

**A Comparative Analysis of AIS Data with the  
Commission for the Conservation of Southern Bluefin Tuna  
Statistical Areas Reported Transshipment Activity in 2019**

## 2019 AIS-Detected Transshipment Activity in Tuna Regional Fisheries Management Organizations

Transshipment of catch at-sea is a major part of the global fishing industry, particularly the tuna sector. However, existing monitoring and regulatory controls over transshipment at-sea are widely considered [insufficient](#), with no guarantee that all transfers are being reported or observed in accordance with Regional Fisheries Management Organizations (RFMOs) Conservation and Management Measures (CMMs). Ineffective and/or incomplete monitoring, control and surveillance of at-sea transshipment creates opportunities for illegally caught seafood to enter the supply chain and may perpetuate human rights abuses aboard vessels and provide an enabling environment for other illicit activities.

To help increase the transparency and understanding of at-sea transshipment activities, Global Fishing Watch (GFW), in partnership with The Pew Charitable Trusts (Pew), is undertaking an [assessment](#) of at-sea transshipment activities occurring inside the Convention Areas of the five global tuna RFMOs. Together, GFW and Pew also launched the [Carrier Vessel Portal](#) (CVP) in 2020. The first of its kind, the CVP is a publicly facing tool focused on at-sea transshipment, that seeks to provide policymakers, authorities, fleet operators, and other fisheries stakeholders information on when and where at-sea transshipment activities are taking place. The CVP uses commercially available satellite Automatic Identification System (AIS) data, combined with machine learning technology and publicly available information provided by RFMO's, including registry data, to identify and display information on potential transshipment activity.

Utilizing the CVP, Pew and GFW are producing a series of annual [reports](#) that compare at-sea transshipment-related activities observable through AIS data with publicly available information generated from RFMO member implementation of the relevant at-sea transshipment CMM. These reports are designed to be RFMO-specific and cover calendar years 2017-2019 inclusive.

These reports assess the activity of carrier vessels and provide indication of possible transshipment events by comparing AIS data of vessels and determining possible “encounters” and “loitering” events. ‘Encounter Events’ are identified when AIS data indicates that two vessels may have conducted a transshipment, based on the distance between the two vessels and vessel speeds. ‘Loitering Events’ are identified when a single carrier vessel exhibits behavior consistent with encountering another vessel at-sea, but no second vessel is visible on AIS. This could be because a second vessel is not present or a second vessel is present but no AIS signal has been detected, also known as a ‘dark vessel’. Loitering events are estimated using AIS data to determine vessel speed, duration at a slow speed and distance from shore.

***Note: AIS data is only one dataset and additional information available to RFMO Secretariats, RFMO members, and flag States is needed to provide a complete understanding of any apparent non-compliant or unauthorized fishing activity identified within this report. Only after investigation by the Secretariat or relevant flag and coastal State authorities should that determination be made and appropriate enforcement or regulatory action taken.***

For more information on the data used in this study, or to request the data annex, please contact [carrier-vessel-portal-support@globalfishingwatch.org](mailto:carrier-vessel-portal-support@globalfishingwatch.org).

## **Acknowledgements**

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**Prepared by: Global Fishing Watch**

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## List of Acronyms

AIS – Automatic Identification System  
CCSBT – Commission for the Conservation of Southern Bluefin Tuna  
CMM – Conservation and Management Measure  
CVP – Carrier Vessel Portal  
DPE – Designated Port of Entry  
EEZ – Exclusive Economic Zone  
GFW – Global Fishing Watch  
IATTC – Inter-American Tropical Tuna Commission  
ICCAT – International Commission for the Conservation of Atlantic Tunas  
IOTC – Indian Ocean Tuna Commission  
IUU – Illegal, Unreported and Unregulated  
LSTLV – Large-Scale Tuna Longline Vessels  
MCS – Monitoring, Control and Surveillance  
MoU – Memorandum of Understanding  
PSMA – Port State Measures Agreement  
RFMO – Regional Fisheries Management Organization  
ROP – Regional Observer Program  
SBT – Southern Bluefin Tuna  
WCPFC – Western and Central Pacific Fisheries Commission  
VMS – Vessel Monitoring System

This report also refers to UN ISO 3166-1 alpha-3 country codes which can be found here for reference <https://unstats.un.org/unsd/tradekb/knowledgebase/country-code>.

## Executive Summary

Transshipment in the Commission for the Conservation of Southern Bluefin Tuna is currently regulated by the [Resolution on Establishing a Program for Transshipment by Large-Scale Fishing Vessels](#). This Resolution includes reporting requirements for both carrier and fishing vessels to help deter Illegal, Unreported, and Unregulated (IUU) fishing activities and better manage the Southern Bluefin Tuna (SBT) fishery. It also requires that all carriers receiving SBT transshipments at sea be authorized to do so by CCSBT, and that an observer be on board the carrier vessel during the transshipment. The Resolution acknowledges the need for greater monitoring, control, and surveillance of vessel activity, transshipments, and landings relating to SBT due to “...grave concern that...a significant amount of catches by IUU fishing vessels have been transhipped under the names of duly licensed fishing vessels.”

This is the third report GFW has submitted to the Annual Meeting of the CCSBT, in which commercially available Automatic Identification System (AIS) data is used to analyze the track histories of carrier vessels operating within the CCSBT Statistical Areas. This year GFW analyzed trends in potential transshipments and port visits during the 2019 calendar year by fleet, and provided an enhanced comparison of AIS activity with ROP data. Because CCSBT does not manage a defined geographic area, but rather Southern Bluefin Tuna, the analysis approach is slightly different than it is for other RFMO transshipment reports. For the analysis, possible transshipment activity is estimated by identifying encounters between carriers and fishing vessels after detected potential fishing activity within the CCSBT Statistical Areas<sup>1</sup> where SBT fishing activity is known to occur.

Collectively there was a 25 percent decline in detected encounters after potential fishing activity was detected in the CCSBT Statistical Areas and a 30<sup>2</sup> to 34<sup>3</sup> percent decline in reported at-sea SBT transshipments between 2018 and 2019, depending on the ROP report. However, there was a large increase in transshipment activity by carriers flagged to the Fishing Entity of Taiwan (hereafter referred to as “Taiwan”).

A similar ~20 percent decline in activity was seen in ROP reports and in detected encounter activity on AIS in the IOTC, ICCAT, and IATTC Convention Areas during the same time period<sup>4</sup>.

As in 2018, Taiwan LSTLVs were involved in the majority of detected encounters with carriers. Notably, there were 27<sup>5</sup> reported SBT transshipments with Taiwanese LSTLVs in 2019,

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<sup>1</sup> See more on Statistical Areas in [Resolution on the Implementation of a CCSBT Catch Documentation Scheme](#)

<sup>2</sup> CCSBT reported 95 SBT at sea transshipments in 2018 compared to 66 SBT at sea transshipments in 2019 -- see Attachment A Table 1 in Operation of CCSBT MCS Measures for CC14 (2018) and CC 15 (2019).

<sup>3</sup> ICCAT reported 29 and IOTC reported 72 at-sea SBT transshipments in 2018 (101 SBT transshipments total), compared to 24 and 43 reported at-sea SBT transshipments by ICCAT and IOTC in 2019 (67 SBT transshipments total), respectively.

<sup>4</sup> Referenced RFMO reports, once published, will be available at <https://globalfishingwatch.org/rfmo-transshipment/>

<sup>5</sup> See Attachment A Table 1 on page 7 in the CC 15 [Operation of CCSBT MCS Measures](#)

although Taiwanese LSTLVs were detected in 101 encounters after fishing in CCSBT Statistical Areas. The difference in the number of reported SBT transshipments and the number of detected encounters on AIS was smaller for Korea (4 detected, 6 reported) and Japan (33 detected, 33 reported).

Although the activity detected on AIS in the Southern Ocean does not necessarily indicate SBT transshipment, the large proportion of potential fishing activity in the SBT regions followed by AIS detected encounters with carriers with no reported SBT transshipments merits further examination. It also reinforces the continued need for diligent information exchange with Member States, and the need for a centralized VMS program with the Commission to facilitate the ability of the CCSBT Secretariat to strengthen oversight of transshipments involving SBT. Additionally, GFW shared the findings of this report with CCSBT Member States for comment prior to final submission to the Commission. The Fishing Entity of Taiwan provided comments regarding the statements made in the report about potential transshipment activity detected by Taiwan flagged vessels, see Annex 2 for detailed response.

The CCSBT Statistical Areas overlap with the Convention Areas of other tuna RFMOs, including the Indian Ocean Tuna Commission (IOTC) and the International Commission for the Conservation of Atlantic Tunas (ICCAT). CCSBT has a Memorandum of Understanding (MoU) with both ICCAT and IOTC<sup>6</sup> requiring the Secretariats of each RFMO to share information relevant to the transfer of their managed species. Overall, all encounters after potential fishing in the CCSBT Statistical Areas occurred during deployments that were reported under the Regional Observer Programs (ROP) of ICCAT or IOTC, and 75 percent of SBT transshipments reported through the ICCAT ROP were matched, highlighting the benefits of AIS as a complementary tool for validating reported information. Due to lack of available reported data, it was not possible to match AIS detected events in IOTC waters specifically to SBT transshipments.

Country reports submitted at the [CCSBT 15th Meeting of the Compliance Committee](#) include names of LSTLVs with reported SBT transshipments at-sea in 2019. This information was compared against the vessel names of LSTLVs detected in encounters after likely fishing in CCSBT Statistical Areas. Of the encounters with carriers that reported SBT transshipments at sea 82.6% of ICCAT and 77% of IOTC encounters were found to be with LSTLVs that also reported SBT at sea transshipments in 2019. This highlights the benefit of detailed information in ROP reports, including geolocation and time of transshipments as well as the need for information on the species transshipped in order to ensure accurate cross-verification of data.

