – if a vessel left the area of interest and returned within 36hrs without making a port call, this was counted as a continuation of the previous trip, rather than triggering the start of a new trip.

A vessel was not required to show low speed activity every day during a trip, ie. if a vessel operated at low speed for five days, then spent two days transiting at high speed before recommencing low speed operations, without leaving the area of interest – both periods of low speed operations would be counted as part of a single fishing trip. All port calls were taken to mark the end of a fishing trip, regardless of whether the port was located inside or outside the area of interest. Time spent by vessels inside their own EEZs was also counted as part of fishing trips where relevant, although this was not the primary focus of this analysis.

The 167 CCSBT-unauthorised vessels conducted 380 fishing trips during 2017 (nb. this figure does not include fishing trips whilst authorised, for vessels that were CCSBT authorised for part of 2017).

Over 80% of vessels conducted between one and three fishing trips in the area of interest during 2017. A small number of vessels conducted more than three fishing trips, with the largest number of trips for a single vessel being eight.

Trips were categorised according to the FAO fishing areas that they occurred in. The majority of trips (66%, or 251 trips involving 114 vessels) took place in FAO area 51 only. The second largest number (47 trips) took place in FAO area 81 only. A number of trips, of longer average duration, included time spent in two or more adjacent FAO areas.

<b>FAO Areas</b>	<b>No. of trips</b>	<b>No. of vessels</b>	<b>Total low speed days</b>	<b>Avg. trip duration (days)</b>
47	23	8	357	17.61
47, 51	25	18	2504	117.64
47, 51, 57	1	1	50	53
51	251	114	11985	51.41
51, 57	16	14	892	73.18
51, 57, 81	8	8	1273	168.75
57	3	3	115	43
57, 81	6	1	42	32
81	47	25	468	21.77
<b>Total</b>	<b>380</b>	<b>167</b>	<b>17686</b>	<b>53.07</b>

*Table 3: Number, total duration and average duration of fishing trips in the area of interest, according to the FAO areas in which trips took place*

The average length of a fishing trip was 53 days, and 82 trips were conducted with a duration of 100 days or more. A significant number of very short trips were identified (95 trips of 5 days or less) – this results in part from vessels that fished only very briefly inside the area of interest (or for several brief periods separated by gaps of more than 36hrs), as part of a larger fishing trip that included operations outside the area of interest.



Average trip duration varied significantly by area. The longest fishing trips were conducted by vessels operating across areas 81, 57 and 51. These vessels, which were all Chinese flagged longliners, all started their voyage in Suva, Fiji and then travelled southwest and passed south of Australia to enter the Indian Ocean, fishing in the area of interest as they progressed from east to west across the Indian Ocean. NB. in all cases, the vessels showed only a very low number of low-speed days in area 81 and visual analysis indicated that fishing activity took place mostly or entirely in areas 51 and 57.

The second longest trips, on average, took place across areas 47 and 51 – in practice these trips involved vessels fishing in the Western Indian Ocean and the easternmost portion of area 47, to the south of South Africa – no vessels were identified that fished across the IOTC and International Commission for the Conservation of Atlantic Tuna (ICCAT) areas. The shorter average length for trips that occurred in area 51 only (51 days per trip) reflects the higher average rate of port calls for vessels operating in this area – many of which made 3 or more calls in to Port Louis throughout the year.

### Port usage

The 167 vessels made a total of 522 port calls between them during 2017, visiting 32 different ports. The majority (58%) of port calls were to Port Louis, Mauritius, and the second largest number of port calls were to Suva, Fiji. Only three other ports had more than 20 port calls in total – Singapore, Cape Town, South Africa and Kaohsiung, Taiwan. Of the 32 ports visited, 18 were used for port calls that occurred prior to fishing trips into the area of interest. More than 60% of port calls before fishing trips took place in Port Louis, with Suva, Cape Town, Singapore and Kaohsiung completing the top 5. A total of 16 different ports were visited by vessels directly after fishing trips into the area of interest. Again, the majority of port calls after fishing trips occurred in Port Louis, followed by Suva and Cape Town. Le Port, Reunion was the fourth most visited port for vessels following fishing trips into the area of interest, but this port was used only by French-flagged longliners that appear likely to have been primarily targeting toothfish.

	<b>Total</b>	<b>Before trips</b>	<b>After trips</b>
Port Louis, Mauritius	305	135	127
Suva, Fiji	48	20	16
Singapore, Singapore	23	10	6
Cape Town, South Africa	21	17	13
Kaohsiung, Taiwan	20	7	1
Le Port, Reunion	15	5	7
Yaizu-shi, Japan	15	0	2
Montevideo, Uruguay	10	2	3
Stanley, Falkland Islands	10	0	0
Victoria, Seychelles	9	2	0
Bokarina, Australia	5	1	1
Edrom, Australia	5	5	5
Russell, New Zealand	4	3	4
Durban, South Africa	3	2	2
George Town, Malaysia	3	1	0
Nantong Shi, China	3	0	0
Nantong, China	3	0	0
Denpasar, Indonesia	2	1	1
Hong Kong, Hong Kong	2	1	0
Miura-shi, Japan	2	0	0
Vigo, Spain	2	1	0
Weihai, China	2	0	2
Busan, South Korea	1	0	0
Colombo, Sri Lanka	1	0	0
Davao City, Philippines	1	1	0
Donggang, Taiwan	1	0	0
Majuro, Marshall Islands	1	0	0
Pape'ete, French Polynesia	1	0	1
Shizuoka, Japan	1	0	0
Shōzu-gun, Japan	1	0	0
Tateyama-shi, Japan	1	0	0
Whangarei, New Zealand	1	1	1

*Table 4: Total number of port visits - annual, before fishing trips and after fishing trips - for ports visited by the 167 CCSBT-unauthorised vessels*

5 vessels were not detected making any port call – however visual inspection of vessel tracks indicated that each of these vessels likely made one or more port calls in to Port Louis, but these were not detected either because the vessel stopped transmitting on AIS shortly before entering port or because insufficient slow-speed positions were detected from inside the port area. For similar reasons, it is likely that the total number of port calls has been underestimated for some vessels.

## Operating patterns

Vessels were categorised according to their operating pattern and clear trends were identified in the flag State and ownership nationality of vessels engaged in different operating patterns.

The majority (approximately 70%) of CCSBT-unauthorised vessels were operating in the Indian Ocean, making port calls in to Port Louis, with an average of just over 3 port calls per vessel throughout the year. Over 70% of these vessels were flagged to Taiwan and the majority of the remainder were flagged to Seychelles and China, with a small number of vessels flagged to Malaysia, Oman and the United Kingdom. Vessels operating out of Port Louis tended to operate in the Western and Central parts of the Indian Ocean, with some vessels concentrating their activity in the Western Indian Ocean, particularly in cells to the east of the South African EEZ, and some vessels operating across a wider area including as far east as the high seas outside the French Antarctic Territories (Iles Amsterdam & Ile Saint-Paul).

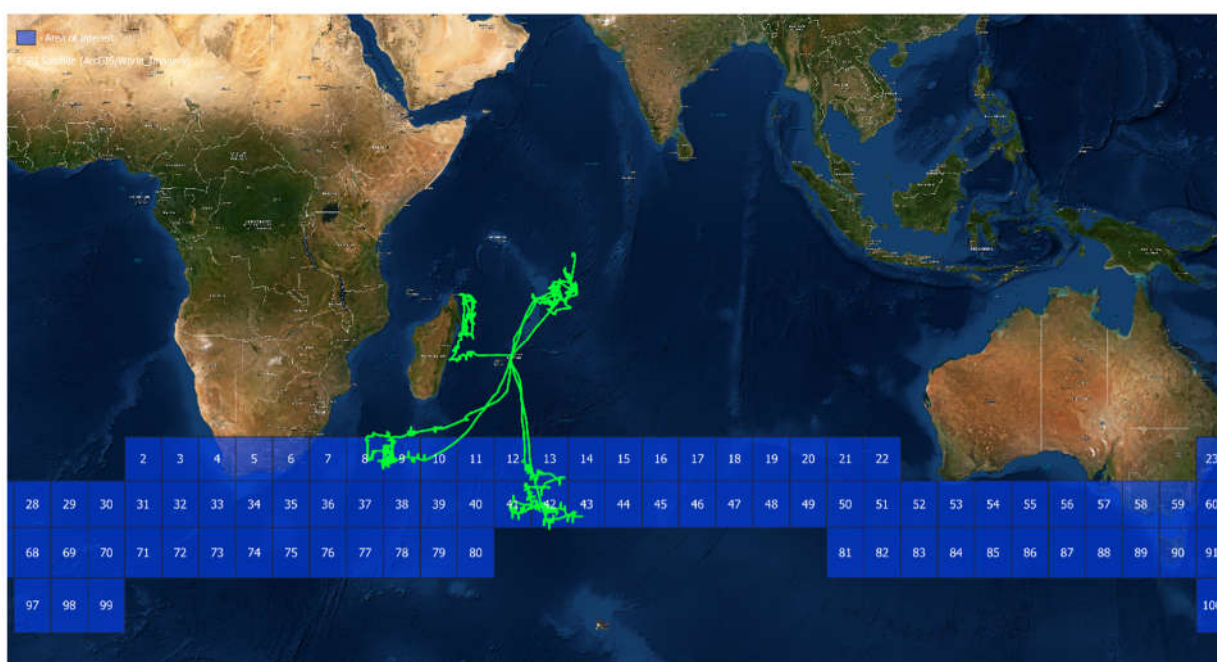


Figure 5: 2017 AIS track of a longliner operating out of Port Louis, showing operating areas in the western and central Indian Ocean. Area of interest in blue.

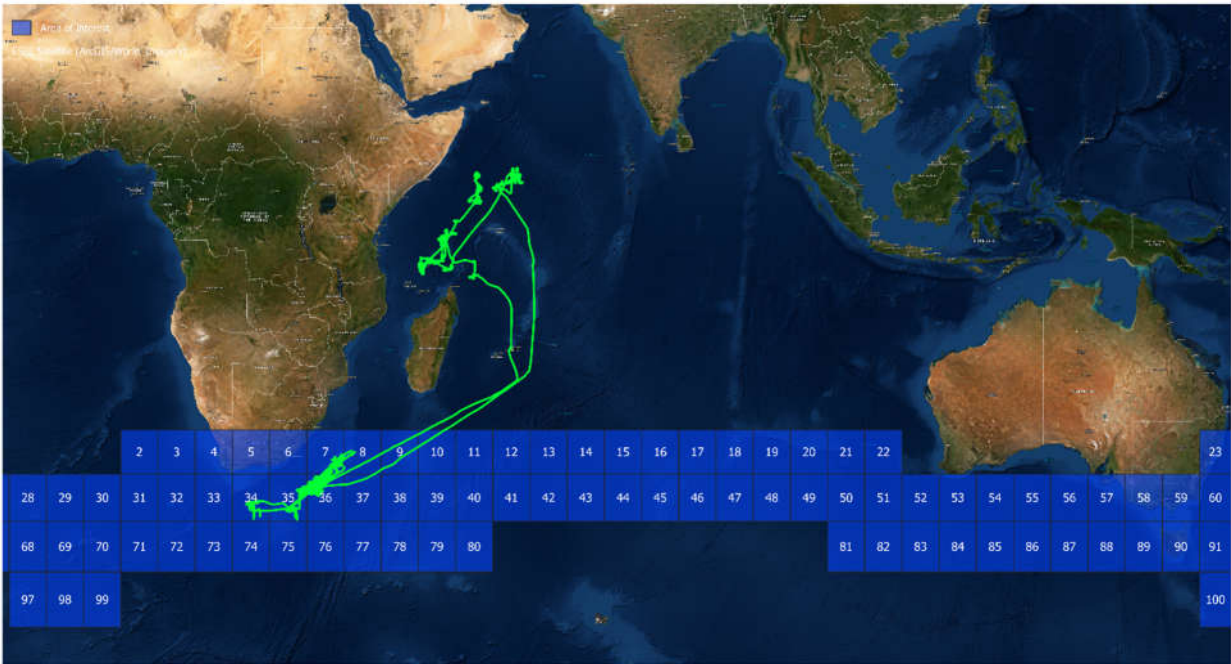


Figure 6: 2017 AIS track of a longliner, showing typical operating pattern in the Western Indian Ocean. Area of interest in blue.