Overall, there were 87 AIS-detected encounters after potential fishing activity by vessels within CCSBT Statistical Areas that occurred with carriers that were then not reported as having SBT transshipments in 2019 by either ICCAT or IOTC. All 87 encounters occurred during IOTC ROP authorized deployments, ensuring some level of oversight, however most of the encounters

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[https://www.ccsbt.org/en/system/files/resource/en/55f1089100365/CC10\\_06\\_IMCS\\_\\_\\_RFMO\\_Relationsh ips.pdf](https://www.ccsbt.org/en/system/files/resource/en/55f1089100365/CC10_06_IMCS___RFMO_Relationsh ips.pdf)

(93%) were with Taiwanese carriers, which report transshipment information separately to CCSBT as they are not a member of IOTC. Over half of the encounters with carriers that did not report SBT transshipments (45 encounters) occurred during peak SBT fishing season and 14 of those encounters occurred with a carrier not registered with and authorized by CCSBT. One of the encounters during peak SBT fishing season was with an LSTLV indicated as transshipping SBT at sea in 2019 and the other 44 encounters were with LSTLVs that did not report any at-sea SBT transshipments in 2019. The inability to trace SBT transshipments from fishing vessel, to carrier, to port across the RFMOs in one reporting structure causes a lack of transparency that makes it difficult to cross verify information. A central source of reporting records by the CCSBT Secretariat that compiles and cross-verifies the SBT transshipment reports and provides the detailed information on transshipments would greatly enhance transparency of SBT transshipments. If these records could be provided during voyages and compared to AIS data by the Secretariat, this could allow for targeted port inspections by member and cooperative ports that prioritizes vessels with a risk of unreported transshipment of SBT.

Landings and transshipments of SBT in port are regulated through the [Resolution for a CCSBT Scheme for Minimum Standards for Inspections in Port](#), which requires Members to designate ports of entry for foreign flagged vessels landing SBT and to inspect at least five percent of all landings. However, analysis of carrier activity indicated that only two of the six ports visited by carriers after encounters with fishing vessels were located within CCSBT Member States. Therefore, the majority of ports used by carriers which may be carrying SBT are not required to comply with this Resolution. While non-Member port States have been invited to attend annual meetings of CCSBT in the past, and have worked with CCSBT on a case by case basis, CCSBT should also encourage non-Member port States to provide inspection information for foreign vessels carrying SBT that visit their ports regardless of whether they not transship or land SBT. In addition, with the large amount of potential fishing and encounter activity detected on AIS within the CCSBT Statistical Areas, but not necessarily linked to reported SBT data, the Resolution should be expanded to include inspections of foreign carrier vessels carrying SBT while they are in port but not necessarily landing and/or transshipping catch.

The analysis of 2019 carrier vessel activity indicates that these Resolutions could be improved in the following ways:

<b>Finding</b>	<b>Recommendation for CCSBT</b>
<p>A 25% decline in encounters occurred in CCSBT during 2019.</p> <p>Although the general proportion of transshipment activity by flag States active in the area was consistent with 2018 findings, Taiwanese flagged vessel activity grew by 22%.</p>	<p>Implement a centralized VMS program to help facilitate the ability of the CCSBT Secretariat to assist in validating reported transshipments of SBT and detecting unreported activity.</p> <p>In addition to VMS, AIS use could be implemented through a Resolution to mandate AIS use for all CCSBT-authorized vessels and have minimum</p>

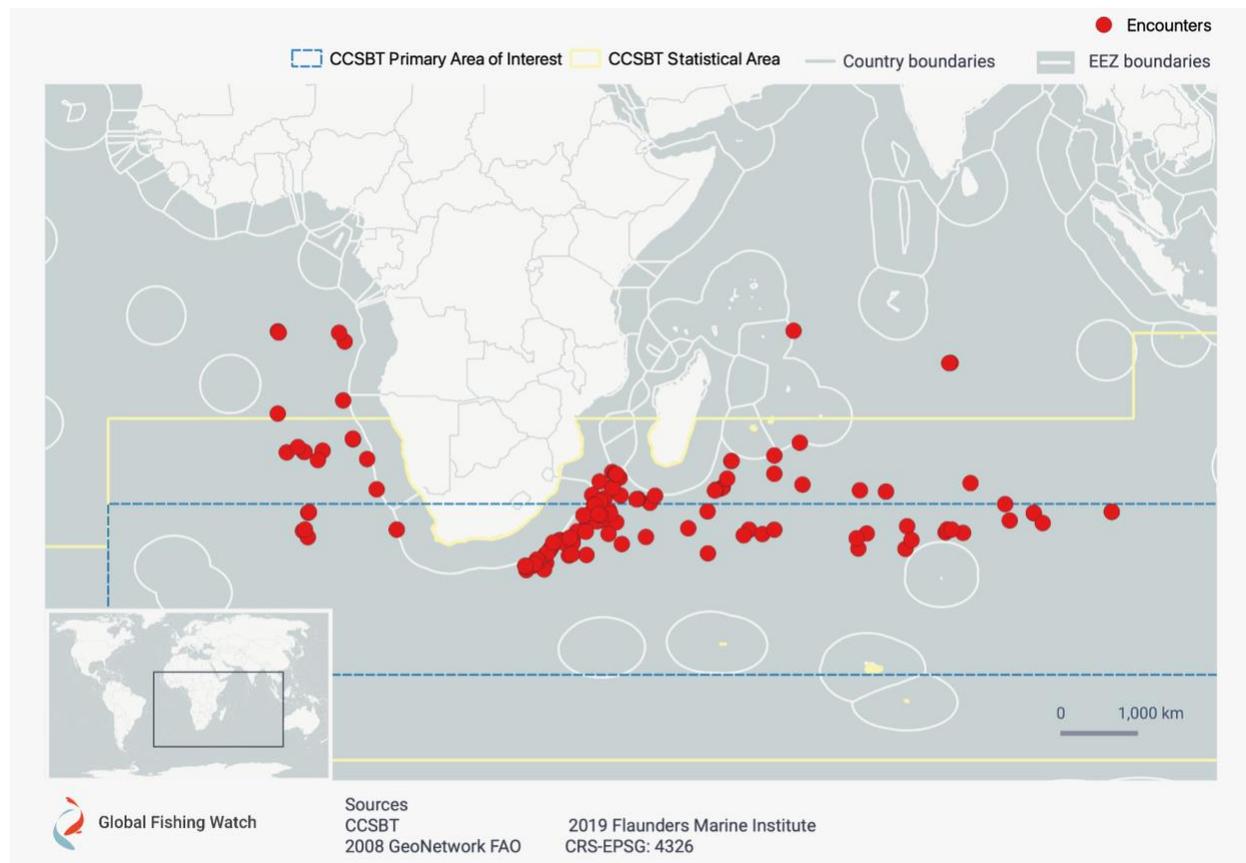
	standards on the implementation of SOLAS Chapter V Regulation 19 <sup>7</sup> .
<p>Using publicly available data, 75% of ICCAT ROP-reported SBT transshipments were matched to AIS detected events.</p> <p>87 encounters were conducted by carriers that did not report SBT transshipments to IOTC or ICCAT after LSTLVs were detected potentially fishing in the primary CCSBT areas of interest. At least 14 encounters during the peak SBT season involved carriers that were not registered with and authorized by CCSBT.</p>	<p>Request that public IOTC ROP reports contain date and geo-coordinates of all transshipment events. Strengthen the MoU with ICCAT and IOTC to require precise catch and transshipment information to be included in SBT transshipment reports, including species, time, and geolocation.</p> <p>Designate a central source of reporting records to compile and cross-verify SBT transshipment reports by Members along with ICCAT and IOTC ROP reports. Timely release of this information could facilitate targeted port inspections by member and cooperative ports that prioritizes vessels with a risk of unreported transshipment of SBT.</p>
<p>The majority of the port States visited by carriers after encounters with LSTLVs potentially fishing in CCSBT Statistical Areas are not members of CCSBT and are therefore not required to comply with the CCSBT Resolution on Minimum Port Inspections.</p>	<p>The CCSBT Resolution on Minimum Port Inspections should be expanded to include inspections of foreign carrier vessels carrying SBT while they are in port but not necessarily landing and/or transshipping catch.</p> <p>Maintain active engagement with non-Member port States to ensure inspections are conducted on both carrier and fishing vessels with a risk of unreported SBT onboard and exchange of inspection and landing details of vessels likely carrying SBT.</p> <p>Outline an obligation with the Resolution for Members to only land SBT that their vessels have caught in ports designated through the CCSBT CMM or designated as ports of entry under the PSMA.</p>

<sup>7</sup> [https://www.lisr.com/sites/default/files/SOLAS%20V\\_Reg19.pdf](https://www.lisr.com/sites/default/files/SOLAS%20V_Reg19.pdf)