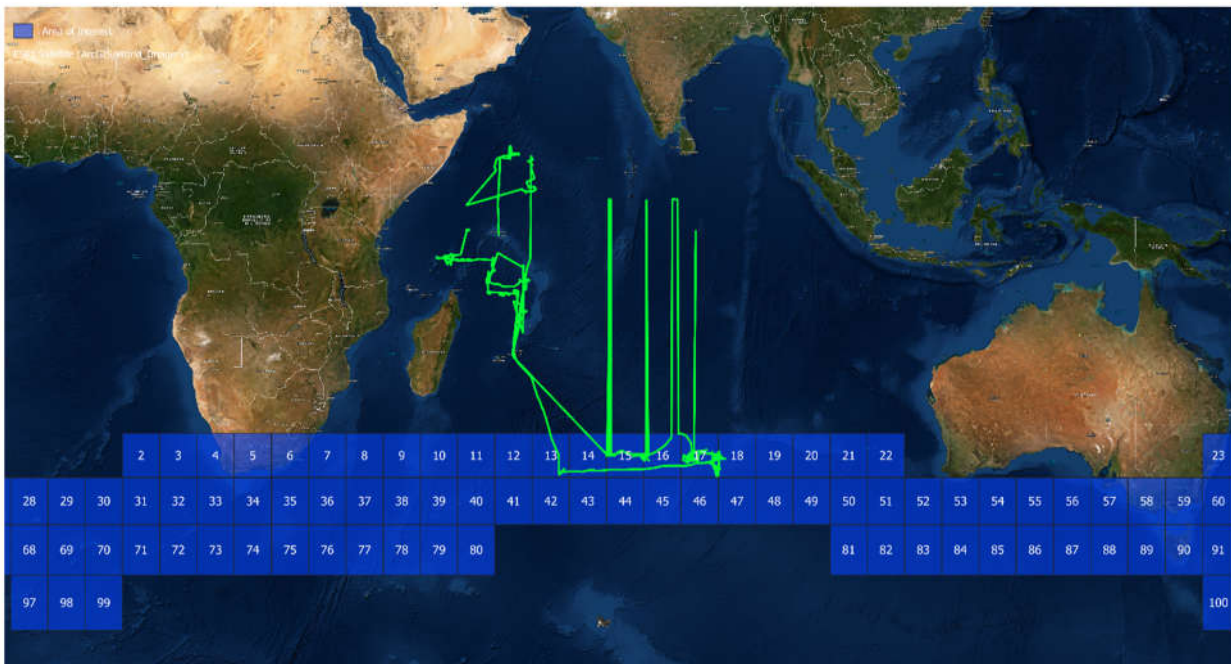


Figure 7: 2017 AIS track of a longliner showing typical operating pattern in the Central Indian Ocean. Area of interest in blue. NB. the vertical lines are likely caused by a positional anomaly which causes the vessel to transmit positions with incorrect latitude. However, the vessel track aligns with port calls in Port Louis, indicating that it is operating in the area of interest

Nine vessels were identified which began their journey in the Pacific and travelled westwards, across the Indian Ocean, fishing en route. Eight of these were Chinese flagged longliners, which all began their trips in Suva, Fiji, and one was a Taiwanese flagged longliner which began its trip in Taiwan. Eight of the nine vessels also visited Port Louis, and some had calls in to other ports en route or at the start or end of their journeys – including Weihai, China, Singapore and Kaohsiung, Taiwan.



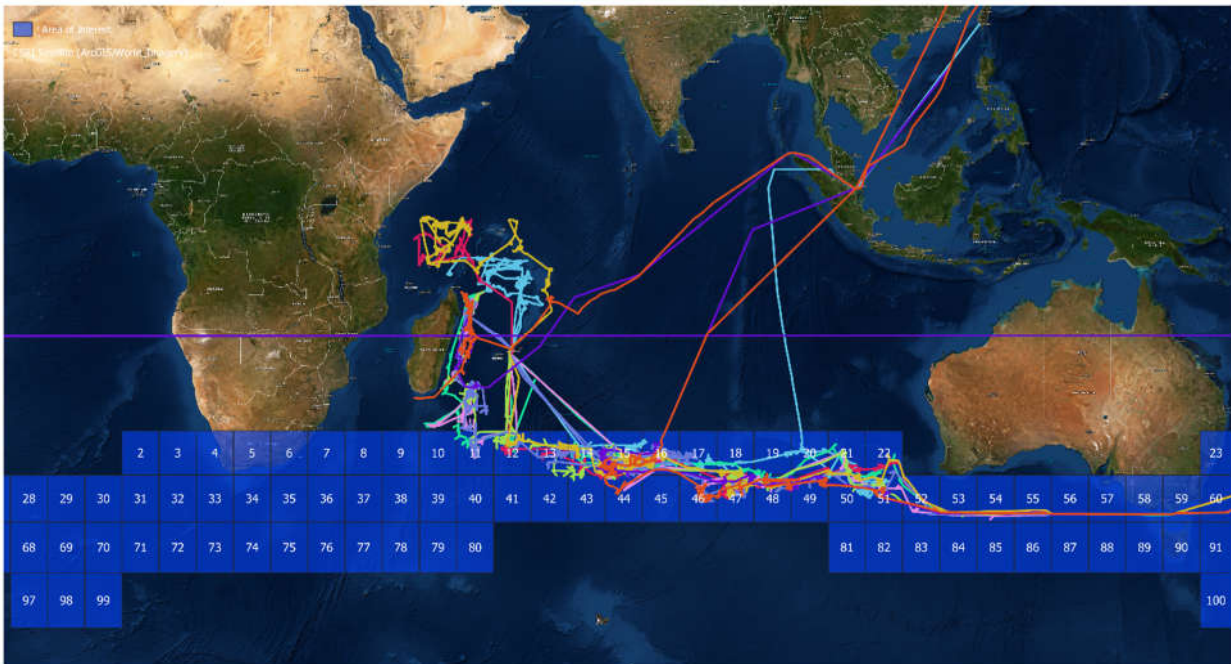


Figure 8: 2017 AIS tracks of the nine vessels that fished east to west across the Indian Ocean, the majority starting their trip in Suva and finishing with a visit to Port Louis. Area of interest in blue.

Nine vessels were identified which fished in the Pacific, making port calls in to Suva, Fiji. All were Chinese longliners and the majority were owned by the same company – Shandong Lidao Oceanic Technology Co Ltd. Most vessels in this group made 3 or more port calls during the year. Unlike the majority of vessels that fished in the Indian Ocean, these vessels did not fish for very extended periods of time in the area of interest – the majority of their fishing grounds were located further to the north in the Western and Central Pacific Fisheries Commission (WCPFC) area, with some fishing taking place in the area of interest in high seas areas to the west and north of the New Zealand EEZ.

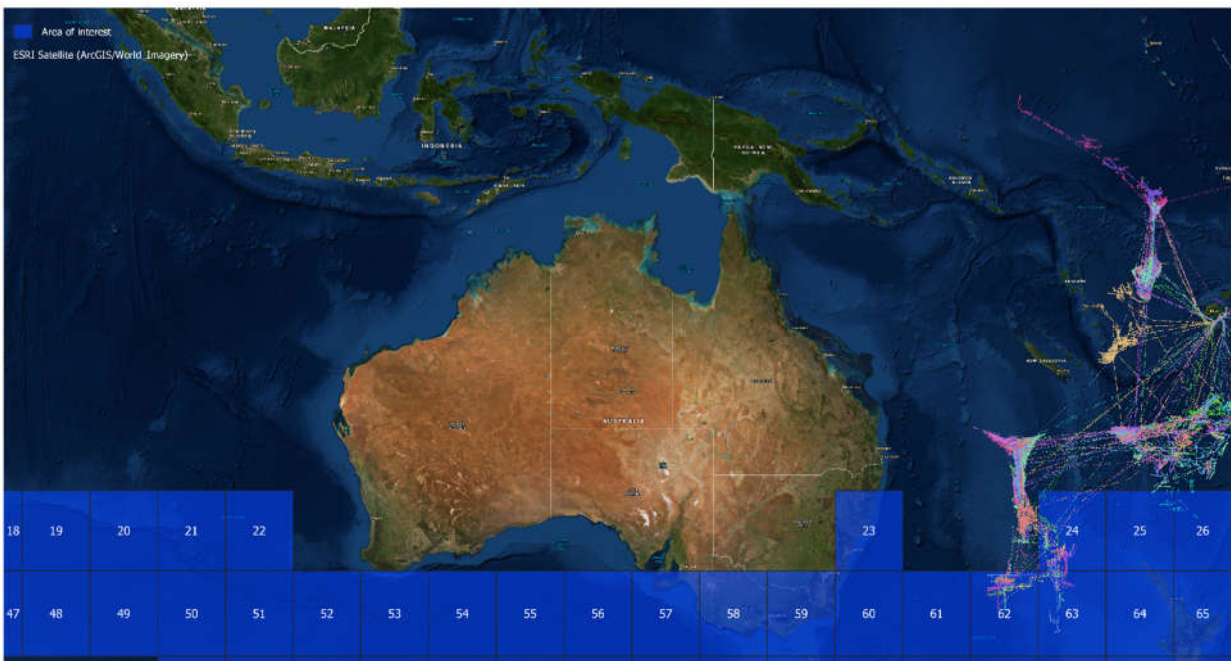


Figure 9: 2017 AIS tracks of Chinese-flagged longliners, operating out of Suva, that fished in the area of interest

Other categories potentially of interest included: three Taiwanese longliners operating in the Atlantic, making port calls in to Montevideo; and three vessels operating in the Atlantic and three vessels operating in the Western Indian Ocean, which made port calls in to Cape Town. Three of these vessels were flagged to Taiwan, one was flagged to Seychelles, one to Spain and one was flag unknown (deregistered by Tanzania in January 2017).

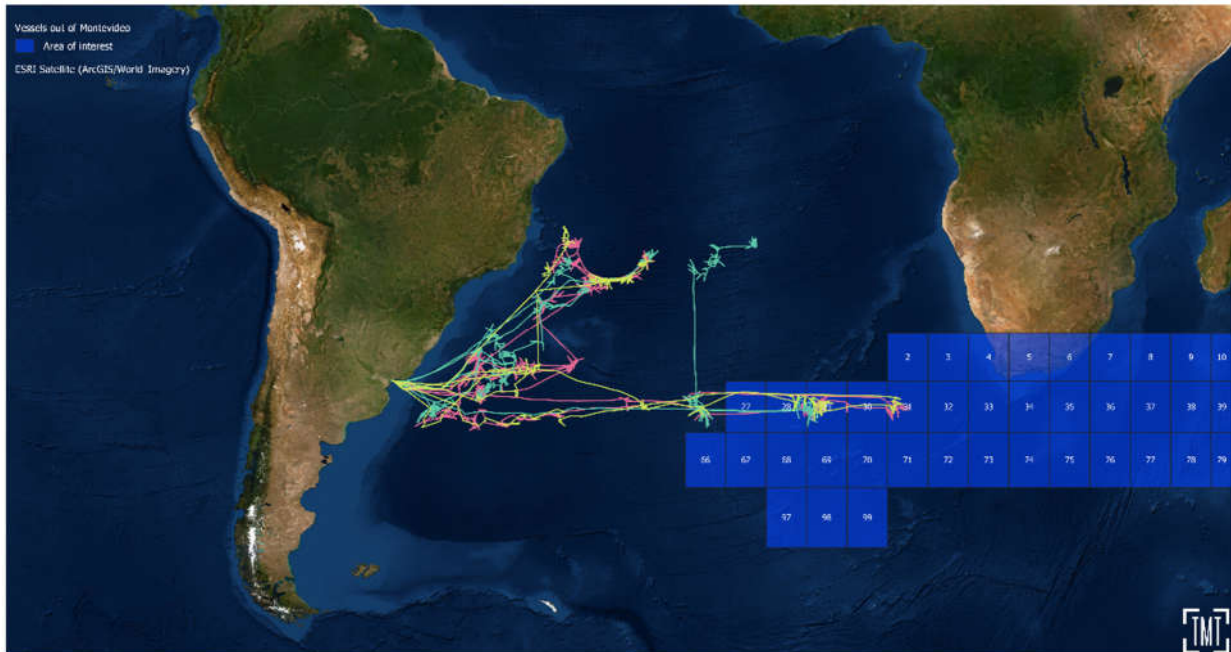


Figure 10: 2017 AIS tracks of three Taiwanese longliners, that fished in the area of interest and operated out of Montevideo. Area of interest in blue.

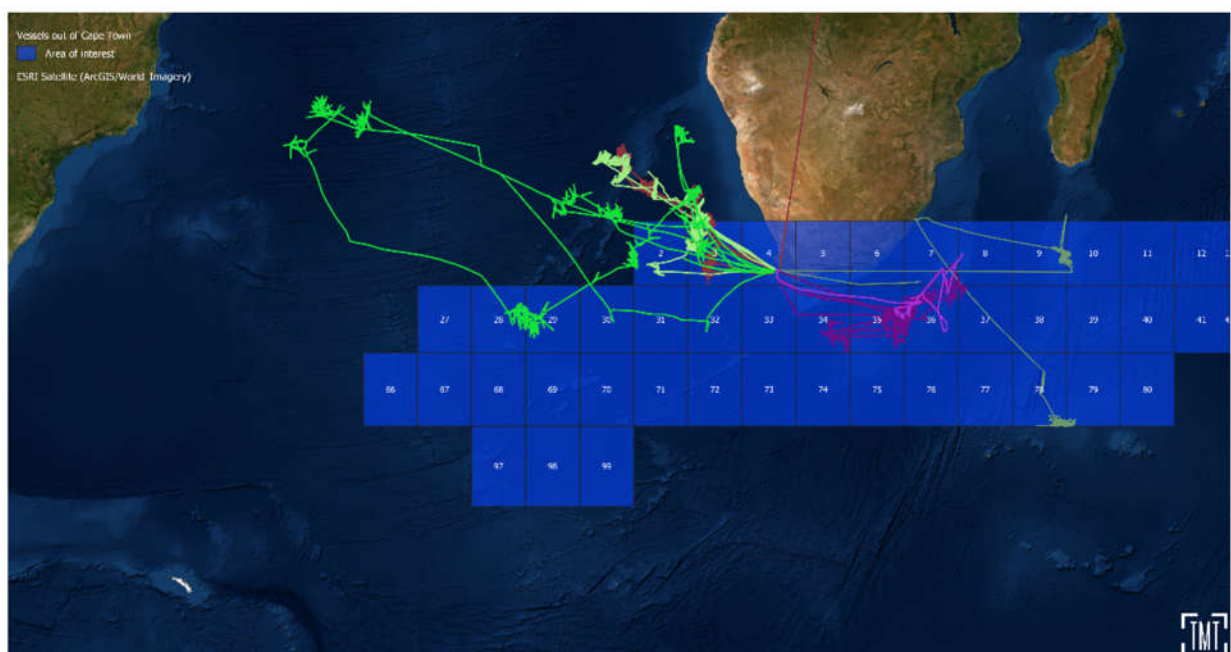


Figure 11: 2017 AIS tracks of vessels operating in the area of interest, out of Cape Town, South Africa. Area of interest in blue.

Other operating patterns which were associated with small numbers of vessels (1-2 vessels per category) included one Japanese-flagged longliner that operated in the Eastern Indian Ocean, out of

the port of Denpasar, Indonesia; and vessels that operated in the Pacific out of ports in Australia, China, Japan, New Zealand, South Korea and Taiwan.

### Encounters at sea

The publicly available GFW map of fishing data was used to identify encounters at sea between the 167 CCSBT-unauthorised vessels and refrigerated cargo vessels (reefers). A vessel encounter is defined in the GFW portal as two vessels that remain continuously within 500m of each other, at low speed, for at least two hours, at a distance of 10km or more from any coastal anchorage. While it is not possible to determine from AIS data alone what the vessels were doing during an encounter, the vessel types involved suggest that encounters were likely to involve transfer of catch, supplies or crew in a significant proportion of cases.

74 encounters were identified involving 40 of the CCSBT-unauthorised vessels. These encounters took place either inside the area of interest, or outside the area of interest but following a period when the vessel had fished inside the area of interest. 72 of the encounters took place in the IOTC area and 2 occurred in the WCPFC area. In all cases, the reefer involved was authorised for the area-based RFMO where it was operating (IOTC/WCPFC) and several of the reefers were authorised as CCSBT carriers also. For full details of the reefer vessels involved, see Table 5 below. Full details of the encounters at sea are provided in the Appendix.

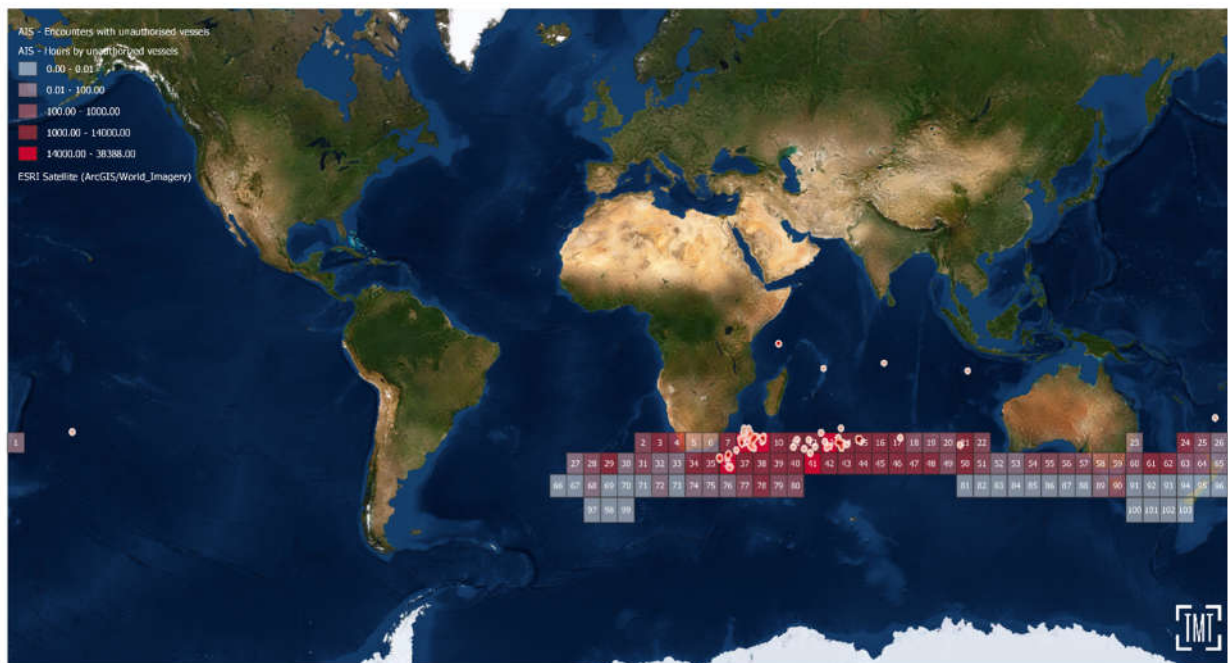


Figure 12: 2017 Distribution of potential encounters with reefers involving CCSBT-unauthorised vessels, layered with cells displaying levels of CCSBT-unauthorised fishing hours.



MMSI	Name	IMO	Flag	Registered owner	Beneficial owner	Operator
416308000	CHEN YU NO. 7	7930175	Taiwan	Chen Fu Oceanic Enterprise Co Ltd	Unknown	Chen Fu Oceanic Enterprise Co Ltd
636017108	CHIKUMA	9666493	Liberia	Ocean Wide Shipping SA	Hakko Marine & Corp	Ocean Wide Shipping / MRS Corporation
563418000	CHITOSE	9666508	Singapore	Wang Tat Corporation PTE LTD	Wang Tat Corporation PTE LTD	MRS Corporation
416696000	FU JYI	6811932	Taiwan	Shine Year Fishing Co Ltd	Shine Year Fishing Co Ltd	Shine Year Fishing Co Ltd
636017301	FUTAGAMI	9105293	Liberia	Navisa Maritima SA	Kobe Shipping Co Ltd	Toei Reefer Line Ltd
636017162	GENTA MARU	9620384	Liberia	Panama TRL SA	Toei Reefer Line Ltd	Toei Reefer Line Ltd
416110700	HO YUAN	7121956	Taiwan	Her Shuen Fishery Co Ltd	Unknown	Her Shuen Fishery Co Ltd
370599000	IBUKI	9666481	Panama	Star Navigation SA	Yamane Sangyo KK	MRS Corporation
664090000	KAIHO MARU	8909680	Seychelles	Well Sea Co Ltd	Unknown	Atlas Ship Management Co Ltd
533000333	KHA YANG 333	7920728	Malaysia	Kha Yang Marine Sdn Bhd	Kha Yang Marine Sdn Bhd	Kha Yang Marine Sdn Bhd
636017161	MEITA MARU	9071583	Liberia	Panama TRL SA	Toei Reefer Line Ltd	Toei Reefer Line Ltd
441032000	MV SEA MANSION	8808161	South Korea	Kanasashi Shipbuilding Co Ltd	Green World Co Ltd	Hanaro Shipping Co Ltd
355317000	ORIENTAL CHILAN	8301723	Panama	Kao Sheng Marine	Go Rising Trading Ltd	Vanguard Shipping Safety Management Consultant Co Ltd
416702000	SHENG HONG	7920869	Taiwan	Sheng Hong Fishery Co Ltd	Unknown	Sheng Hong Fishery Co Ltd
636017359	SHOTA MARU	9194892	Liberia	Panama TRL SA	Toei Reefer Line Ltd	Toei Reefer Line Ltd
416602000	SHUN TIAN FA 168	7323401	Taiwan	Hon Shun Fishery Co Ltd	Unknown	Hon Shun Fishery Co Ltd
351822000	TAI FU NO. 3	7927453	Panama	Sun Victory Shipping SA	Unknown	Sun Victory Shipping SA
431201000	TAISEI MARU NO. 15	8710728	Japan	Ocho Dorado Shipping SA	Taiseimaru Kaiun KK	Taisei Maru Kaiun KK
636017468	TENHO MARU	9128764	Liberia	Princess Line SA	Hayama Senpaku KK	Hayama Senpaku KK
352241000	TUNA PRINCESS	9314612	Panama	Star Navigation SA	Yamane Sangyo KK	MRS Corporation
636017275	VICTORIA II	9140097	Liberia	Navisa Maritima SA	Kobe Shipping Co Ltd	Toei Reefer Line Ltd
416521000	YONG MAN SHUN	7302031	Taiwan	Jenn Shoou Song Seafood Ltd	Unknown	Feng Shun Fishery Co Ltd

Table 5: Identity and ownership information for the 22 reefers detected in at-sea encounters with the CCSBT-unauthorised vessels during 2017



Approximately half of the 40 CCSBT-unauthorised vessels involved in the 74 encounters were Taiwanese flagged, with a further 11 vessels flagged to China. The remainder were flagged to Seychelles, Vanuatu, Oman and Japan.

#### Reefer drift events in the area of interest

A transshipment will only be detected as a vessel encounter on AIS if both vessels involved are transmitting over AIS. Potential transshipment activity is much harder to detect in cases where either the fishing vessel or the receiving vessel was not transmitting over AIS at the time of the encounter. 'Drift events' in which AIS indicates that a vessel drifted at low speed for a period of several hours or more, can occur when a vessel encounters another (non-transmitting) vessel, for transshipment or other purposes. However, drift events can also occur for other reasons, including vessels awaiting orders, awaiting a berth in port or conducting repairs. For this reason, these events are potentially of interest to identify vessels and operating areas that could be subject to further investigation or monitoring, but cannot be taken as a strong indication that transshipment has occurred.

AIS tracks of reefers that were detected operating in the area of interest were analysed to identify drift events that could indicate potential transshipment with a vessel not transmitting on AIS. Three such events were identified:

**TAGANROGSKIY ZALIV – Panama –** The Greek-operated, Panama flagged reefer TAGANROGSKIY ZALIV was involved in a multi-day drift event in the area of interest, to the east of the South African EEZ. The drift event occurred in a heavily fished area and several longliners were operating in the vicinity at the time, but no encounter was detected suggesting that if the reefer did tranship with one or more vessels during this period, they were not transmitting over AIS at the time. The vessel was authorised to operate in the ICCAT area but its IOTC authorisation had expired in late 2016, when the vessel was reflagged from Liberia to Panama. The vessel was not CCSBT authorised.

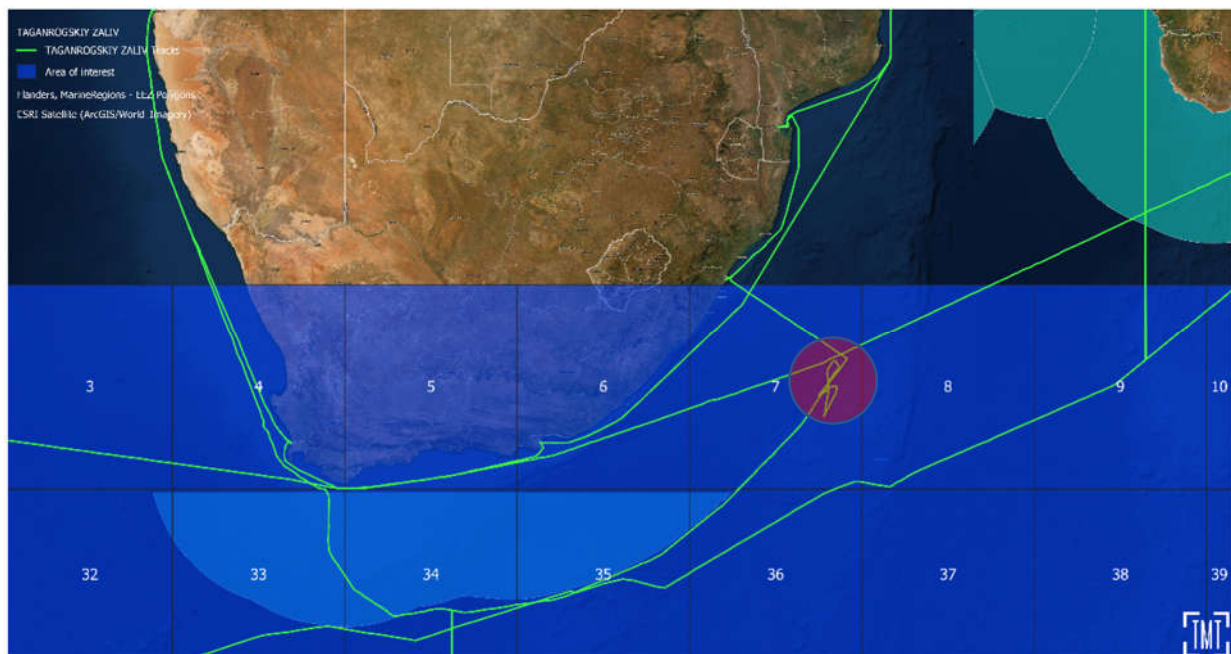


Figure 13: Drift event involving the reefer TAGANROSKIY ZALIV, in the area of interest, 27 - 29 November 2017. Area of interest in blue

**FRIO DOLPHIN – Panama –** The Greek owned, Panama flagged reefer FRIO DOLPHIN was involved in a multi-day drift event in the area of interest outside the South African EEZ, in late November 2017. Whilst this occurred in an area heavily targeted by tuna longliners, it was outside of the normal

fishing season for this area and no fishing vessels were identified fishing in the vicinity on AIS, though several were transiting through the area en route to other fishing grounds. The vessel was authorised to conduct transshipment at sea by WCPFC and South Pacific Regional Fisheries Management Organisation (SPRFMO) during 2017 but was not IOTC or CCSBT authorised.