## Activity Overview

### AIS Data Summary

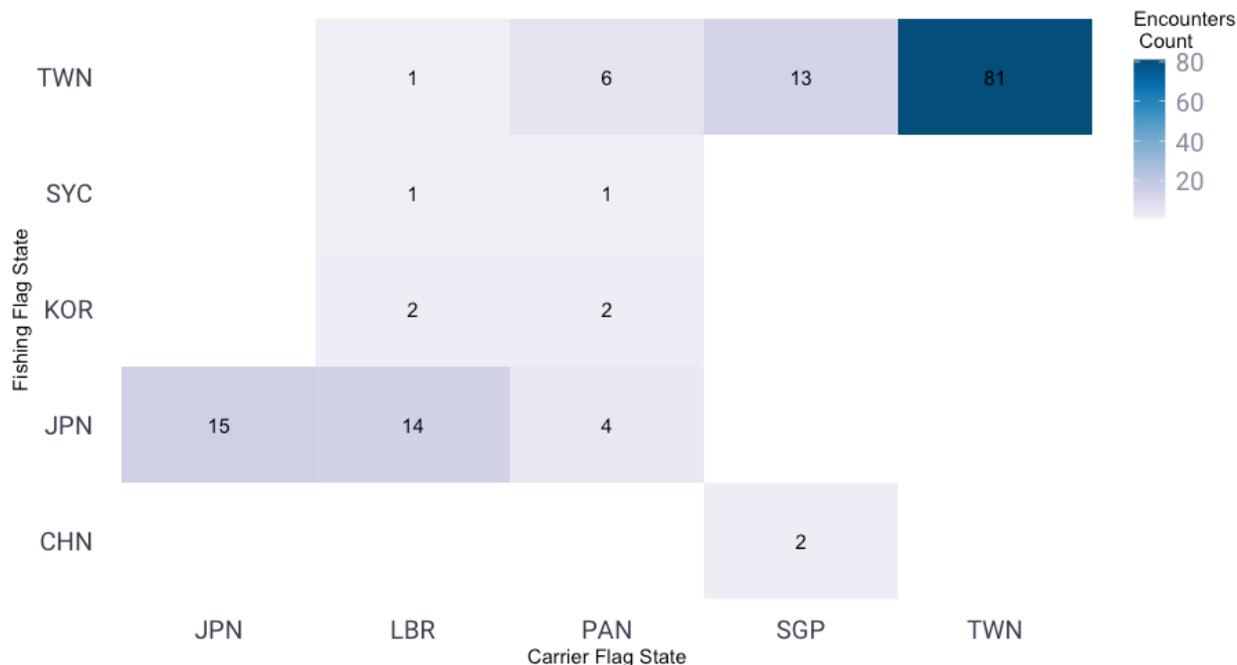
GFW recorded 147 AIS-detected encounters in 2019 between carrier vessels and Large-Scale Tuna Longline Vessels (LSTLVs) after the fishing vessel was observed potentially fishing<sup>8</sup> within CCSBT Statistical Areas. This report primarily focuses on the 142 encounters that occurred in the Statistical Areas between 20 West and 120 East longitude (Figure 1) as feedback from previous reports indicated this area was most likely to involve the capture of SBT.



**Figure 1.** Encounters that occurred between a carrier and fishing vessel after potential fishing occurred within the CCSBT Statistical Areas

<sup>8</sup> Any and all references to “fishing” should be understood in the context of Global Fishing Watch’s fishing detection algorithm, which is a best effort to determine “apparent fishing effort” based on data from the Automatic Identification System (AIS) collected via satellites and terrestrial receivers. As AIS data varies in completeness, accuracy and quality, it is possible that some fishing effort is not identified and conversely, that some fishing effort identified is not fishing. For these reasons, Global Fishing Watch qualifies all designations of vessel fishing effort, including synonyms of the term “fishing effort,” such as “fishing” or “fishing activity,” as “apparent,” rather than certain. Any/all Global Fishing Watch information about “apparent fishing effort” should be considered an estimate and must be relied upon solely at your own risk. Global Fishing Watch is taking steps to make sure fishing effort designations are as accurate as possible.





**Figure 3.** Number of encounters between carrier and fishing vessels by Flag State

It is important to note that the CCSBT analysis is reliant on fishing vessels being detected on AIS potentially fishing within the CCSBT Statistical Areas prior to an encounter. Thus, the summary of activity indicates those fleets that were active in the Southern Ocean, including potential fishing prior to possible transshipments, but may not directly correlate to fleets that did indeed catch SBT.

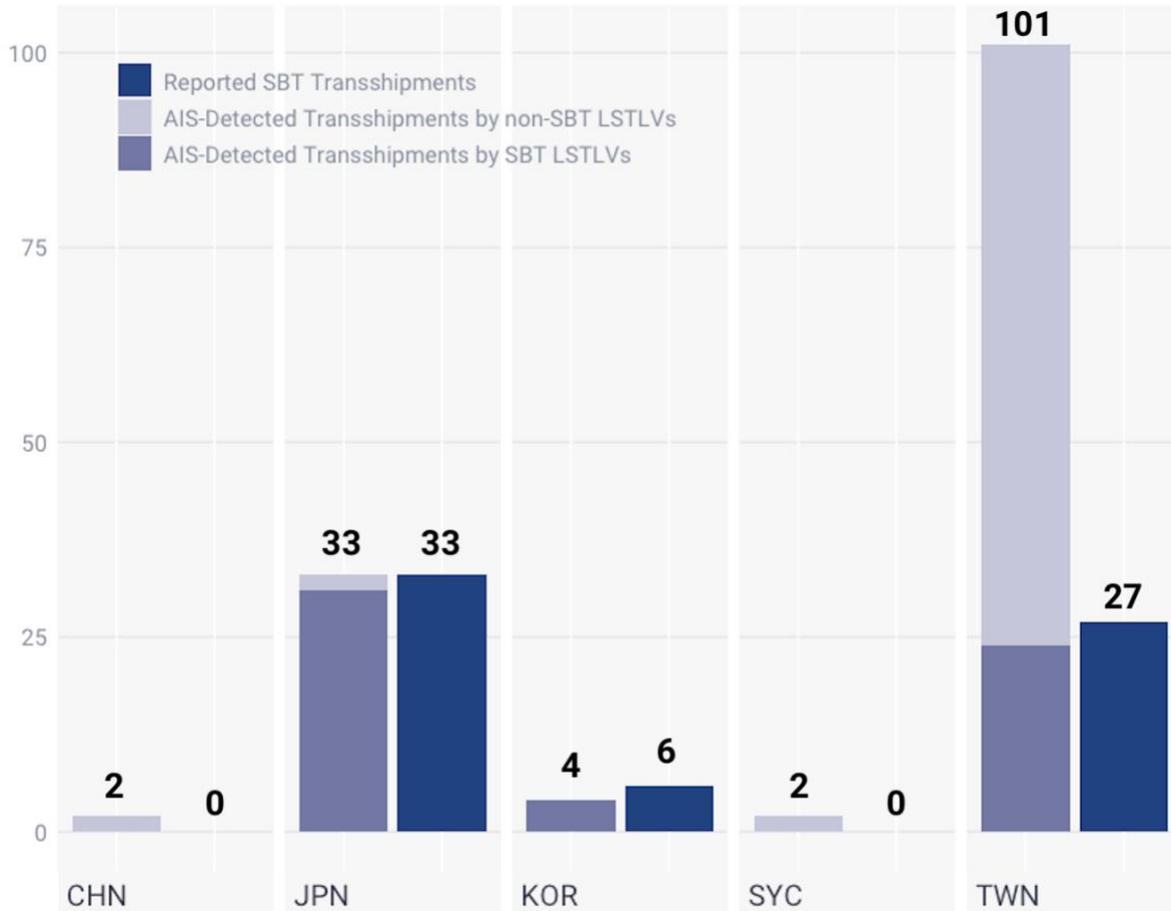
### *Comparison of CCSBT Transshipment Summary to AIS*

CCSBT provides a summary of reported SBT transshipments, by LSTLV flag State, in the [Operation of CCSBT MCS Measures](https://www.ccsbt.org/en/system/files/CC15_09_Operation_of_CCSBT_MCS_Measures_Rev1.pdf) report. When compared to AIS, Japanese and Korean LSTLVs were detected in a similar number of encounters as compared to the number of reported SBT transshipments, while Taiwan was detected in noticeably more encounters, relative to the number of reported SBT transshipments (Figure 4)<sup>9</sup>. Japan reported 33 SBT transshipments by their LSTLV fleet and Korea reported 6 SBT transshipments. On AIS, Japanese LSTLVs were detected in 33 encounters while Korean LSTLVs were detected in 4 encounters. The majority of Japanese LSTLVs detected in encounters (94%) and all of the Korean LSTLVs detected in encounters were with LSTLVs that reported transshipping SBT at sea in 2019 (Figure 4). There were significantly fewer SBT transshipments reported by Taiwanese LSTLVs (27)<sup>10</sup> than there were encounters detected on AIS after potential fishing in CCSBT Statistical Areas (101). It is possible the detected activity is related to other species of tuna, tuna-like species, or to SPRFMO managed species, but further investigation is warranted.

<sup>9</sup> See table 1 on page 7

[https://www.ccsbt.org/en/system/files/CC15\\_09\\_Operation\\_of\\_CCSBT\\_MCS\\_Measures\\_Rev1.pdf](https://www.ccsbt.org/en/system/files/CC15_09_Operation_of_CCSBT_MCS_Measures_Rev1.pdf)

<sup>10</sup> [https://www.ccsbt.org/en/system/files/CC15\\_09\\_Operation\\_of\\_CCSBT\\_MCS\\_Measures\\_Rev1.pdf](https://www.ccsbt.org/en/system/files/CC15_09_Operation_of_CCSBT_MCS_Measures_Rev1.pdf)



**Figure 4.** Number of reported SBT transshipments by LSTLV flag State compared to the number of detected encounters after potential fishing in CCSBT Statistical Areas. Detected encounters with the darker shading indicate LSTLV reported SBT at-sea transshipment in 2019.

For all carriers and fishing vessels active around the CCSBT Statistical Areas it is critical to ensure transshipment activity has proper oversight, via detailed ROP records and a centralized VMS system for the CCSBT Commission. It is also important to be able to compare AIS-detected activity with ROP-reported activity to cross-verify that all SBT related transshipment activity is being reported and what activity may require further investigation. Mandated use of AIS, ideally class A for best reception quality, would help ensure the accurate assessment of the data that can help independently verify reported activity. Requiring SBT to be *“transhipped separate to other tuna-like species, in order to assist observers with identification”* as recommended by CCSBT<sup>11</sup> would further ensure SBT transshipments maintain a proper level of oversight.

Collectively, AIS-detected transshipment events after potential fishing activity in the CCSBT Statistical Areas was down by 25 percent as compared to 2018.

<sup>11</sup> [https://www.ccsbt.org/en/system/files/CC15\\_09\\_Operation\\_of\\_CCSBT\\_MCS\\_Measures\\_Rev1.pdf](https://www.ccsbt.org/en/system/files/CC15_09_Operation_of_CCSBT_MCS_Measures_Rev1.pdf)

Reported activity was down by just over 30 percent as compared to 2018.<sup>12</sup> IOTC, IATTC and ICCAT also saw a similar decrease in AIS-detected and ROP-reported transshipment activity<sup>13</sup>. Analysis of the WCPFC Convention Area has yet to be completed. The exact reason for the decline cannot be assessed by AIS analysis. The cause is not currently known but may be linked to a change in catches or a shift in fishing operations towards port landings for 2019.