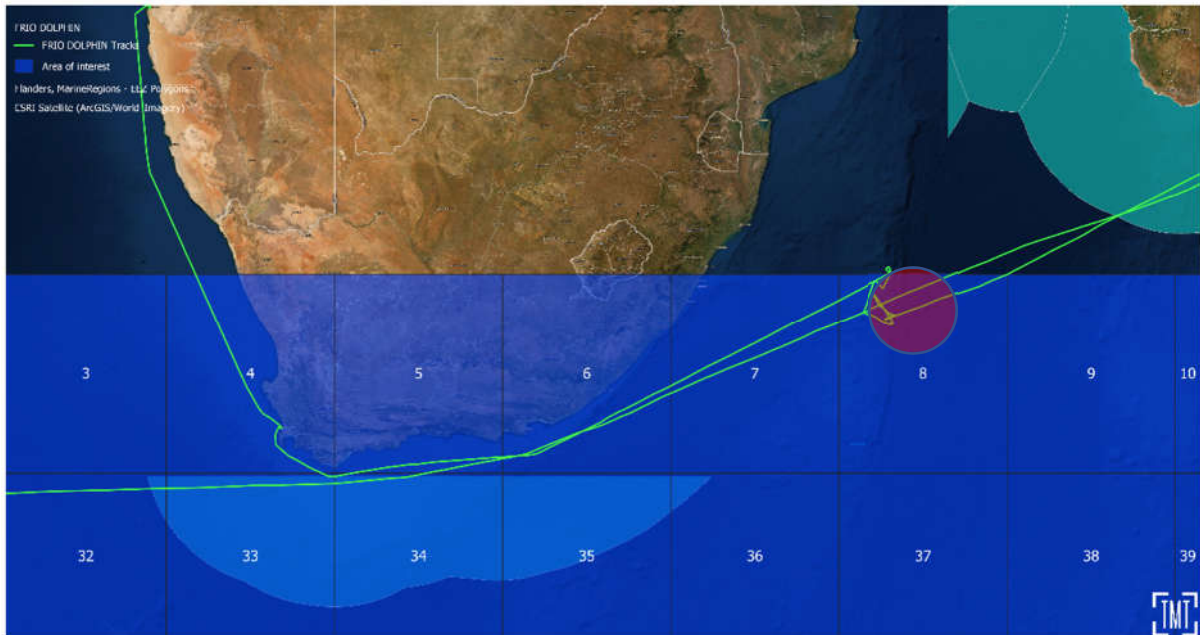


Figure 14: A multi-day drift event involving the reefer FRIO DOLPHIN, in the area of interest to the east of the South African EEZ, 25 - 29 November 2017. Area of interest in blue.

SKYFROST – Panama – The Greek-owned, Panama flagged reefer SKYFROST was involved in a drift event in the AOI on 24 April 2017. The drift event occurred in a heavily fished area and several longliners were operating in the vicinity at the time, but no encounter was detected suggesting that if the reefer did tranship with one or more vessels during this period, they were not transmitting over AIS at the time. The vessel was ICCAT authorised at the time but was not authorised to IOTC or CCSBT.

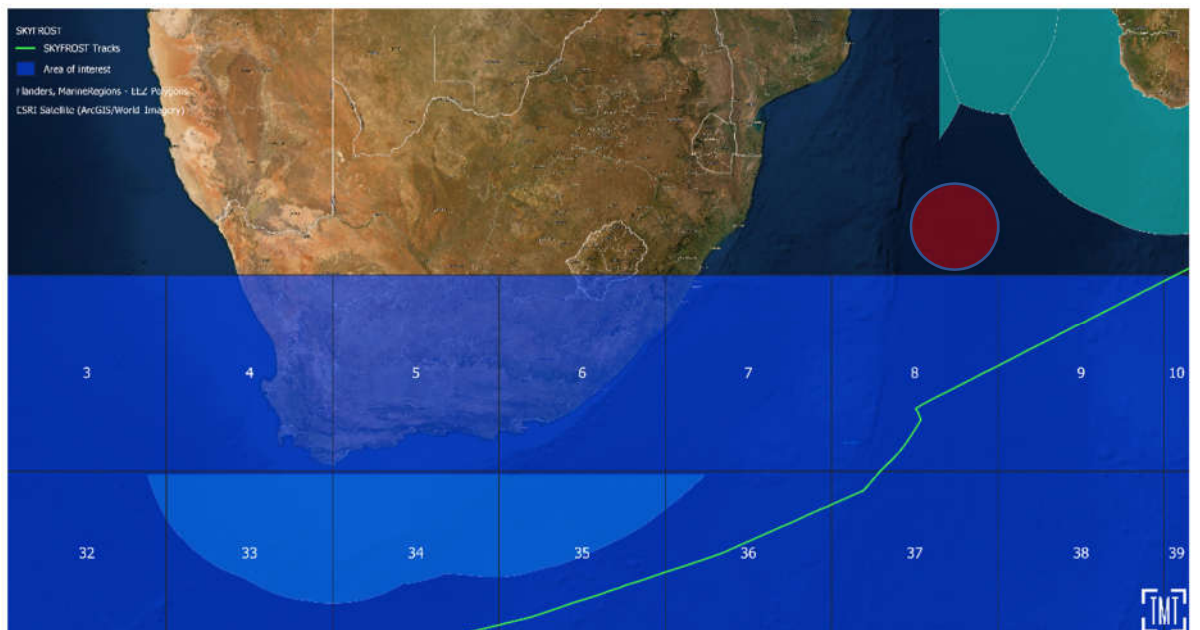


Figure 15: A drift event involving the reefer vessel SKYFROST, in the area of interest to the east of the South African EEZ, 24 April 2017

### Other fisheries in the area of interest

Analysis of vessel operating patterns, RFMO authorisations and other sources indicated that several of the CCSBT-unauthorised vessels were likely to be primarily targeting non-tuna species, so are considered lower risk for illegal fishing of SBT. These were:

A trawler flagged to Cook Islands, operating out of Cape Town

An Australian vessel variously authorised/reported as a bottom trawler or bottom longliner, operating out of ports in Australia

Two New Zealand flagged vessels, whose AIS tracks and/or authorisation history indicate that they were likely targeting bottom species

Three French-flagged longliners, operating out of La Reunion. Areas of operation indicate that all three are likely engaged in bottom longlining for toothfish, although one vessel did have some fishing activity further north in the eastern Indian Ocean, target species unknown.

A South African flagged longliner operating out of Cape Town, which Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) authorisation and operating areas indicate was likely targeting toothfish

A trawler, flagged to the Falkland Islands, operating in the Atlantic out of Montevideo

## Risk factors

It is likely that a significant proportion of the fishing activity undertaken by the 167 CCSBT-unauthorised vessels was targeting species other than SBT, for which the vessels were authorised – either by an area-based tuna RFMO or another RFMO, such as SPRFMO. A number of different approaches were used to identify fishing operations that could be considered higher risk for illegal fishing of SBT. In the absence of verification, for example through inspection of vessel landings and logbook data, it is not possible to state conclusively that any of the 167 vessels were targeting SBT. However, this risk-based approach does help to identify ports, fleet sectors and areas that could be the focus of future monitoring, control and surveillance (MCS) efforts to detect and reduce illegal fishing of SBT.

## RFMO authorisations

The majority of the 167 CCSBT-unauthorised vessels were tuna longliners that were authorised to the area-based tuna RFMO/s (tRFMOs) in whose area they were operating (IOTC, ICCAT or WCPFC). However, cross-referencing of vessel identities with available authorisation data did identify one tuna longliner that operated without authorisation to the relevant tRFMO in 2017.

### IKAR: A stateless vessel operating in the area of interest

IKAR (IMO 8696130) is a tuna longline vessel that was previously flagged to Tanzania. It was IOTC authorised from 2010 to 23 January 2017, when the vessel was deregistered by the Zanzibar Maritime Authority, and its IOTC authorisation was subsequently cancelled<sup>3</sup>. The vessel continued to transmit on AIS using the MMSI allocated by Tanzania, and no new flag State was identified so it was considered likely to be operating as a stateless fishing vessel after this date. AIS data showed that it departed the port of Cape Town in June 2017 and travelled to the fishing grounds to the east of the South African EEZ, where it operated until November 2017, at which point it ceased AIS transmissions.

No vessel encounters involving IKAR were detected on AIS, however given the period of time it was present on the fishing grounds it is likely that it did tranship – possibly with another fishing vessel – during that period. Analysis of AIS data to detect tandem vessel operations (see below) did identify one CCSBT authorised vessel which could potentially have encountered IKAR on more than ten occasions whilst operating on the fishing grounds. However, it should also be noted that IKAR was detected on AIS only intermittently whilst on the fishing grounds (visible periods lasted 1 – 3 days, with significant gaps between them) so it is very plausible that the vessel could have had one or more encounters at sea during periods when it was not visible on AIS.

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<sup>3</sup> See [https://www.iotc.org/sites/default/files/documents/2017/12/Circular\\_2017-090\\_-\\_Vessel\\_without\\_nationalityE.pdf](https://www.iotc.org/sites/default/files/documents/2017/12/Circular_2017-090_-_Vessel_without_nationalityE.pdf) for full details

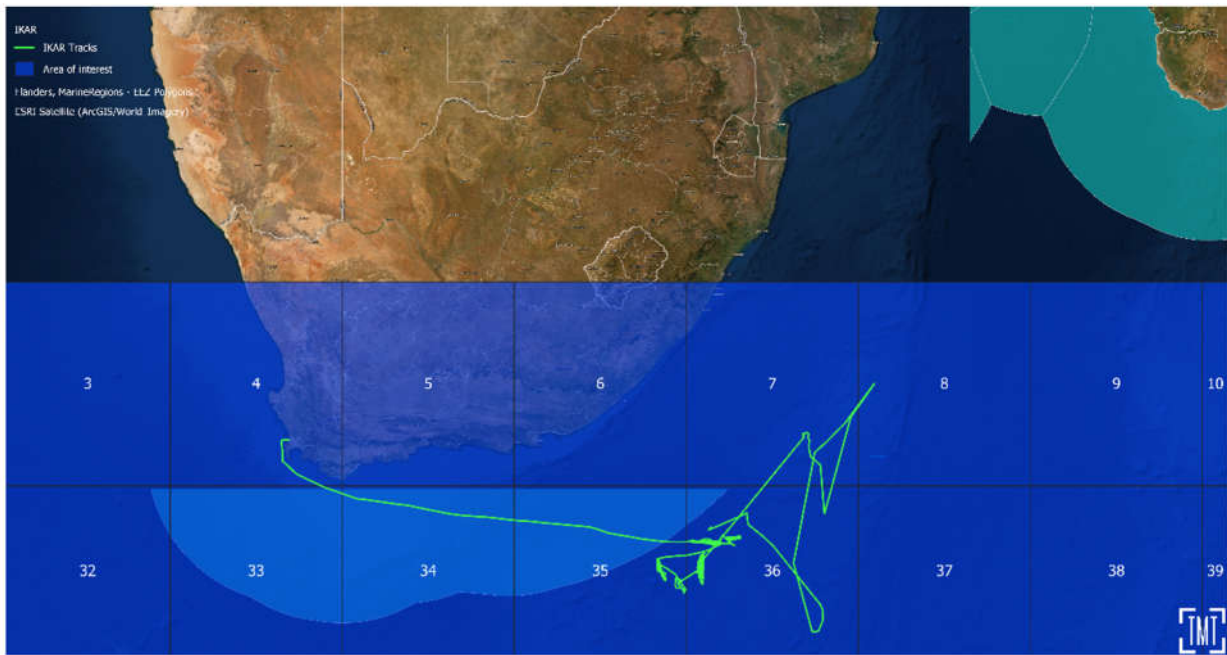


Figure 16: AIS track of the vessel IKAR, June to November 2017

### Tandem operations

Based on anecdotal reports of CCSBT-unauthorised vessels targeting SBT in areas being fished by vessels authorised to CCSBT, it was hypothesised that high risk operations could be detected by identifying CCSBT-unauthorised vessels that operated ‘in tandem’ with CCSBT authorised vessels. To detect vessels that could potentially have operated in tandem, AIS tracks of the 167 CCSBT-unauthorised vessels and the 277 CCSBT authorised vessels were analysed to identify instances where a CCSBT-authorised and an CCSBT-unauthorised vessel could have met at sea on at least ten different days during 2017.