## Overlaps with IOTC and ICCAT ROPs

The CCSBT [Resolution on Establishing a Program for Transshipment by Large-Scale Fishing Vessels](#) outlines the monitoring and reporting requirements for carrier vessels and LSTLVs that transship SBT at sea and in-port. While the program requires a CCSBT observer to be on board the carrier vessel during the transshipment, the “*CCSBT transshipment program is harmonised and operated in conjunction with those of ICCAT and IOTC to avoid duplication of the same measures. ICCAT or IOTC observers on a transshipment vessel that is authorised to receive SBT are deemed to be CCSBT observers provided that CCSBT standards are met.*”<sup>14</sup>

GFW analyzed SBT transshipments which were reported through both the ICCAT and IOTC ROPs in 2019 and compared these reports to the AIS-detected encounters. ICCAT observer reports<sup>15</sup> were used to identify reported transshipments involving SBT. Table 1 in the IOTC document IOTC-2020-CoC17-04b<sup>16</sup> was used to identify information on transshipments of SBT within IOTC waters during 2019. No detailed geolocation or temporal data on SBT transshipments reported by the IOTC ROP is publicly available, in contrast to ICCAT.

### *Reported Activity*

To determine possible SBT-related transshipments, GFW identified encounters between carriers and LSTLVs occurring after the LSTLVs were detected potentially fishing in the CCSBT Statistical Areas on AIS. The total number of encounters by carriers listed as reporting SBT transshipments to ICCAT and IOTC were calculated and compared to the total number of reported transshipments by the carriers. The specific location of these encounters is shown in the figure below (Figure 5). The ICCAT ROP provides specific geolocation and time of reported SBT transshipments, and this data is also included in the map below (Figure 5). Because the ICCAT ROP data includes location and times of transshipments, as well as information on the type and volume of fish transshipped, GFW was able to match SBT transshipments to AIS-detected encounter and loitering activity in the ICCAT Convention Area (Figure 5).

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<sup>12</sup> 95 SBT transshipments reported to CCSBT in 2018

[https://www.ccsbt.org/en/system/files/CC14\\_06\\_Operation\\_of\\_CCSBT\\_MCS\\_Measures%20Rev1.pdf](https://www.ccsbt.org/en/system/files/CC14_06_Operation_of_CCSBT_MCS_Measures%20Rev1.pdf)  
compared to 66 SBT transshipments reported in 2019

[https://www.ccsbt.org/en/system/files/CC15\\_09\\_Operation\\_of\\_CCSBT\\_MCS\\_Measures\\_Rev1.pdf](https://www.ccsbt.org/en/system/files/CC15_09_Operation_of_CCSBT_MCS_Measures_Rev1.pdf)

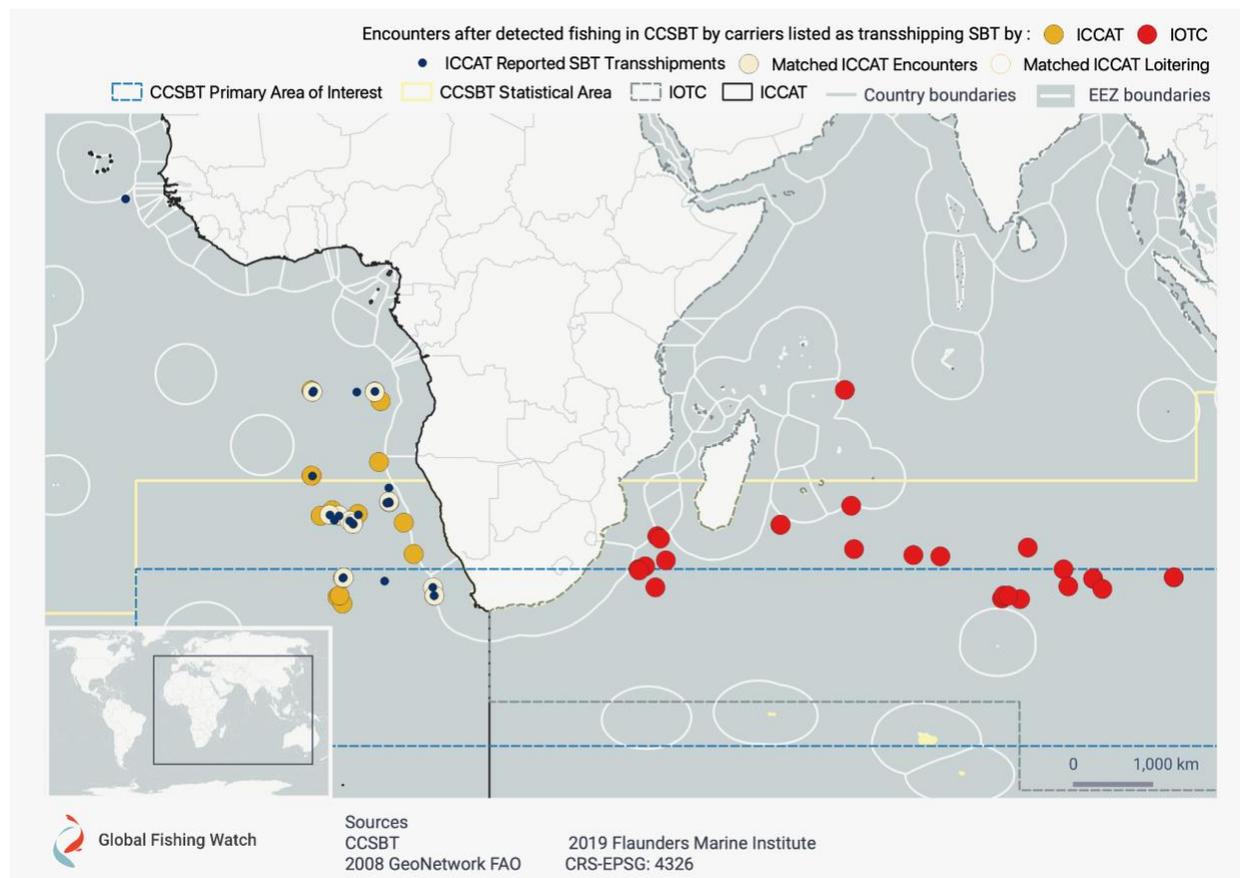
<sup>13</sup> A ~20 percent decline on the high seas between 2018 and 2019. Referenced RFMO reports, once published, will be available at <https://globalfishingwatch.org/rfmo-transshipment/>

<sup>14</sup> <https://www.ccsbt.org/en/content/monitoring-control-and-surveillance>

<sup>15</sup> <https://www.iccat.int/en/ROP.html>

<sup>16</sup> <https://www.iotc.org/documents/summary-iotc-regional-observer-programme-during-2019-contractor>

Further, all encounter and loitering events detected in ICCAT could be used in the matching of the ICCAT ROP SBT data as all SBT transshipped during ICCAT ROP deployments were indicated as being caught in the CCSBT Statistical Areas in 2019. AIS detected transshipments could not be matched for IOTC in an equivalent way as the exact locations and times of SBT transshipments is not available from the IOTC ROP.



**Figure 5.** Possible transshipment activity conducted by carriers that reported SBT transshipments to IOTC and ICCAT ROPs.

### *AIS Detected Events Matched to ICCAT ROP*

Of the 24 ICCAT ROP-reported SBT transshipments in 2019, GFW matched<sup>17</sup> 17 to encounter events and one to a loitering event. Therefore, a total of 18 distinct reported SBT transshipments, or 75 percent of the reported events, were detected via AIS (Table 1).

<sup>17</sup> A matched encounter is defined as an encounter event within 12 hours and 10 kilometers of a reported transshipment event. A matched loitering event is defined as within 12 hours and 5 kilometers of a reported transshipment event. The matching algorithm is stricter as loitering events are less well defined than encounter events.

This match rate is similar to 2018 (72.4%). If the matching algorithm is relaxed to match encounters within 13 kilometers of a reported SBT transshipment, as opposed to the 10 kilometer radius typically used, over 90% of SBT transshipments reported by ICCAT are matched. All of the matched encounters were verified to be with LSTLVs that reported SBT transshipments at-sea based on data available in CCSBT country reports.

When the same matching algorithm was used on only encounters detected after potential fishing in the CCSBT Statistical Areas (the 142 encounters identified after LSTLVs were detected potentially fishing in CCSBT Statistical Areas), the rate declined to under half matched (45.8%). This lower match rate would indicate that previous to encounters that matched reported SBT transshipments, the fishing vessel was not transmitting AIS consistently to be detected by GFW algorithms while active in the CCSBT Statistical Areas.

**Table 1.** AIS-detected Carrier Activity Compared to ICCAT Reported SBT transshipments

Carrier Flag	Reported Carriers	AIS-Detected Carriers	Reported SBT Transshipments	AIS Matched Encounters	AIS Matched Loitering
JPN	2	2	16	10	0
LBR	3	3	7	7	1
PAN	1	0	1	0	0

### *AIS Detected Events Matched to IOTC ROP*

Unlike ICCAT, IOTC’s ROP transshipment report does not include geolocation or timestamp data, or information on the species transshipped during individual transshipment events. IOTC does provide a list of carriers which reported SBT transshipments in 2019 and the total number of SBT transshipments reported by that vessel during the calendar year. GFW used this list to identify encounters by carriers with reported SBT transshipments in the IOTC Convention Area in 2019. Reported SBT transshipments and detected encounters after potential fishing in the CCSBT Statistical Areas is compared in the table below (Table 2). Notably, loitering activity is not analyzed in the IOTC, unlike in ICCAT. In ICCAT loitering events are matched to known SBT transshipments with reported geo-coordinates and time, whereas in IOTC SBT transshipment information is not publicly available. Because loitering, by definition, only indicates carrier movement potentially indicative of transshipment but with no fishing vessel identified there is no way to know if loitering in the IOTC is linked to fishing in the CCSBT Statistical Areas, and more pointedly, to SBT reported transshipments.