It should be noted that this analysis looked only for potential encounters, extrapolated from available positional data and based on the assumption that vessels could travel at a speed of up to 15 knots between transmissions over AIS. For two vessels to be identified as a potential tandem operation does not necessarily imply that a vessel encounter was visible on AIS, only that the two vessels could have encountered each other at sea on at least ten different days in the year. This was taken as a proxy for vessels operating in tandem, but could also occur when two vessels operated close together in busy fishing grounds.

This analysis resulted in the identification of 418 vessel pairs, involving 57 authorised vessels and 64 CCSBT-unauthorised vessels (NB. the nine vessels that were authorised for part of 2017 were counted on both the CCSBT-authorised and CCSBT-unauthorised vessel lists). Visual analysis of tracks showed considerable variation in the relationship between the CCSBT-authorised and CCSBT-unauthorised vessel, across the 418 pairs. In some cases, the two vessels had close operations for the majority of the year with very similar tracks on AIS – calling in to port at the same time and fishing close together over long periods of time. In other cases, tracks indicated that vessels had this kind of close interaction for part of the year, but operated in different areas for part of the year. Finally, some pairs were simply operating in the same area over a period of ten days or more, with several opportunities for encounters at sea.

All three categories of relationship could potentially indicate an increased risk that the CCSBT-unauthorised vessel was engaged in fishing for SBT – either because it fished part or all of the year in



the same area as a vessel that, based on authorisation data, may have been targeting SBT for part of the year; or because tracks indicate that the CCSBT-unauthorised vessel would have had opportunity to tranship catch of SBT to an authorised vessel, which could enable it to be laundered into the legal supply chain. However, tandem operations occurred in areas where other tuna species are also known to be caught, and involved vessels authorised to other tRFMOs, therefore inclusion in a vessel pair should not be taken to indicate that a vessel definitely engaged in unauthorised fishing for SBT.

More than half of the potential tandem operations that were detected involved two Taiwanese flagged vessels and the majority of these (249 out of 276 pairs) involved potential vessel encounters in cells to the south and east of the South African EEZ. Whilst AIS tracks indicate that these pairs include some genuinely cooperative relationships, it is also likely that a number of the vessel relationships detected in this area stem from the very high level of activity by both authorised and CCSBT-unauthorised vessels – which correlates with high catch levels of IOTC species. The second most common pairing was CCSBT-unauthorised vessels flagged to the Seychelles, which were potentially operating in tandem with authorised vessels flagged to Taiwan. Similarly, the majority (116 out of 118) of these relationships involved potential vessel encounters in the fishing areas outside the South African EEZ.



Figure 17: 2017 Distribution of potential encounters between authorised and CCSBT-unauthorised vessels, layered with cells displaying levels of CCSBT-unauthorised vessels' fishing hours

CCSBT-unauthorised vessel flag State	Authorised vessel flag State					Total
	Japan	New Zealand	Portugal	Spain	Taiwan	
China					17	17
Japan	2					2
New Zealand		3				3
Seychelles					118	118
Taiwan			4	5	267	276
Unknown					1	1
Vanuatu					1	1
<b>Total</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>404</b>	<b>418</b>

Table 6: Flag States of CCSBT-authorized and CCSBT-unauthorized vessels involved in potential 'tandem operations'

Figure 18 shows the 2017 AIS tracks of a group of vessels that appear likely to have operated in tandem for part of the year: vessel A was CCSBT authorised through 2017 (turquoise), and operated in relatively close proximity to vessel B (red), which was CCSBT authorised from 1 April 2017 – although both vessels commenced operations in the area of interest prior to that date (see figure 19). A close relationship was also detected between vessel A and vessels C, D and E (green, yellow, purple), none of which were CCSBT authorised in 2017 – though these relationships did not last through the year and the latter three vessels fished together in a different area when operating north of the area of interest.

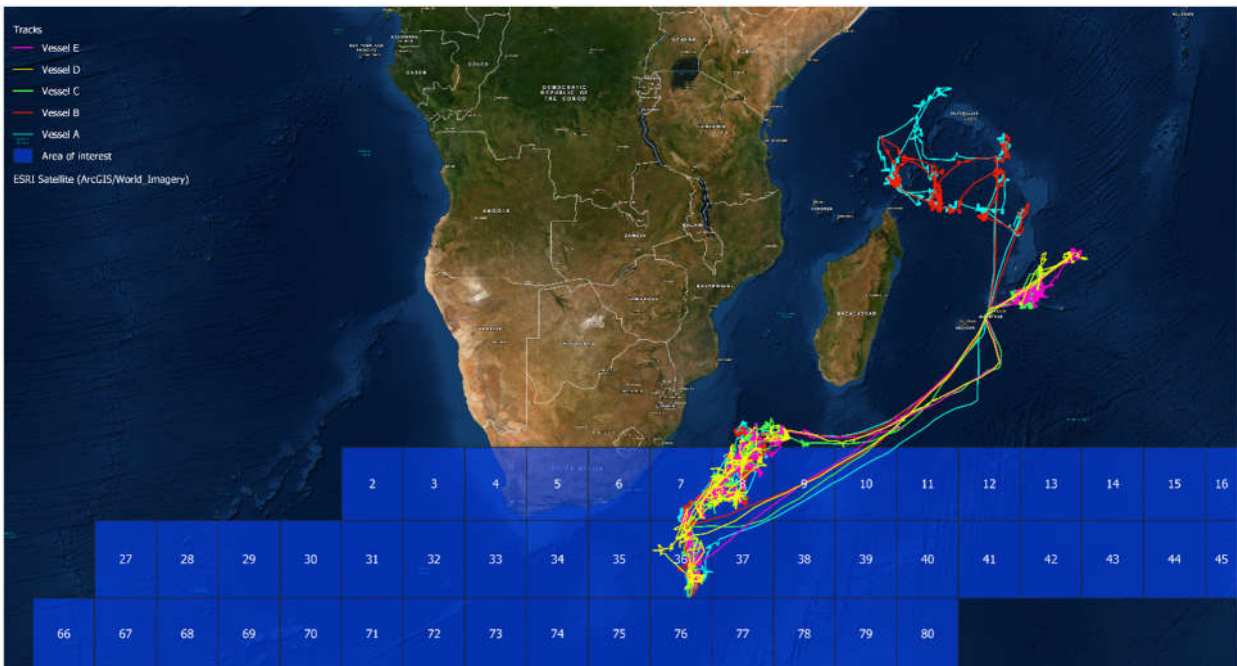


Figure 18: 2017 AIS tracks of CCSBT authorised vessel A (turquoise), vessel B that was authorised from 01/04 (red) and vessels C, D and E with no 2017 CCSBT authorisation (green, yellow, purple)

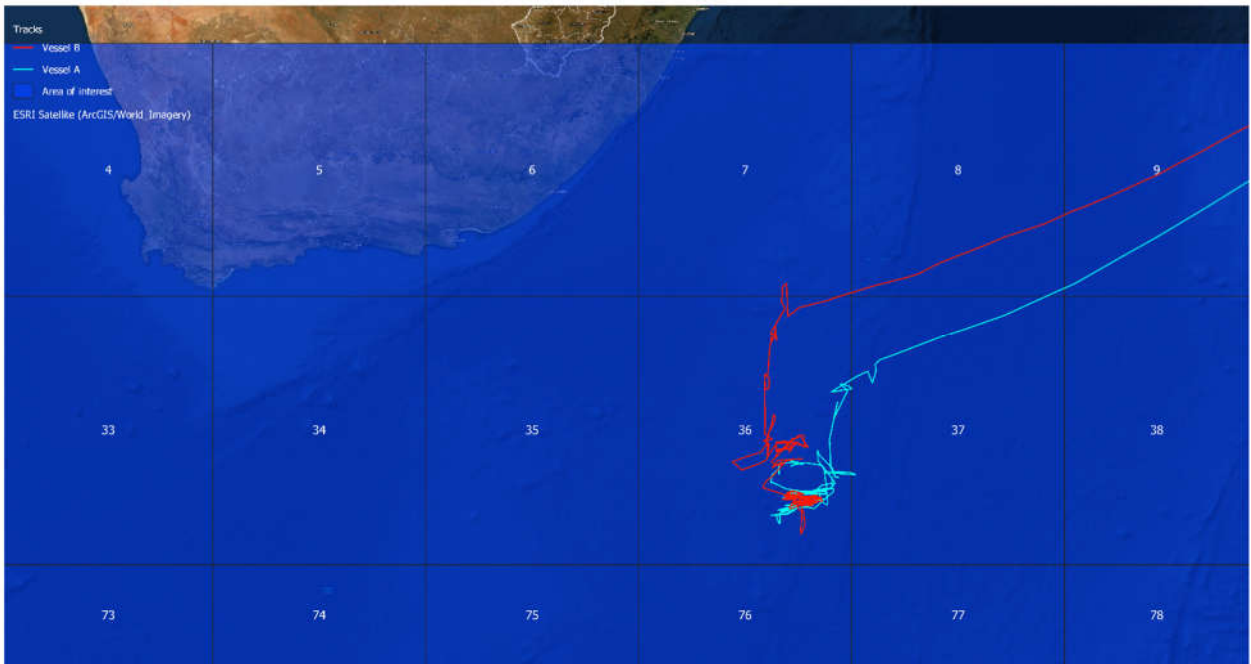


Figure 19: Operations of the CCSBT authorised vessel A (turquoise) partly authorised vessel B (red), in the area of interest, prior to the latter vessel's CCSBT authorisation, which started on 1 April 2017

Figure 20 provides another example of a clear tandem relationship, involving vessel F (CCSBT authorised) and vessel G, both of which made visits to the port of Cape Town during 2017. The CCSBT authorised vessel left Cape Town in March and returned in December and was not detected making any port calls in the intervening months, although it was not transmitting on AIS between 25<sup>th</sup> March and 19<sup>th</sup> July, during which time its operations are unknown. This vessel was also not detected in any at-sea encounters during 2017. It is highly unlikely that the vessel could have operated from March to December without offloading catch, which suggests that one or more of its port calls and/or transhipment operations are not visible on AIS.

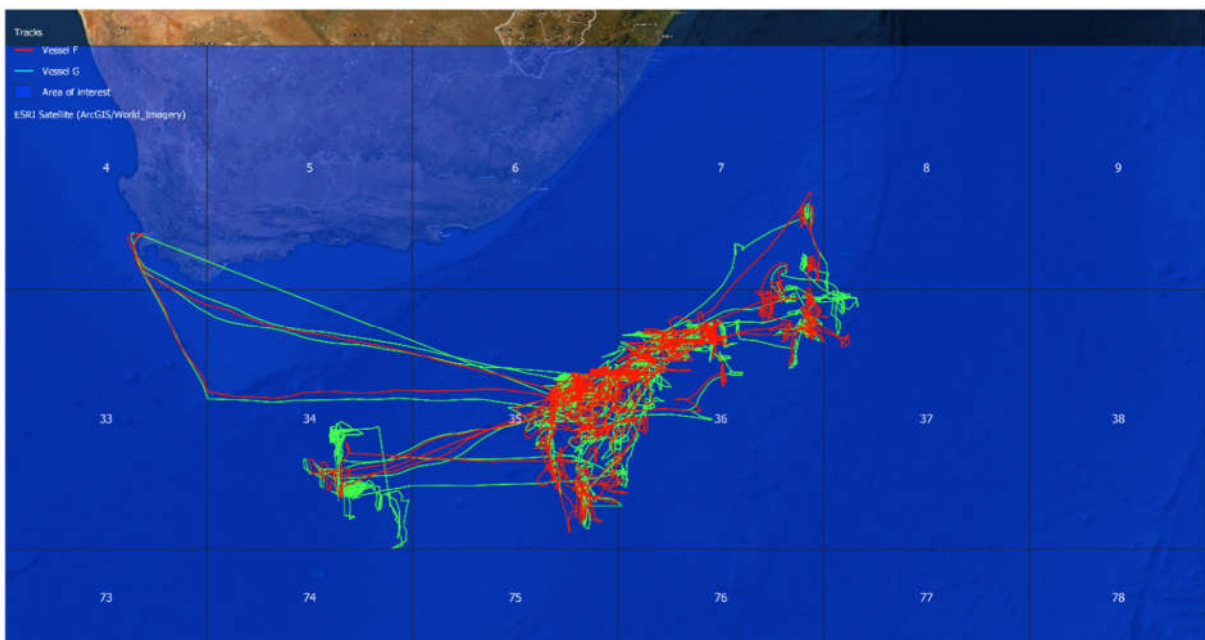


Figure 20: 2017 AIS tracks of the CCSBT authorised vessel F (red) and unauthorised vessel G (green), showing tandem operations out of the port of Cape Town



### Overview of vessels involved in tandem relationships

57 CCSBT-authorized vessels were detected in potential tandem operations, of which 47 were Taiwanese flagged and the remainder were flagged to New Zealand, Spain, Portugal and Japan. The 57 vessels were detected making 144 port calls during 2017, just over half of which were to Port Louis, Mauritius. The second most visited port by authorized vessels involved in tandem relationships was Kaohsiung, Taiwan, followed by Durban and Cape Town, South Africa.