**Table 2.** AIS-Detected Carrier Activity Compared to IOTC Reported SBT Transshipments

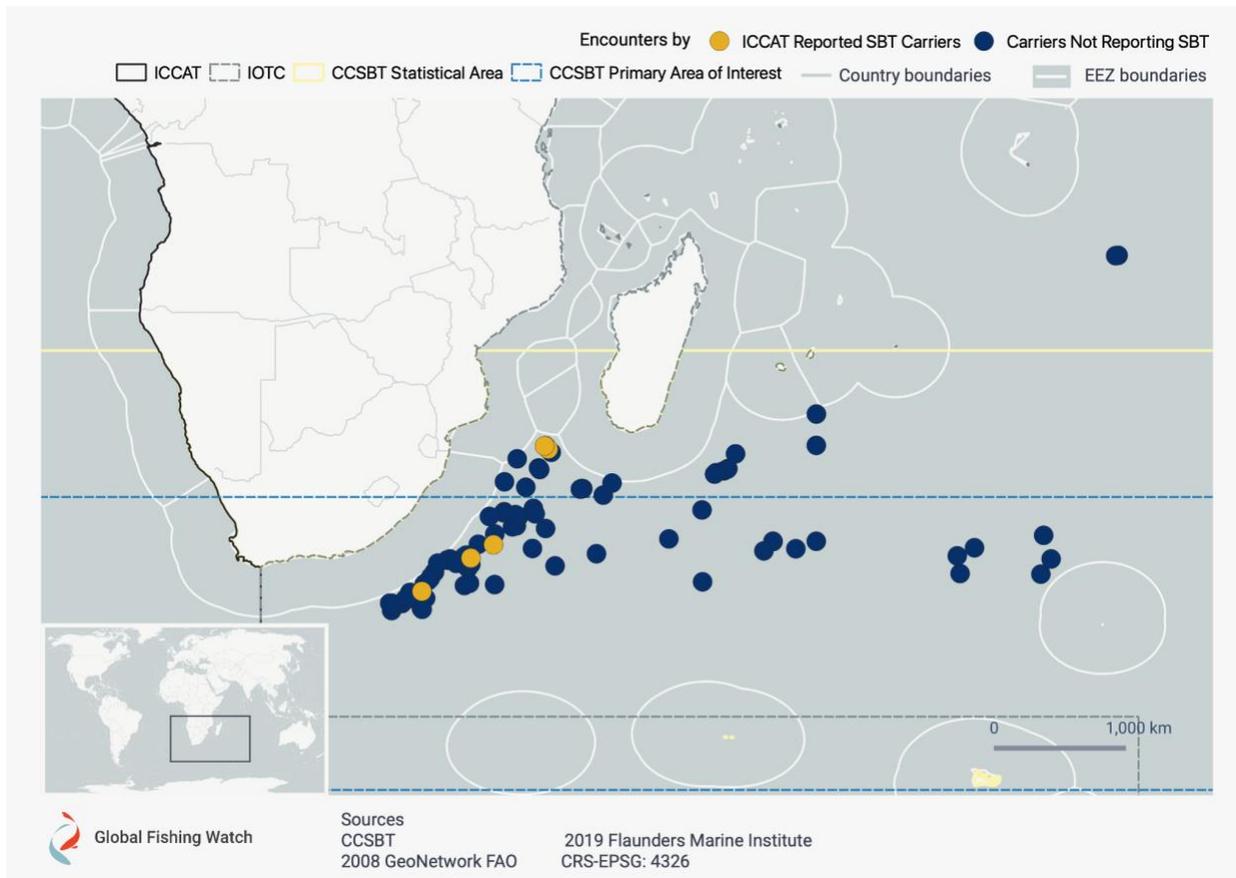
Carrier Flag	Reported Carriers	AIS-Detected Carriers	Reported SBT Transshipments	AIS-Detected Encounters
JPN	1	1	5	3
LBR	2	2	5	5
PAN	2	2	7	3
SGP	1	1	26	15

The high match rate with the ICCAT ROP data, as compared to the IOTC data provides several insights. AIS can be an effective supplementary tool in supporting the efforts of fisheries management authorities, and would be an even stronger tool were AIS mandated for use by all carrier and fishing vessels. Additionally, more comprehensive ROP reporting standards across all RFMOs, such as geolocation coordinates, time of transshipment event, and duration of transshipment would help improve cross verification of data.

#### *Detected Encounters Not Matched to Reported SBT Transshipments in the IOTC*

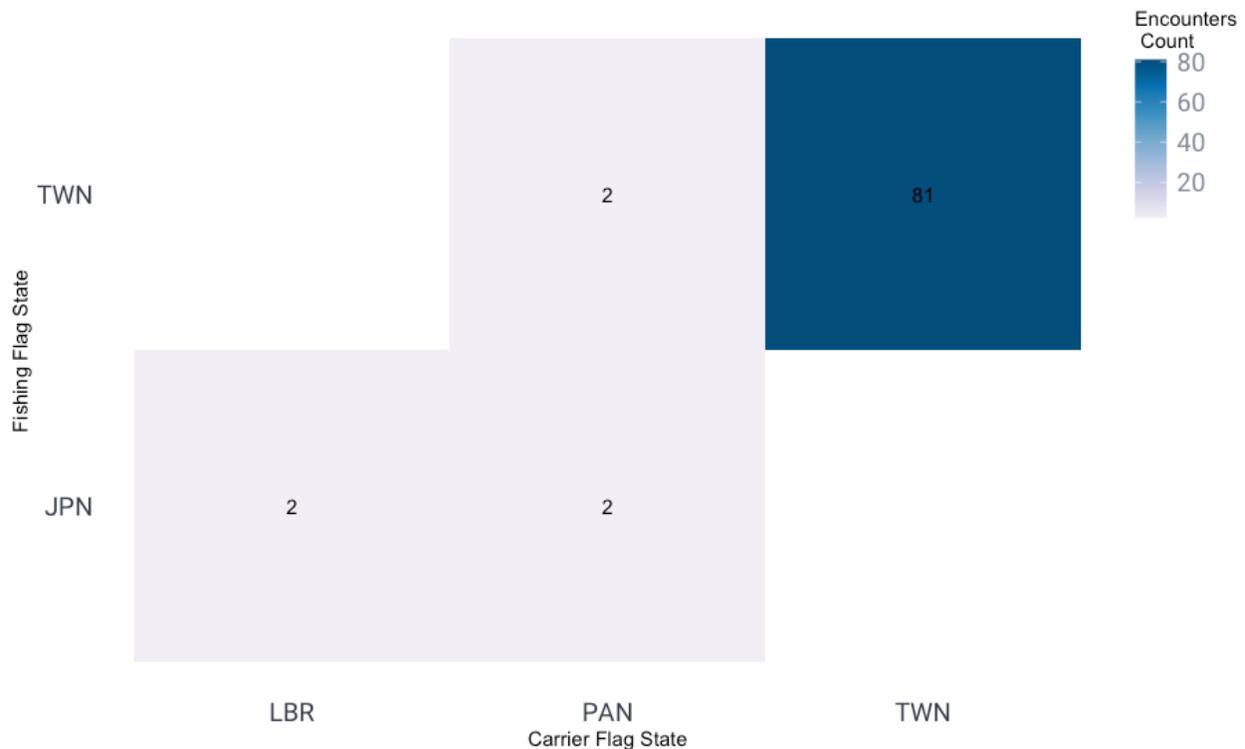
GFW detected 93 encounters in the IOTC Convention Area conducted by 12 carrier vessels which were not listed as reporting SBT transshipments in the IOTC ROP report (Figure 6). All encounters occurred during IOTC authorized deployments.

Six of these encounters were conducted by four carrier vessels which reported SBT transshipments to ICCAT but not to IOTC (See Figure 6) and all carriers were authorized by CCSBT in addition to IOTC. It is possible these carriers transshipped SBT in ICCAT but not in IOTC and this activity is not related to SBT transshipments. However, to ensure SBT are not lost in the supply chain, all SBT should be transshipped separate from other tuna-like species, as recommended by CCSBT.



**Figure 6.** AIS detected encounters during IOTC ROP deployments by carriers without SBT reported transshipments. Yellow-Orange encounters indicate carriers which reported SBT transshipments to ICCAT but not IOTC in 2019.

GFW detected 87 encounters conducted by 8 carrier vessels which were not listed as reporting SBT transshipments in either ICCAT or IOTC ROPs (Figure 7).



**Figure 7.** Number of encounters between carriers that did not report SBT and fishing vessels by Flag State

The 87 encounters occurred in the overlap area between IOTC and CCSBT and likely fishing operations prior to the encounter occurred within CCSBT Statistical Areas. All encounters occurred during IOTC authorized deployments<sup>18</sup> suggesting some level of oversight, however most of the encounters (93%) were with Taiwanese carriers (Figure 7), which report transshipment information separately to CCSBT as they are not a member of IOTC.

Of the 87 encounters, 55 were conducted by five carrier vessels registered by CCSBT to transship SBT. The remaining 32 encounters were conducted by three carriers which were registered to IOTC but not by CCSBT (Table 3).

<sup>18</sup> Following a request made by Pew and GFW in 2020, the IOTC Secretariat provided 2019 ROP deployment data, including vessel name, IMO, call sign, and flag State information, as well as deployment start and end dates and port visits, and information on when and where the ROP observer boarded and disembarked.

**Table 3.** AIS-Detected Activity of Carriers that did not report SBT Transshipments to ROPs

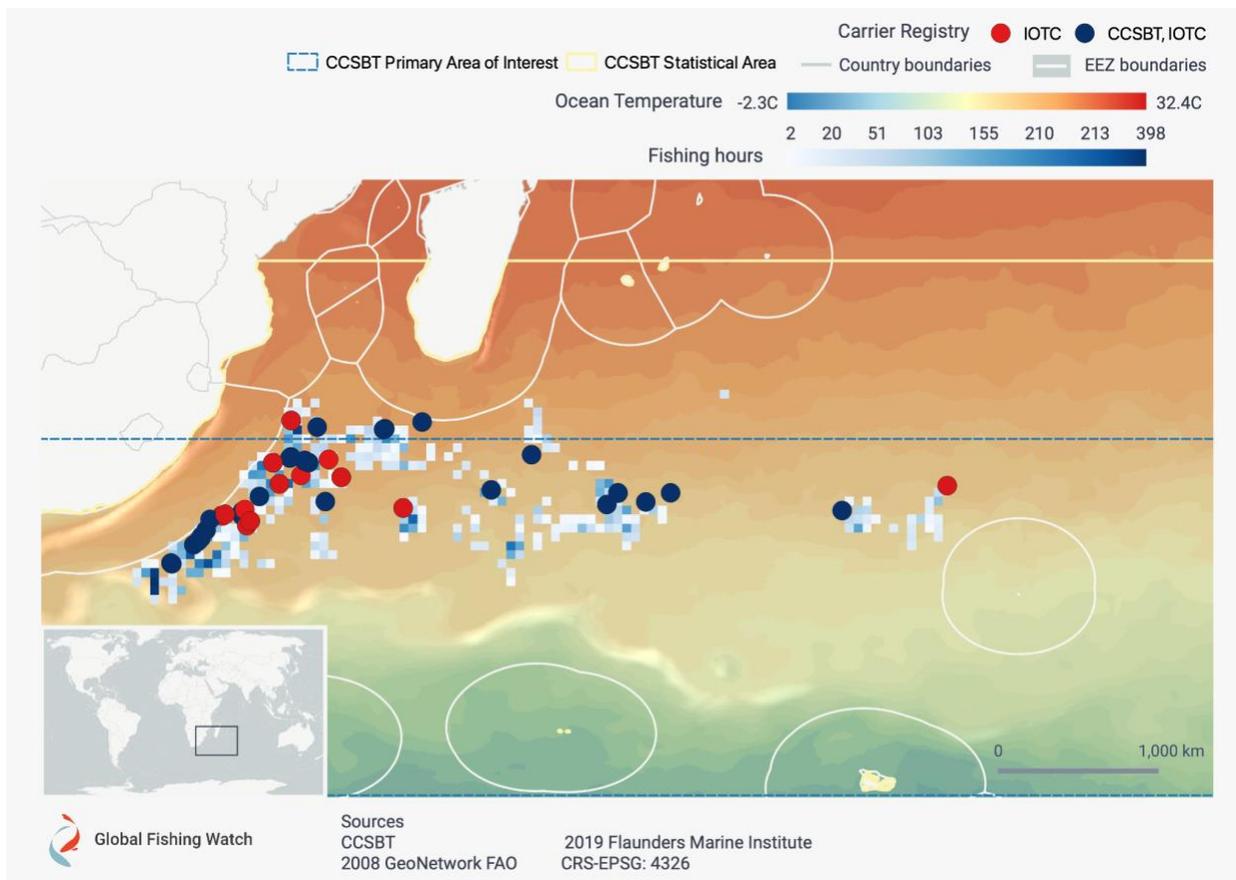
Carrier Flag	Carrier Registry	Detected Carriers	Encounters
TWN	CCSBT, IOTC	3	51
LBR	CCSBT, IOTC	1	2
PAN	CCSBT, IOTC	1	2
TWN	IOTC	2	30
PAN	IOTC	1	2

The main fishing season for SBT typically peaks around July, as reported by CCSBT<sup>19</sup>. Therefore, the 45 encounters linked to carriers not listed as transshipping SBT which occurred between June and August were further examined. Only one of these encounters, between a Panamanian carrier and Taiwanese LSTLVs, was with an LSTLVs that reported transshipment activity in the CCSBT Compliance Committee country reports. The other 44 encounters were between Taiwanese carriers and Taiwanese LSTLVs and neither carrier nor LSTLVs reported SBT transshipment activity at sea in the 2019 ICCAT, IOTC, or CCSBT ROP transshipment reports. In the map below, fishing activity conducted before the 45 encounters, which all occurred between May and August, are reflected and the darker blue pixels indicate greater fishing effort (Figure 8). As can be seen, the potential fishing activity was largely in the CCSBT Primary Area of Interest<sup>20</sup>, where a greater distribution of SBT tends to reside<sup>21</sup>. Of these events, 31 occurred when the carrier was registered with IOTC and CCSBT (blue), while 14 occurred when the carrier was only registered with IOTC (red) (see Figure 8).

<sup>19</sup> <https://www.ccsbt.org/userfiles/file/data/CatchByYMGOLoLa.xlsx>

<sup>20</sup> Primary Area of Interest is a subset of the CCSBT Statistical Areas as defined by the CCSBT Secretariat.

<sup>21</sup> <https://www.ccsbt.org/en/content/about-southern-bluefin-tuna>



**Figure 8.** Encounter events detected during peak SBT fishing season (June through August) in 2019 by carriers with no SBT reported transshipments by the IOTC or ICCAT ROPs. Encounters are colored by if carriers were authorized by CCSBT. Fishing effort prior to encounters is underlaid in addition to data on average ocean temperature.

Representatives of Taiwan did state that “*Taiwan has required our fishing vessels and the carriers authorized to transship with our fishing vessels to comply with IOTC, ICCAT and CCSBT Resolutions in terms of transshipment. In addition, all carriers that conducted transshipment at sea in 2019 had ROP observers onboard. All vessels conducting at-sea transshipment under our authorization submitted the relevant information to the abovementioned RFMOs in accordance with their Resolutions...*”<sup>22</sup>

While it is possible these encounters were related to transfers of catch which did not include SBT, the levels and location of potential fishing activity in areas known to be highly productive for SBT before the encounter suggests clarification on specific transshipment details, including species caught, is required to better evaluate findings. A central source of reporting records by CCSBT that provides detailed information on SBT transshipments, including location, data, and species transshipped and both carrier and fishing vessel involved, based on the ICCAT and

<sup>22</sup> For more information on Taiwan’s efforts to monitor their fisheries and ensure compliance with CCSBT regulations, please see Annex 2.

IOTC ROP reports and individual CCSBT Compliance Committee Country reports would provide a much clearer understanding of the link between the different reporting sources. This cohesive reporting structure would provide more transparency on exactly what SBT transshipments are already monitored and by whom, and allow for the most effective cross verification by other monitoring methods such as data collected through AIS and VMS. Together, increased use of AIS by fishing vessels and improved reporting by overlapping RFMOs would allow for cross checking. If a system utilizing AIS data in this way was implemented, vessels with a risk of unreported SBT onboard could be identified while at sea to allow for risk based targeting of port inspections by member and cooperating port States. This system would be further strengthened if CCSBT implements a centralized VMS program allowing the Secretariat and Members further audit and validate reported transshipments of SBT and to help ensure that unreported activity can be detected.

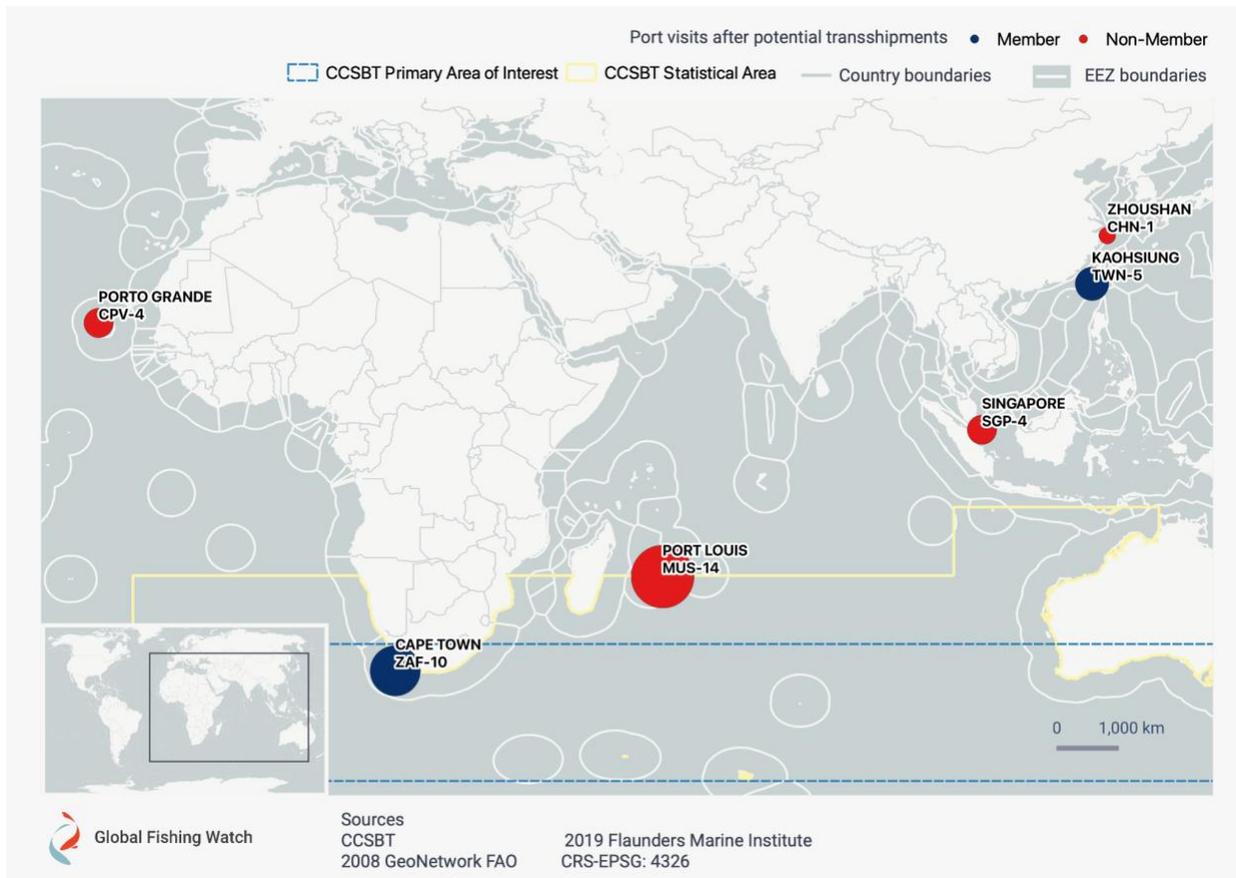
## Port Visits

CCSBT has developed a resolution on minimum standards for inspections in port<sup>23</sup>. This resolution includes requirements for Members such as: port States must designate ports to which foreign fishing vessels may enter; ensuring capacity to conduct vessel inspections; vessels seeking to use the port for purposes of landing or transshipment must provide prior notification and information; and inspection of *“at least 5% of [foreign fishing vessel] landing and transshipment operations in their designated ports”* each year.