Port	No. of port visits
Port Louis, Mauritius	78
Kaohsiung, Taiwan	14
Durban, South Africa	9
Cape Town, South Africa	8
Singapore, Singapore	7
Denpasar, Indonesia	6
Russell, New Zealand	6
Gisborne, New Zealand	4
Tauranga, New Zealand	4
Montevideo, Uruguay	2
Victoria, Seychelles	2
Kerikeri, New Zealand	1
George Town, Malaysia	1
Shizuoka, Japan	1
Yaizu-shi, Japan	1

*Table 7: Ports visited by CCSBT authorised vessels that were detected in potential tandem operations with CCSBT-unauthorised vessels*

64 CCSBT-unauthorised vessels were detected in potential tandem operations, of which 40 were flagged to Taiwan, 11 to Seychelles, 9 to China and the remainder were flagged to New Zealand, Vanuatu, Japan and flag unknown (IKAR). Seven CCSBT-unauthorised vessels were identified which were detected in fewer than two port visits during 2017, had no detected at sea transshipments, and were involved in a potential tandem operation with one or more authorised vessels. On the basis that available AIS data indicated limited opportunities for transshipment in port or with a reefer, these could potentially be considered higher risk for encounters with authorised CCSBT vessels, or other unauthorised transshipment not visible on AIS.

### AIS coverage

The level of AIS coverage varied significantly between vessels, with some of the CCSBT-unauthorised vessels transmitting throughout the year, whilst others had one or more long gaps in AIS transmissions. AIS tracks for 2017 were analysed to identify gaps in received signals of 48 hours or longer. Based on this 48 hour threshold, it was found that 55 out of 167 vessels transmitted for 90% or more of 2017 – ie. the vessel was in an AIS gap of 48 hours or more for 10% or less of the year. By contrast, 19 vessels were identified which had AIS coverage for 50% of the year or less. The level of AIS coverage varied by flag State - Japanese flagged vessels had the highest rate of AIS coverage, transmitting for an average of 338 days in the year. The lowest level of AIS coverage was shown by the stateless vessel IKAR, which transmitted for only 40 days in total despite operating on the fishing grounds over a period of several months.

Gaps in AIS coverage do not necessarily indicate that a vessel is operating illegally or otherwise non-compliant – some vessels may switch AIS off during port visits, which can cover extended periods of

time, and gaps in AIS coverage can also occur when vessels are operating in busy areas and signals are not received. Nevertheless, significant AIS gaps do limit our ability to identify vessel operations based on AIS data and for this reason it should be assumed that the at-sea encounters, tandem operations and fishing activity outlined in this report are only a sub-set of the total activity by these vessels. In addition, it should be noted that a gap of 48 hours is sufficient for a vessel to conduct transshipment at sea, so even those vessels with high levels of AIS coverage according to this analysis may have gone dark on AIS for periods long enough to engage in undetected at-sea encounters.

<b>Flag</b>	<b>NO. of vessels</b>	<b>Total days AIS coverage</b>	<b>Average days/MMSI</b>
Japan	3	1014	338
France	3	963	321
Seychelles	15	4543	303
Taiwan	95	27827	293
Falkland Islands	1	291	291
Vanuatu	6	1711	285
Malaysia	6	1658	276
China	28	7659	274
South Africa	1	269	269
United Kingdom	1	262	262
Spain	1	221	221
Cook Islands	1	209	209
Oman	1	107	107
Australia	1	105	105
Fiji	1	77	77
New Zealand	2	124	62
Unknown	1	40	11

*Table 8: Total AIS coverage by flag State for 2017, and average per vessel - gaps in coverage defined as any period of 48 hours or more with no transmissions received*

## RFMO reported catch levels

Low speed presence by CCSBT-unauthorised vessels in each of the 103 cells was cross-referenced with CCSBT catch data (aggregated for the years 2015 – 2017). For cells occurring in the IOTC area, vessel operations were also cross-referenced with IOTC reported catch and catch rate (average for the years 2015 – 2017). The decision to focus on IOTC catch data was made on the basis that a significant proportion of activity by CCSBT-unauthorised vessels occurred in the IOTC area. Cells with very high and very low levels of catch reported to CCSBT were subject to analysis in order to identify any trends or activities that could potentially be considered high risk for SBT IUU.

## Cells with low or zero catch reported to the CCSBT

The area of interest included a number of cells with no or very low catch reported to CCSBT, despite occurring within the assumed general distribution of SBT. This could be explained by the fact that SBT are not present (or present in low numbers) in these areas; because vessels are not fishing there for unknown reasons; or because SBT catch is not being reported. Fishing vessel low speed hours for these cells were checked for any indications of unreported fishing in these areas.

39 of the 103 cells in the area of interest had a total reported catch level below 100 SBT for the years 2015 – 2017. Of these 39 cells, 15 had no reported catch of SBT.

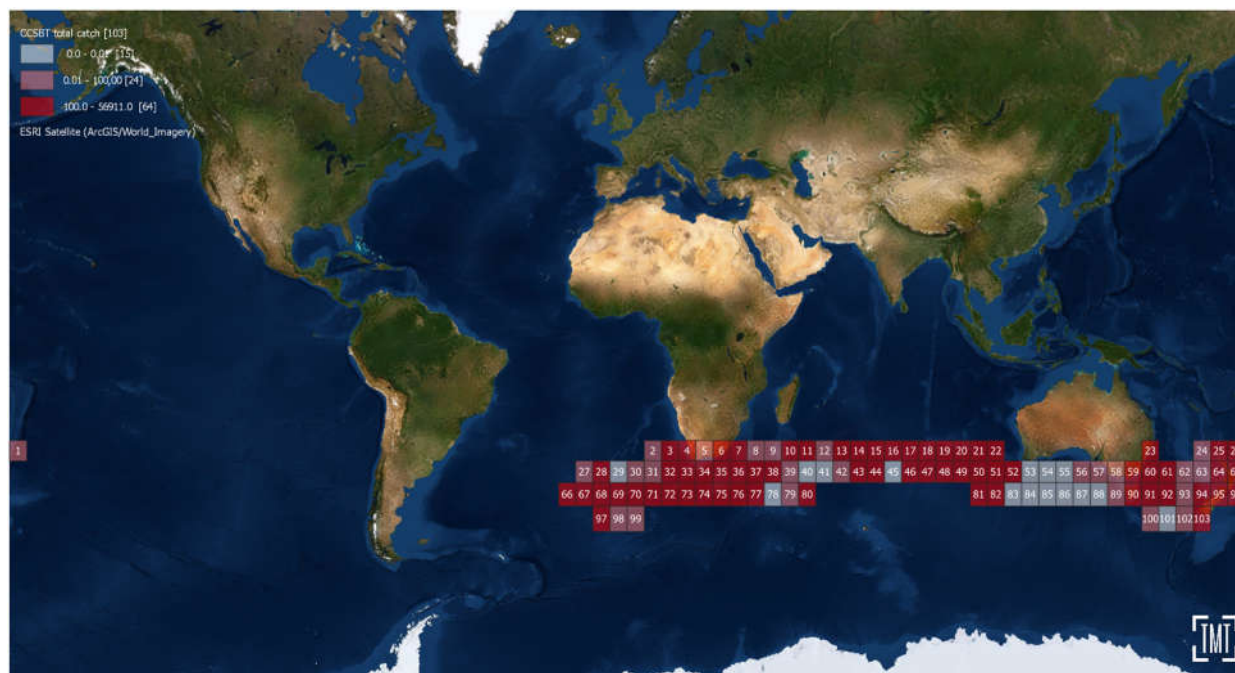


Figure 21: The 103 cells in the area of interest, showing CCSBT total reported catch level and cells with zero catch reported highlighted

## IOTC area:

13 of the 15 cells with zero reported CCSBT catch occurred within the IOTC area, and ten of those also had no catch reported to IOTC during the same period. Of the ten cells with no catch reported to either RFMO, there were six cells with no AIS presence by CCSBT authorised or CCSBT-unauthorised vessels. In four cells, low speed operations by CCSBT-unauthorised vessels were detected. However, visual analysis of CCSBT-unauthorised vessel tracks in these cells confirmed that all low speed hours were either related to vessels that were occasionally engaged in a holding pattern whilst in transit through the cells, or fishing activity by vessels that were unlikely to be targeting SBT, based on vessel tracks or known vessel authorisations.

<b>CELL</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>78</b>
<b>Presence hours</b>	304	344	389	2269
<b>CCSBT-unauthorised low speed hours</b>	85	195	214	1758
<b>Explanation</b>	Transit and holding pattern	Transit and holding pattern	Transit and holding pattern	Presence and fishing by non-relevant vessels

Table 9: Vessel presence in cells with no reported CCSBT or IOTC catch

3 of the 15 cells with zero reported CCSBT catch that occurred in the IOTC area did have significant IOTC catch reported for this period, which was reflected in the level of CCSBT-unauthorised vessel low speed hours. The total fishing hours by the 277 CCSBT authorised vessels in these cells was much lower, suggesting that fishing activity in these areas is primarily targeting IOTC or other species, rather than SBT.

<b>CELL</b>	<b>40</b>	<b>41</b>	<b>45</b>
<b>IOTC total catch by NO</b>	94607	287445	11415
<b>IOTC total catch by MT</b>	1656.657	3712.76	198.44
<b>Authorised low speed hours</b>	0	313	2
<b>CCSBT-unauthorised low speed hours</b>	12123	19223	1947

Table 10: Vessel presence in cells with no reported CCSBT catch and high reported IOTC catch

**Cell 45** is located almost entirely within the EEZ of the French territory of Iles Amsterdam & Ile Saint-Paul, with the corners of the cell extending beyond the EEZ. Low speed hours by CCSBT-unauthorised vessels consisted primarily of operations by toothfish longliners and trawlers operating within the EEZ, as well as one tuna longliner operating just outside the EEZ. Another longliner, authorised to both CCSBT and IOTC, also briefly operated on the high seas of this cell, accounting for the authorised low speed hours.

**Cells 40 and 41** are located on or in the vicinity of Gallieni, Gaus, Atlantis II and Novara fracture zones. They had high levels of CCSBT-unauthorised vessel low speed hours, primarily associated with longliners authorised to the IOTC. This corresponds with the level of catch reported to the IOTC for this area, which was also high.

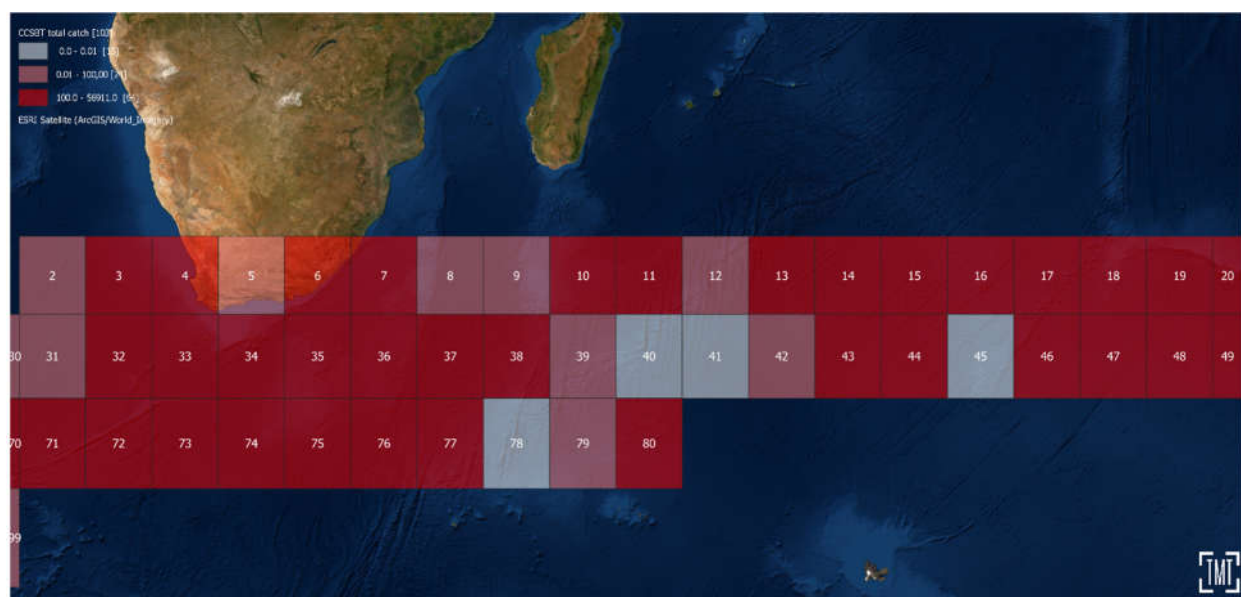


Figure 22: Cells located in the Western Indian Ocean

It should be noted that three of the cells adjacent to **cells 40 and 41** also have a low level of catch reported to the CCSBT, which suggests that whatever is causing the low level of catch reported in 40 and 41 is relevant across a wider area.