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23

[https://www.ccsbt.org/sites/ccsbt.org/files/userfiles/file/docs\\_english/operational\\_resolutions/Resolution\\_Minimum\\_Port\\_Inspection\\_Standards.pdf](https://www.ccsbt.org/sites/ccsbt.org/files/userfiles/file/docs_english/operational_resolutions/Resolution_Minimum_Port_Inspection_Standards.pdf)

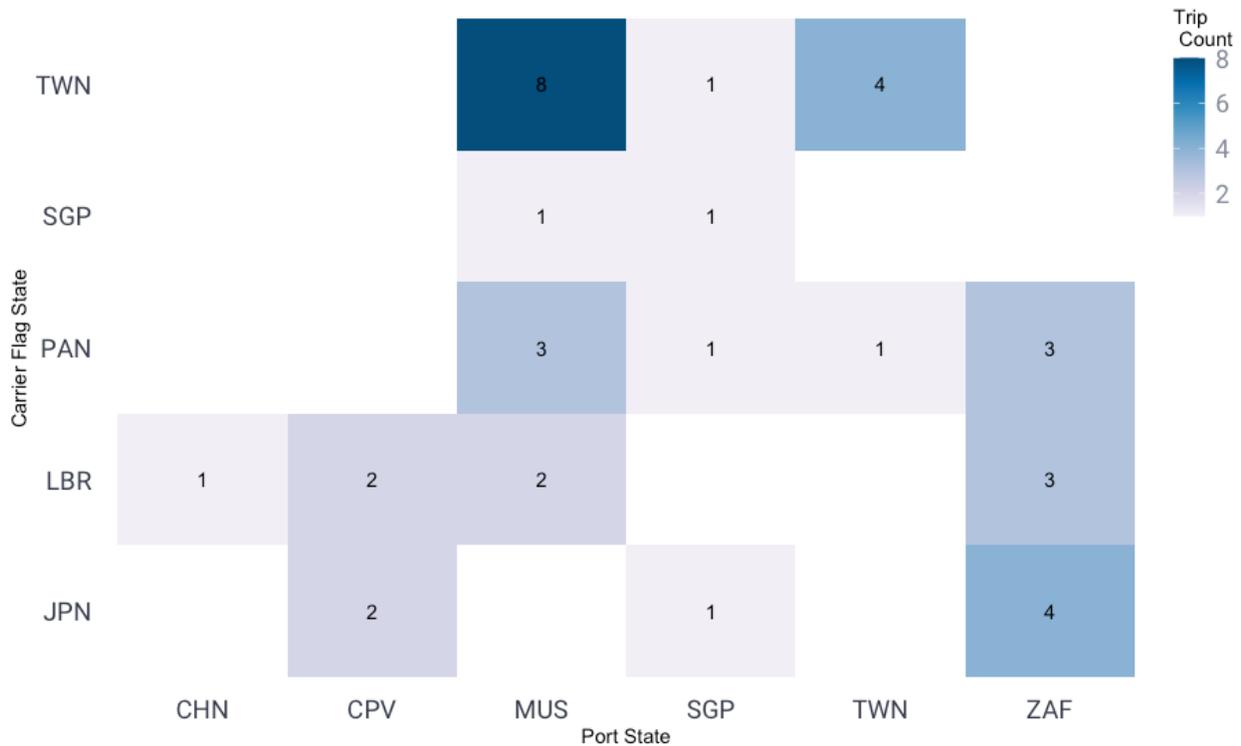


**Figure 9.** Ports visited by carriers after CCSBT encounter events

Six ports were visited by carriers after AIS-detected encounters with LSTLVs that were observed potentially fishing within CCSBT Statistical Areas before the transshipment (Figure 9). The most frequented ports after an encounter were Port Louis, Mauritius, and Cape Town, South Africa. Of the six port States visited by carriers, only two are CCSBT Members, South Africa and Taiwan (Figure 9), and so required to conduct inspections and report in line with the CMM. The use of these ports for landing and transshipment of SBT ensures the necessary levels of oversight at port, but vessels that visit CCSBT member ports for other purposes with SBT on board are not required to apply the CMM. Therefore, the Resolution should be expanded to cover foreign vessels carrying SBT while they are in port but not necessarily landing and/or transshipping catch. This would align with the FAO Port State Measures Agreement (PSMA) and several other RFMO port State measures, and would ensure broader oversight of SBT catch.

The remainder of the ports visited by carriers after potential transshipment of SBT are not found in CCSBT Members (Figure 9; Figure 10). As mentioned in the 2018 report, non-Member States such as Mauritius and Singapore have been extended invitations to attend CCSBT annual meetings in the past. It is noted that CCSBT does work with non-Member port States like Singapore on a case by case basis to exchange relevant SBT landing information - this

approach should be extended to all non-Member port States, but again it would be useful were that to include information on all vessels carrying SBT, even if they did not land or transship it. Moreover, it would be beneficial for all port States that receive vessels carrying SBT to also be extended an invitation to participate in CCSBT activities as Cooperating Non-Members to ensure that they follow the requirements of this CMM and share inspection and landing data of those carriers landing/transshipping SBT in port.



**Figure 10.** Count of port visits per Port State by Carrier Flag State

Of the four port States visited by carriers likely carrying SBT on board which are not members of CCSBT, two are, however, party to the UN FAO PSMA<sup>24</sup> (Cabo Verde and Mauritius) and so should subject foreign vessels to appropriate measures. It would be beneficial if some information exchange could be arranged with these port States to help ensure oversight of vessels likely carrying SBT. Additionally, Members should encourage their vessels carrying SBT to visit and use ports designated through the CCSBT CMM or designated as ports of entry under the PSMA.

<sup>24</sup> <http://www.fao.org/treaties/results/details/en/c/TRE-000003/>

## Conclusions and Recommendations

The findings of this report highlight the complicated nature of managing at-sea transshipment of species-specific catch sourced from CCSBT Statistical Areas. Transshipment is a complex practice, made more complicated by the lack of consistent reporting mechanisms, information sharing, and oversight. Implementing a centralized VMS or mandating the use of AIS in the absence of VMS, is critical to ensuring consistent and unequivocal data to better understand transshipment related activity on the high seas. Strengthening existing measures and efforts through MoUs, such as requiring consistent reporting methods by observers, requiring ROP data include geolocation, catch volume and species transshipped for each observed transshipment, will help assist in verifying reported data and detecting unreported activities. Further, ensuring effective port inspection schemes in both Member and non-Member States, not only during landing and transshipping, but also during visits to ports unrelated to landing, will ensure inspections on vessels with a risk of unreported SBT. These key findings and corresponding recommendations for the Commission to consider are provided in the table below:

Finding	Recommendation for CCSBT
<p>A 25% decline in encounters occurred in CCSBT during 2019.</p> <p>Although the general proportion of transshipment activity by flag States active in the area was consistent with 2018 findings, Taiwanese flagged vessel activity grew by 22%.</p>	<p>Implement a centralized VMS program to help facilitate the ability of the CCSBT Secretariat to assist in validating reported transshipments of SBT and detecting unreported activity.</p> <p>In addition to VMS, AIS use could be implemented through a Resolution to mandate AIS use for all CCSBT-authorized vessels and have minimum standards on the implementation of SOLAS Chapter V Regulation 19<sup>25</sup>.</p>
<p>Using publicly available data, 75% of ICCAT ROP-reported SBT transshipments were matched to AIS detected events.</p> <p>87 encounters were conducted by carriers that did not report SBT transshipments to IOTC or ICCAT</p>	<p>Request that public IOTC ROP reports contain date and geo-coordinates of all transshipment events. Strengthen the MoU with ICCAT and IOTC to require precise catch and transshipment information to be included in SBT transshipment reports, including species, time, and geolocation.</p> <p>Designate a central source of reporting records to compile and cross-verify SBT transshipment reports by</p>

<sup>25</sup> [https://www.lisr.com/sites/default/files/SOLAS%20V\\_Reg19.pdf](https://www.lisr.com/sites/default/files/SOLAS%20V_Reg19.pdf)

<p>after LSTLVs were detected potentially fishing in the primary CCSBT areas of interest. At least 14 encounters during the peak SBT season involved carriers that were not registered with and authorized by CCSBT.</p>	<p>Members along with ICCAT and IOTC ROP reports. Timely release of this information could facilitate targeted port inspections by member and cooperative ports that prioritizes vessels with a risk of unreported transshipment of SBT.</p>
<p>The majority of the port States visited by carriers after encounters with LSTLVs potentially fishing in CCSBT Statistical Areas are not members of CCSBT and are therefore not required to comply with the CCSBT Resolution on Minimum Port Inspections.</p>	<p>The CCSBT Resolution on Minimum Port Inspections should be expanded to include inspections of foreign carrier vessels carrying SBT while they are in port but not necessarily landing and/or transshipping catch.</p> <p>Maintain active engagement with non-Member port States to ensure inspections are conducted on both carrier and fishing vessels with a risk of unreported SBT onboard and exchange of inspection and landing details of vessels likely carrying SBT.</p> <p>Outline an obligation with the Resolution for Members to only land SBT that their vessels have caught in ports designated through the CCSBT CMM or designated as ports of entry under the PSMA.</p>

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## Annex 1. Detailed Methodology

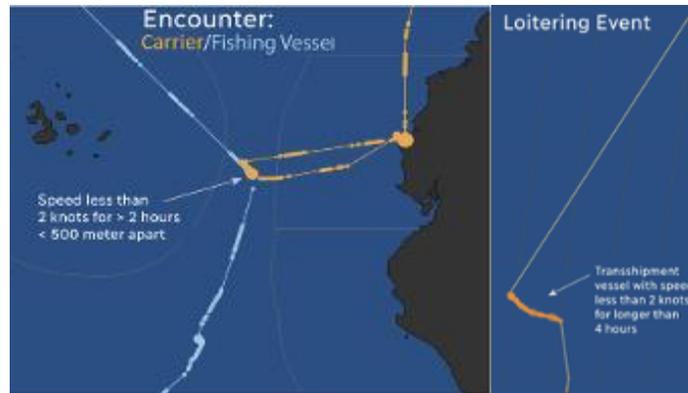
### *AIS-based data methods*

Carriers registered over 300 gross tons and on international voyages are already required to broadcast on Automatic Identification System (AIS), as mandated by the International Maritime Organization (IMO) (IMO 2015). Although the use of AIS is not globally mandated for fishing vessels, AIS used in fishing fleets is increasing with a growing number of flag and coastal States mandating its use through their own national or regional fisheries regulations. AIS devices broadcast the location of a vessel along with other information, including identity, course and speed. This makes the use of AIS, and its subsequent analysis, very useful in understanding fishing activity that can be used to support and complement existing national and RFMO Monitoring, Control and Surveillance (MCS) programs. This is especially true as AIS can provide a greater insight of fishing vessel activities, especially when these interactions involve vessels of differing flag States where VMS data is not publicly available or readily shared between authorities.

The Carrier Vessel Portal (CVP) is established using GFW datasets developed from AIS data. The CVP uses the same datasets used in the 2019 transshipment reports (<https://globalfishingwatch.org/rfmo-transshipment/>), including possible transshipment events defined as encounter and loitering events, port visits by carrier vessels, vessel identity information broadcast from AIS, and publicly available vessel registry data. While datasets used in this report match the CVP, this analysis added a number of additional constraints to the potential transshipment events analyzed (geographic area of interest, minimum and maximum restrictions on loitering events) and thus the CVP data must be filtered to match these constraints.

GFW uses publicly broadcasted AIS data to estimate vessel information and vessel activity, including fishing, encounters and loitering events. Encounters, where two vessels meet at-sea, may indicate possible transshipment activity between two vessels. Vessel encounters are defined when two vessels are within 500 meters of each other for at least 2 hours and traveling at < 2 knots, while at least 10 kilometers from a coastal anchorage (Miller et al. 2018). Whereas, vessel loitering is when a carrier vessel travelled at speeds of < 2 knots for at least 4 hours, while at least 20 nautical miles from shore (see Miller et al. 2018 for original methodology, however the original minimum of 8 hours has been changed to 4 hours for the purposes of this study).

Loitering by a single carrier vessel where the carrier vessel exhibits behavior consistent with encountering another vessel at-sea, but no second vessel is visible on AIS, may also indicate a possible transshipment event but where there is no AIS data for the second vessel, also known as a 'dark vessel' (Figure A1). Loitering events may indicate a possible encounter for which data is lacking for the second vessel, possibly due to lack of AIS transmission, poor satellite coverage, or the size of the second vessel (INTERPOL 2014).



*Figure A1 - Examples of vessel tracks during typical 'Encounter' where two vessels meet at-sea and 'Loitering' events where a carrier vessel (referred to as transshipment vessel) has behavior consistent with encountering an LSTLV at-sea but no LSTLV is visible on AIS*

The GFW database also contains an estimate of port visits conducted by carriers. GFW defines ports as any 0.5-kilometer grid cell with 20 or more unique vessels stationary for greater than 12 hours. A port visit includes the port entry and exit of a vessel if the vessel stops. A vessel "enters" port when it is within 3 kilometers of a GFW-defined port. A vessel has 'stopped' when it has entered port and slowed to a speed of 0.2 knots and has started movement again when it moves over 0.5 knots. A vessel "exits" port when it is at least 4 kilometers away from the previously entered port. Note, for the purposes of this analysis any port visits that had a duration of less than 3 hours were removed from the data. Port stops can vary in duration from less than an hour to multiple weeks. Generally, very short port stops, as defined by GFW, may be intermediate ports a vessel stops at before entering a port to conduct activities of interest to this report, such as offloading of catch. Therefore, in an attempt to exclude intermediate ports, this analysis excluded port visits of less than 3 hours, so that all voyages ended at ports where the carrier vessels remained for at least 3 hours.

The carrier and fishing vessels analyzed in this report were chosen based on the GFW database of fishing and carriers. The fishing database is defined in Kroodsma et al. (2018) and includes fishing vessels based on registry database information or as defined by a convolutional neural network (Kroodsma et al. 2018). Fishing vessels capable of fishing tuna were defined by the GFW vessel classification using known registry information in combination with a convolutional neural network used to estimate vessel class (network described in Kroodsma et al. 2018). The carrier database is defined in Miller et al. (2018) and was curated using International Telecommunication Union and major RFMOs, vessel movement patterns based on AIS, a convolutional neural network used to estimate vessel class (see Kroodsma et al. 2018) and the International Maritime Organization (IMO) unique identifier.

Because CCSBT focuses specifically on Southern Bluefin Tuna, encounter events for this report were identified if the fishing vessel potentially fished inside CCSBT Statistical Areas within 3 weeks of the encounter and after any previous encounter or port visit. Potential fishing is estimated using a convolutional neural network that uses AIS based data such as vessel speed,

direction, and rate of turn to classify if a fishing vessel is likely fishing or transiting (not fishing) (See Kroodsma et al. 2018).

Vessel authorization was established by using the publicly available vessel registry produced by CCSBT<sup>26</sup>, ICCAT<sup>27</sup> and IOTC<sup>28</sup>. In addition, the ICCAT Observer Reports<sup>29</sup> were used to identify spatial-temporal data of reported SBT transshipments to match AIS-detected data. Lastly, the IOTC list of vessels<sup>30</sup> that transshipped SBT was used to identify carriers that reported SBT transshipments. If a carrier or fishing vessel was listed as 'authorized' on any of the public registries during an encounter or loitering event the event was considered 'authorized'. However, if a vessel was not authorized on one of the three registries during the time period of an encounter or loitering event the authorization status is unknown. The ability to determine vessel authorization is largely dependent on the accuracy and comprehensiveness of the public registries, as well as the vessel information (name, MMSI, IMO, call sign) transmitted on AIS by the vessel and used by GFW.

### *Data caveats*

The analysis presented in this report relies on commercially available AIS data and publicly available information. Therefore, the AIS data is limited by those vessels that transmit AIS data and do so by providing accurate vessel identity information. The CCSBT Statistical Areas have relatively strong Class-A AIS reception, however there may be a limit on AIS data in the CCSBT Statistical Areas due to vessel use of AIS, for instance there tends to be less vessel presence in the Southern Ocean (see Taconet, Kroodsma, and Fernandes 2019). AIS data tends to be sparser and more limited for vessels equipped with Class-B AIS devices (Kroodsma et al. 2018). For further analysis of GFW AIS data quality in the Southern Ocean refer to: Taconet, Kroodsma, and Fernandes 2019. AIS device class often depends on flag State regulations, vessel length, and vessel purpose. Because of the limitations of AIS data, lack of complete and accurate public vessel databases and registries, and limitations of modelling estimations, the AIS detected encounter, and loitering data are represented as accurate as possible but should be considered restrained estimates based on these limitations (see Kroodsma et al. 2018, Miller et al. 2018, and <https://globalfishingwatch.org/> for further discussion).

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<sup>26</sup> <https://www.ccsbt.org/en/content/ccsbt-record-authorised-vessels>

<sup>27</sup> <https://www.iccat.int/en/VesselsRecord.asp>

<sup>28</sup> <https://www.iotc.org/vessels>

<sup>29</sup> <https://www.iccat.int/en/ROP.html>

<sup>30</sup> <https://www.iotc.org/documents/summary-iotc-regional-observer-programme-during-2019-contractor>

## **Annex 2. The Fishing Entity of Taiwan CCSBT Response**

The following is an email from the Fisheries Agency of Taiwan in response to this report. Per Commission policy, this report was submitted 45 days prior to the start of the 28<sup>th</sup> Annual Meeting of the CCSBT for Member review. No other Members provided feedback to this report. The report was updated (page 21) based on the feedback from Taiwan, below.

Date Received: September 9, 2021

*“We appreciate that Pew provided this report on utilizing AIS data for analyzing the encounter activities in the CCSBT statistical area.*

*We noted that some specific paragraphs pay close attention to Taiwanese flagged vessel’s activities in this report. It is point out that a large increase in encounters between Taiwanese fishing vessels and carriers, and the difference between the numbers of the SBT transshipment reported by the Taiwanese LSTLVs and the encounters detected by AIS in CCSBT Statistical Areas. In those cases, we would like to share our opinion as follows:*

*First of all, we would like to reiterate that Taiwan has required our fishing vessels and the carriers authorized to transship with our fishing vessels to comply with IOTC, ICCAT and CCSBT Resolutions in terms of transshipment. In addition, all carriers that conducted transshipment at sea in 2019 had ROP observers onboard. All vessels conducting at-sea transshipment under our authorization submitted the relevant information to the abovementioned RFMOs in accordance with their Resolutions, therefore, all transshipments have been closely monitored by those RFMOs.*

*Secondly, with regard to the paragraph “Comparison of CCSBT Transshipment Summary to AIS” on page 12, we would like to stress that not all encounters were including the transshipment of SBT catch in practice.*

*Another thing is we believe that the sentence “no Taiwanese vessels reported SBT transshipments” in the 2nd paragraph of the Finding is misleading. As pointed out on page 12 of this report, there were 27 reported SBT transshipments by Taiwan in 2019. We would like to suggest the submitter clarify this Finding and revise this sentence.*

*Lastly, the Fishery Monitor Centre (FMC) of the Fisheries Agency of Taiwan consistently monitors Taiwanese fishing vessels’ position and encounters through real-time VMS information 24/7. Moreover, those vessels which be detected unusual encounter by FMC will be flagged for high priority inspection by the competent authority or the independent third party while they enter ports.”*