**ICCAT area:**

The remaining 2 of the 15 cells with zero reported CCSBT catch were located in the ICCAT area.

CELL	29	101
Authorised low speed hours	868	0
CCSBT-unauthorised low speed hours	1011	0

Table 11: Vessel presence in cells with no reported CCSBT catch located in the ICCAT area

While **cell 101** had no detected fishing vessel presence on AIS, **cell 29** had a significant number of both authorised and CCSBT-unauthorised low speed hours. As this cell was in the northernmost part of the area of interest, CCSBT catch level in the area immediately to the north was not known, and catch levels in cells to the east and west were low, however it is interesting to note that the cells immediately to the south of cell 29 had significant reported levels of CCSBT catch, and included the cell with the highest recorded catch level in the area of interest (cell 69 – 56,911 specimens 2015-2017), as well as the cells with the third and tenth highest reported catch levels. The catch rates in these cells were the 19<sup>th</sup>, 26<sup>th</sup> and 27<sup>th</sup> highest in the area of interest.

CCSBT-unauthorised vessel activity in cell 29 was accounted for by four Taiwan flagged longliners, three of which operated out of Montevideo and one out of Cape Town. One was CCSBT authorised from 1<sup>st</sup> April 2017 but was included on the CCSBT-unauthorised vessel list as its activities in the area of interest started before this date. All fishing activity by these vessels in cell 29 occurred in March and April. This coincided with the peak of authorised vessel low speed hours in cell 29, which were primarily associated with fishing activity by four Taiwanese flagged longliners, all of which also operated out of Montevideo and fished in the area in March or April (one called in to Cape Town following this fishing trip).

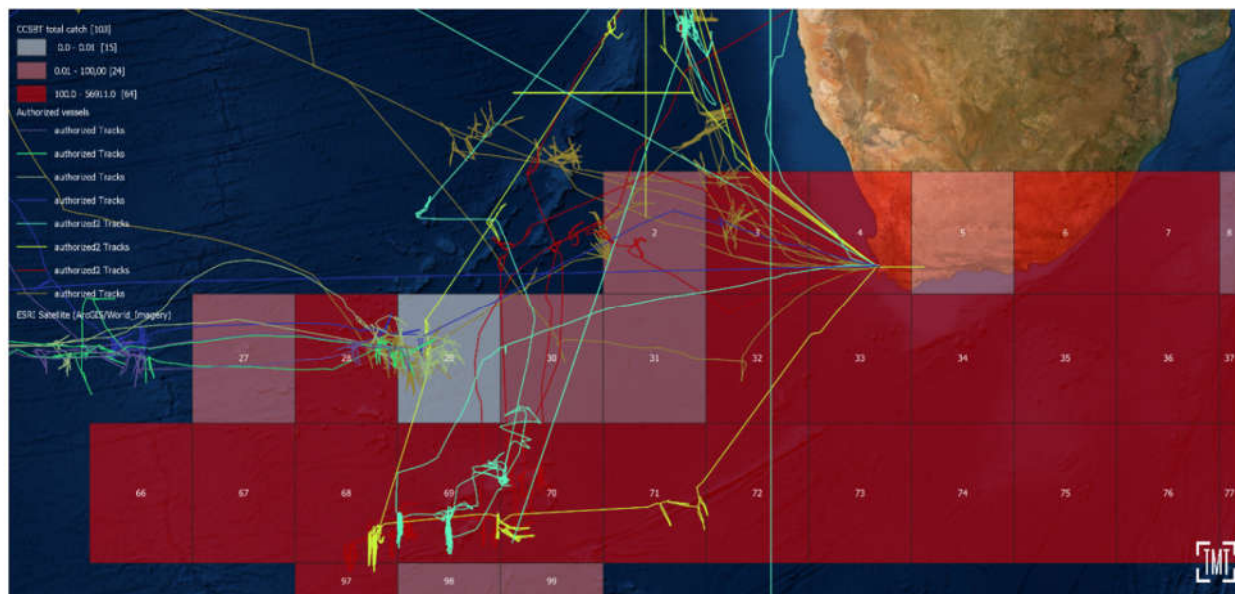


Figure 23: AIS tracks of CCSBT authorised vessels that operated in or near cell 29 in 2017



Based on the high catch levels reported immediately to the south, it could be hypothesised that the fishing activity by authorised and CCSBT-unauthorised vessels in cell 29 includes at least some targeting of SBT. However, all of the vessels operating in this area were also ICCAT authorised in 2017, so vessel presence would need to be overlaid with ICCAT catch data, and possibly also data on distribution and migratory patterns of SBT, to more accurately assess the risk of SBT IUU in this area.

#### Cells with high catch reported to the CCSBT

Of the 10 cells with the highest total catch reported to the CCSBT, five were located in the Western Pacific, two in the Indian Ocean, and three in the Atlantic. Five of these cells contained activity by CCSBT-unauthorised vessels, while five did not. Of the five cells with vessel activity, the two located in the Indian Ocean had the highest level of activity by CCSBT-unauthorised vessels, followed by two cells in the Western Pacific and one in the Atlantic.

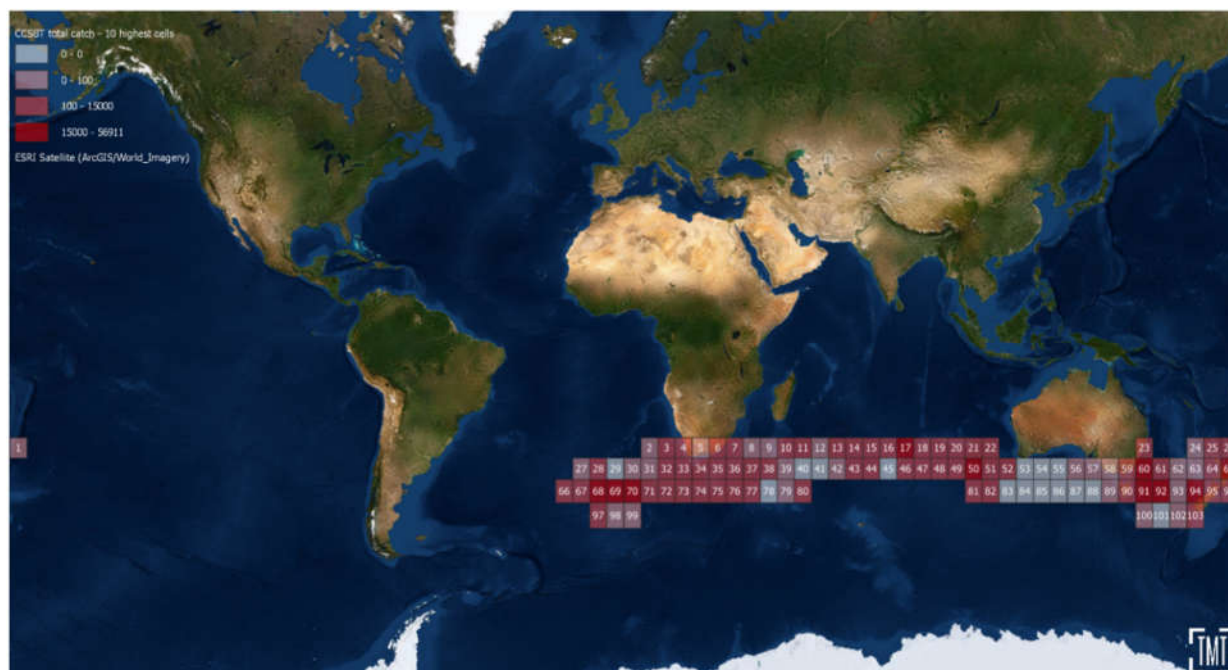


Figure 24: Cells categorised by reported CCSBT catch level

CELLS	17	50	60	65	68	69	70	91	92	94
CCSBT total catch/NO	25082	53693	30818	22710	19467	56911	45796	42450	29964	24042
IOTC total catch by NO	126255	122826	NA	NA	NA	NA	NA	NA	NA	NA
IOTC total catch by MT	1725	1023	NA	NA	NA	NA	NA	NA	NA	NA
Authorised low speed hours	14056	19029	446	17726	11853	12089	8440	9711	10064	7776
CCSBT-unauthorised low speed hours	2187	1051	160	24	90	0	0	0	0	0

Table 12: Vessel presence in the ten cells with the highest reported CCSBT catch

CCSBT-unauthorised low speed hours in **cell 65**, which is located along the north east coast of New Zealand, were associated with two New Zealand flagged fishing vessels, which sources suggest were likely to be targeting bottom species, so not considered high risk for SBT IUU. **Cell 68**, which is located south east of Tristan da Cunha, saw a low level of fishing activity by a Falkland Islands flagged fishing vessel, which was also considered to be low risk for SBT IUU.

Some of the low speed hours assigned to **cell 60**, off the south east coast of Australia, were associated with vessels making low-speed approaches to the port of Eden, which was located in the cell, as well as fishing activity by vessels that were not considered high risk for SBT IUU, based on operating patterns and reported gear type. However, analysis of AIS tracks indicated that two CCSBT-unauthorised Japanese vessels, presumed to be operating with drifting longlines, did carry out a set and haul operation on the high seas within the cell, as well as showing significant fishing activity in cell 61, to the east, which had a total CCSBT reported catch of 9338. WCPFC catch data was not included in this analysis, so the likelihood of vessels targeting other species in this area is not known.

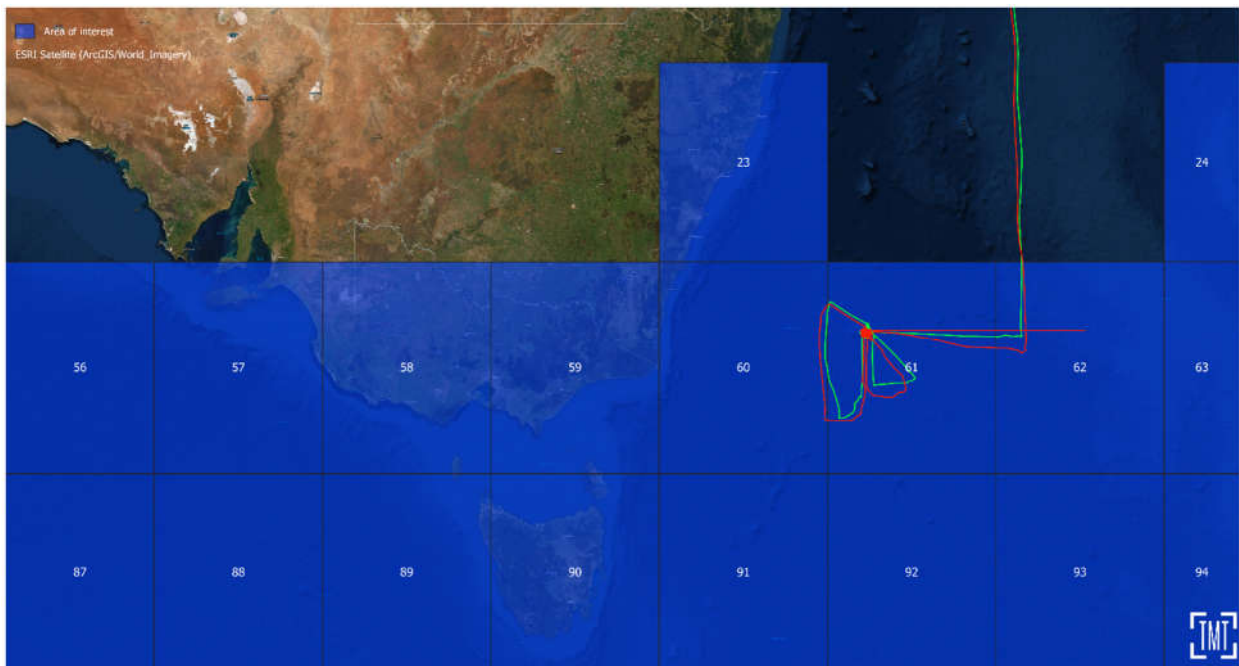


Figure 25: 2017 activity in the area of interest by two Japanese flagged longliners in cells 60 and 61

Low speed hours in **cell 50**, south west of Australia, were associated with seven vessels, which also operated further west in **cell 17** (high reported CCSBT catch) along with another 11 vessels, all of which also fished in many other neighbouring cells with lower CCSBT catch levels. Except for one vessel that was considered to be operating with bottom set gear, and so considered low risk for SBT IUU, all were identified as tuna longliners. This group of vessels included the eight that fished from east to west across the Indian Ocean – seven Chinese longliners that started their trip in Suva, and one Taiwanese longliner that started its trip in Taiwan. It also included eight Chinese longliners that fished in the Indian Ocean, based out of Port Louis (with some making additional port calls to Victoria, Seychelles and ports in China), as well as one Japanese flagged longliner that fished out of Denpasar, Indonesia. All were IOTC authorised, and catch levels reported to IOTC for this area were significant, so it is not possible to conclude based on AIS data alone whether any of these vessels were targeting SBT.

#### Area focus: High seas outside the EEZ of South Africa

A significant level of CCSBT-authorised and CCSBT-unauthorised vessel presence was concentrated in the Western Indian Ocean. Analysis of vessel presence through the year identified that the majority of CCSBT-unauthorised vessels operating in this area were present only seasonally, operating further north (outside the area of interest) during southern hemisphere summer. However, several vessels were identified that continued operating in the area of interest after the majority of the tuna fleet had moved north.

In November and December 2017, after the majority of the longline fleet that had been operating in the area of interest had moved north, four CCSBT-unauthorised vessels remained in cells 35 and 36, located southeast of the South African EEZ, with vessel tracks indicating that they continued to fish.



January



February



March



April



May



June



July



August



September



October



November



December



Figure 26: Low speed positions for all CCSBT-unauthorised vessels per month, through 2017.

Two of the vessels were flagged to Taiwan, one to the Seychelles and one vessel was operating with an unknown flag or stateless (IKAR, see above). Three of the four were IOTC authorised, and the two Taiwanese flagged vessels were also CCSBT authorised from 1 April 2017, but were included in the analysis as they commenced operations in the area of interest before this date (NB. this means that the activities of the two Taiwanese vessels in November and December 2017 were CCSBT authorised).

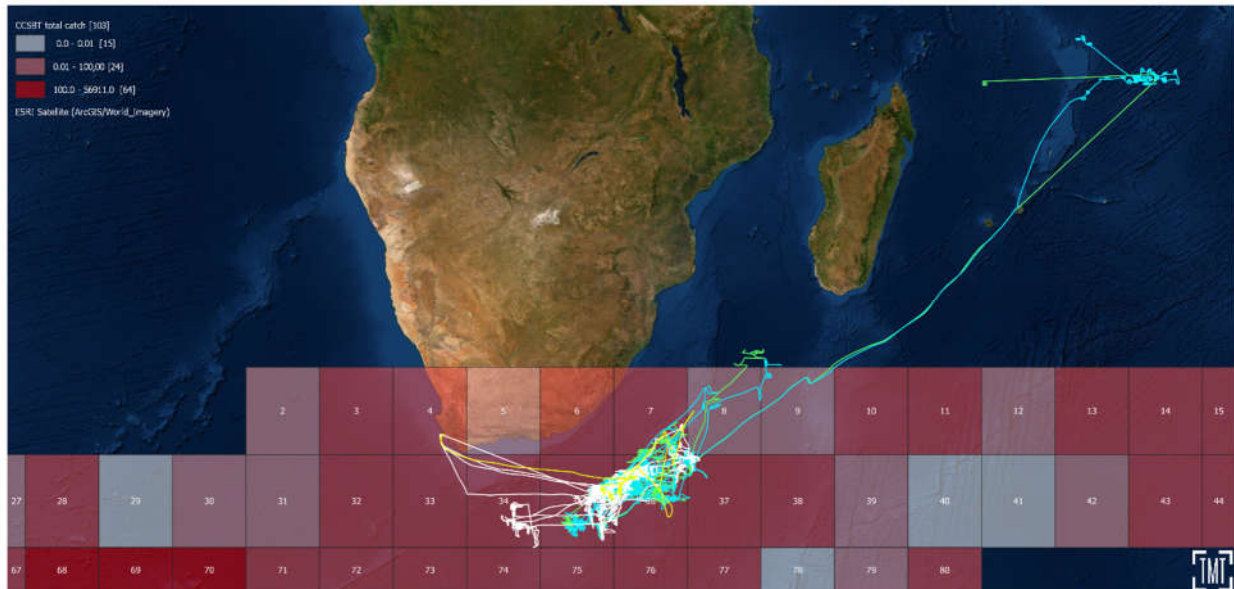


Figure 27: Map showing the tracks for the four vessels throughout 2017, and the concentrated activity off South Africa.

While the four vessels operated in several cells in this area through the year, analysis shows that the majority of their activities occurred within cells 35 and 36. This is also somewhat different to the general pattern displayed by CCSBT-unauthorised vessels in this area, which not only moved north for part of the year but also tended to have activities spread across more cells in the area of interest. It is interesting to note that the fleet composition of vessels operating in cell 35 in particular differs from the composition of the CCSBT-unauthorised fleet as a whole. Out of a total of 15 CCSBT-unauthorised vessels with low speed hours in cell 35 during 2017, seven were Seychelles flagged, six were Taiwan flagged, one flagged to Oman and one had flag unknown (IKAR). This means that 46% of the Seychelles flagged CCSBT-unauthorised vessels operated in this area at some point during 2017, compared to only 7% of the Taiwanese-flagged CCSBT-unauthorised vessels.

It is also interesting to note that the two Taiwanese flagged fishing vessels departed Port Louis, Mauritius around 10<sup>th</sup> of March 2017 and spent close to two weeks transiting to the area off South Africa, arriving at the fishing grounds only seven days prior to the start of their CCSBT authorization. This could be taken as an indication that the vessels' voyage to this specific area was undertaken, at least in part, to target SBT. However, this transit does also coincide with the movements of the wider tuna fleet, which also moves south around this time of year, so the significance of fishing activities in this early part of the year is unclear.

Both cells 35 and 36 had some low speed presence by CCSBT authorised vessels during November and December 2017 – with fishing activity by six Taiwanese flagged longliners, all of which fished in cells 35 and 36, with some activity in adjoining cells. Five of the six departed the area between early November and mid-December, calling in to port in either Port Louis, Cape Town or Kaohsiung. One vessel was still on the fishing grounds at the end of the year.

The significance of this activity by authorised vessels is unclear, as fishing activity by CCSBT authorised vessels in November and December could be taken to indicate that SBT may be targeted in this area during this period, but it is unclear why only a relatively small portion of the total authorised fleet would be present if that is the case. Low speed hours by authorised vessels (all of which were also IOTC authorised) were at their highest level in cells 35 and 36 in the middle of the year, coinciding with presence of the wider tuna fleet. This may simply indicate that the high level of fishing activity on IOTC species in these cells makes it difficult to detect trends in vessel activity targeting SBT. It should be noted that total reported catch of IOTC species in both cells is high.

## Conclusion

This analysis set out to use AIS data to detect fishing vessel activities that could be considered high risk for IUU fishing of southern bluefin tuna and identify any clear trends in risk activities, in terms of geographic distribution, flag State, port usage and other key vessel characteristics. 167 vessels were identified over AIS that fished in the defined area of interest, outside their EEZ, in 2017, without CCSBT authorisation. The majority of these were tuna longliners, which could therefore be considered a potential risk for IUU fishing of SBT. Clear trends were identified in the nationality, ownership nationality, operating pattern and port usage of these vessels. The majority were flagged to Taiwan and operated primarily in the Western Indian Ocean, making port calls into Port Louis, Mauritius. Other significant fleet segments included Chinese flagged longliners, operating out of Suva, Fiji and Port Louis, Mauritius; and Seychelles flagged longliners, which also operated primarily out of Port Louis. Smaller groups of vessels that should still be considered potentially significant for this study included Japanese longliners operating in the Pacific, and one that operated in the Eastern Indian Ocean out of Denpasar, Indonesia; Taiwanese flagged longliners operating out of Montevideo, Uruguay; and vessels operating in the Atlantic and Indian Oceans out of Cape Town, South Africa.

However, all but one of the tuna longliners identified were authorised to the area-based tuna RFMO where they were operating (IOTC, ICCAT or WCPFC). This meant that, with the exception of one suspected stateless vessel that operated in the Western Indian Ocean with no RFMO authorisation, all of these vessels were likely engaged in authorised fishing for other tuna species during part or all of the year. As a result, it was not possible to clearly identify any particular activities or vessels as high risk for SBT IUU on the basis of AIS analysis alone. However, analysis of AIS tracking data for these 167 vessels does provide potentially valuable insights to indicate geographic areas, ports and flag States that could be the focus of further efforts to detect IUU fishing of SBT.

Care should be taken in extrapolating trends in SBT IUU risk from the trends in vessel nationality and operating patterns outlined in this report. The analysis clearly identified that the majority of non-CCSBT authorised vessels operating in the area of interest were Taiwanese flagged, with a larger proportion under Taiwanese ownership, and most of these were operating in the Western Indian Ocean out of Port Louis, Mauritius. However, this reflects broader Flag State trends in industrial tuna longline fisheries so is to be expected, given the significant area of overlap between catch areas for SBT and other tuna species. Whilst the trends in vessel nationality and port usage outlined in this report can indicate focus areas for further investigations, it cannot automatically be assumed that these flag and port States account for the majority of SBT IUU catch.

The analysis sought to identify and describe operations by the CCSBT-unauthorised vessels in the area of interest, including fishing trips, related port calls, transshipment at sea and 'tandem operations', which indicate potential cooperation between CCSBT authorised and CCSBT-unauthorised fishing vessels. Clear trends but also significant variation in vessel operating patterns were identified. Time spent fishing in the area of interest ranged from one day or less by vessels dipping into the area as part of fishing operations situated largely outside; to trips lasting 200 days or more. The average trip length was 53 days and vessels were detected making between one and eight port calls during the year.

Some vessels had at-sea encounters with refrigerated cargo vessels, inside or outside the area of interest, but the number of vessels detected in at-sea encounters was not large. This may partly reflect the fact that some vessels made several port calls through the year, and likely offloaded catch in port; it is also likely that vessels had at-sea encounters that were not detected on AIS, because one or both of the vessels involved was not transmitting on AIS at the time. All detected encounters

involved reefer vessels that were authorised to the area-based RFMO in which they were operating, and some were also authorised to CCSBT. A number of reefer drift events were detected in the area of interest, but in the absence of cross-checking with other available data it is not possible to determine whether or not these involved transshipment at sea, and no clear donor vessels were identified on AIS.

64 vessels were detected in 'tandem operations' with one or more CCSBT authorised vessels. Track analysis indicated that these tandem operations ranged from groups of two or more vessels that operated very close together throughout the year, engaged in a clearly cooperative relationship, to vessels that operated close together over short periods of time with several opportunities for encounters at sea – generally in heavily fished areas.

Cross-referencing of vessel AIS data with CCSBT catch data, as well as IOTC catch data for cells occurring in the IOTC area, identified some areas and fleets that could be a focus for further investigation. However, in all cases where data was cross-checked, reported catch of other tuna species was significant, so cross-checking with other information sources is required to better determine SBT IUU risk in these areas. These areas of interest included:

- Taiwanese longliners operating in cell 29 (Atlantic) in March and April, out of the ports of Montevideo and Cape Town. This operation was considered potentially of interest due to the high reported catch of SBT in cells adjacent to the south.
- Japanese longliners which operated briefly in cell 60, to the east of the Australian EEZ – in an area with high catch reported to CCSBT
- Several vessels (primarily Chinese flagged, also one Taiwanese and one Japanese) which operated in cells 50 and 17 in the Eastern and Central Indian Ocean, operating out of several different ports in the Pacific and Indian Ocean.
- Vessels operating in cells 35 and 36 – located to the southeast of the South African EEZ, in the Western Indian Ocean – during the southern hemisphere summer, when the majority of the tuna fleet is operating in areas further north. Several authorised vessels were identified operating in this area, as well as two vessels that were CCSBT-unauthorised during November and December (one flagged to Seychelles and one stateless or flag unknown).

As with all studies conducted using AIS data, it is assumed that not all vessels and not all vessel operations were detected so the results of this analysis only reflect a sub-set of the vessels and operations that could be considered high risk for SBT IUU. Vessels that were not transmitting on AIS, and the majority of vessels that transmitted with no or low quality identifiers or using an MMSI that was subject to spoofing were not included in the analysis. It should also be assumed that some operations of the vessels that were included in the analysis were not detected, with the rate of AIS coverage varying significantly per vessel.

The reliance on AIS data to detect vessel presence could go some way to explain the fact that almost all vessels included in the analysis were authorised to the RFMO in which they were operating. It is possible that SBT are being targeted by IUU vessels, not authorised to any tuna RFMO, but if that is the case they are not transmitting clearly over AIS.

On the other hand, the analysis demonstrated the limitations of using positional data alone to detect IUU risk in a fishery that has significant overlap with other fisheries targeted by the same vessels. Whilst AIS can provide useful insights into the geographic areas, ports and fleets that could be the focus of further investigation, cross-checking with vessel level catch data, vessel inspection and other information sources is required in order to better understand the likely distribution of SBT IUU risk.