



**Global Fishing Watch**

**A Comparative Analysis of 2017 Reported Transshipment  
Activity in the International Commission for the  
Conservation of Atlantic Tunas (ICCAT) Convention Area  
using AIS Data**

**Prepared By: Global Fishing Watch**

**Acknowledgments**

This report was funded in part by the Gordon and Betty Moore Foundation and produced in cooperation with The Pew Charitable Trusts (“Pew”). The authors would like to thank Duncan Copeland and Claire van der Geest for reviewing the study.



# Contents

List of Acronyms .....	4
Executive Summary .....	5
1 Introduction .....	8
International Commission for the Conservation of Atlantic Tunas (ICCAT) .....	9
2 Study Objective .....	12
3 AIS Analysis Methods.....	13
4 Overview of ICCAT Transshipment Activity in 2017 .....	14
4.1 AIS Detection of Carrier Vessels and LSPLVs .....	15
4.2 AIS-Detected Encounters.....	15
4.3 Spatial Analysis of AIS-Detected Encounters .....	17
4.4 AIS-Detected Loitering Events .....	19
4.5 Spatial Analysis of AIS-Detected Loitering Events.....	21
4.6 Time Duration of Loitering Events .....	24
4.7 Section Summary and Key Findings .....	26
5 Comparing AIS-Detected and Observer Reported Carrier Activity.....	27
5.1 Comparing Observer Reported Carrier Trips and AIS-Detected Events .....	28
5.2 AIS-Detected Port Visits by Carrier Vessels on ICCAT ROP Trips .....	32
5.3 Section Summary and Key Findings:.....	34
6 In-Port Transshipment Reporting and Activity of non-CPC vessels in the ICCAT Convention Area in 2017.....	34
6.1 Section Summary and Key Findings.....	38
7 Data Caveats .....	39
8 Key Findings.....	40
9 Conclusion.....	41
References.....	43
Annex 2: Detailed Methodology.....	45
AIS-Based Data Methods .....	45

## List of Acronyms

AIS – Automatic Identification System

CapFish - Capricorn Fisheries Monitoring

CCSBT – Commission for the Conservation of Southern Bluefin Tuna

CPC - RFMO Contracting Party (Member) and Cooperating Non-Contracting Party

GFW - Global Fishing Watch

ICCAT – International Commission for the Conservation of Atlantic Tunas

LSPLV - Large Scale Pelagic Longline Vessels

MCS – Monitoring Control and Surveillance

MRAG - Marine Regional Assessment Group

PSMA – Port State Measures Agreement

RFMO – Regional Fisheries Management Organization

ROP – Regional Observer Program

VMS – Vessel Monitoring System

WCPFC - Western and Central Pacific Fisheries Commission

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

The International Commission for the Conservation of Atlantic Tunas (ICCAT) permits at-sea transshipments between refrigerated cargo, or carrier vessels, and Large Scale Pelagic Longline Vessels (LSPLVs), which are ICCAT-authorized fishing vessels greater than 24 meters in length overall.

This study used commercially available satellite Automatic Identification System (AIS) data combined with the application of machine learning technology and access to publicly available information produced by ICCAT to conduct a comparative analysis of the track histories and potential activities of carrier vessels operating in ICCAT Convention Area waters in 2017. The objective was to provide better understanding of carrier vessel movement and operations in the convention area in order to help enable better informed decisions on the management of transshipment in the ICCAT Convention Area.

The AIS-derived data used in this study is also a source of supplemental information for consideration by the ICCAT Compliance Committee in validating reported activity by authorized carrier vessels, identifying anomalous events or even responding to address instances of potential unauthorized behavior.

Specifically, Global Fishing Watch (GFW) combined open source AIS data with ICCAT vessel authorization data to create a dataset of vessel identity information. GFW also developed a database of AIS-based encounters between carrier vessels and LSPLVs and loitering events by a single carrier vessel that was used as preliminary indication of potential transshipment activity. GFW used these databases in conjunction with various publicly available ICCAT documents such as those related to the ICCAT carrier vessel Regional Observer Program (ROP) to analyze reported and AIS-derived potential transshipment activity occurring within the ICCAT Convention Area during 2017. The resulting output can be further cross-checked and validated by both CPC management authorities and the ICCAT Secretariat using non-public national or Commission data such as transshipment declarations and vessel logbooks to positively identify those activities justifying further investigation.

**Key Finding 1:** Analysis of AIS data can be effective in detecting reported transshipment events as encounters with LSPLVs or loitering events with high matching rates.

- *Recommendation:* ICCAT should consider use of AIS as a supplemental tool to help monitor implementation of the ROP, validate transshipment activity, and assist in the early detection of potential noncompliant behavior that requires further follow up by the ICCAT Secretariat or flag State authorities. This would be further strengthened by mandating the use of AIS by ICCAT-authorized vessels.

- *Recommendation:* Further strengthen clarity around high seas transshipment in ICCAT by consolidating the geolocation and date of all ROP-authorized transshipments reported to the Secretariat by calendar year in a singular document rather than in multiple references.
- *Recommendation:* Encourage more RFMOs follow ICCAT's lead in transparency of reported information. Transparency of information leads to improved compliance through self-correcting behavior. ICCAT CPCs should consider advocating that more publicly available information from the global tuna RFMOs will lead to improved management of tuna stocks and will help ensure greater compliance with global transshipment regulations.

**Key Finding 2:** While 11 carrier vessels reporting to the ROP were observed on AIS encountering LSPLVs, one additional carrier vessel was observed encountering an LSPLV but was not listed by ICCAT as an authorized carrier vessel or identified by the ROP. An additional 76 carrier vessels had loitering events inside the ICCAT Convention Area that included 32 ICCAT authorized carrier vessels that were not reported by the ROP and 44 carrier vessels that were not reported by the ROP nor included on the ICCAT authorized carrier vessel list.

- *Recommendation:* ICCAT should require CPCs provide an annual report on all their respective flagged carrier vessels that operate in ICCAT waters during a given calendar year to account for their presence. These reports should include confirmation that carrier vessels not involved in the ICCAT ROP did not conduct transshipment activity involving ICCAT sourced and managed species.

**Key Finding 3:** Carrier vessels flagged to non-CPCs were observed operating in many CPC port States. As these vessels are not flagged to ICCAT CPCs there is no requirement for the carrier vessels themselves, nor their flag State authorities, to report on their activity. It is possible that these carrier vessels transshipped ICCAT-sourced catch while in port.

- *Recommendation:* ICCAT should consider amending *Recommendation 12-07* reporting requirements for CPCs to expand reporting on in-port transshipment activity of their flagged longline and purse seine vessels to include not only volume and species transshipped in-port, but also number of transshipments and port locations where these transshipments took place. This would facilitate the ability of the Secretariat and other relevant authorities to cross-check and validate in-port reporting of fishing vessels.
- *Recommendation:* ICCAT should consider amending *Recommendation 12-07* reporting requirements for CPC-flagged fishing and carrier vessels to be inclusive of the Secretariat in addition to the relevant CPC flag and port State authorities. This would facilitate the ability of the Secretariat to compile annual data on in-port transshipment activity involving ICCAT-sourced catch and provide for more comprehensive monitoring and validation of in-port transshipments of ICCAT-sourced catch and details of their subsequent landings.
- *Recommendation:* ICCAT should prohibit non-CPC flagged carrier vessels from conducting at-sea or in-port transshipments of ICCAT-sourced catch prior to first point of landing. Non-CPC flagged carrier vessels themselves, nor their flag State authorities, are bound by ICCAT management measures or reporting obligations. Potential non-

compliance with ICCAT management measures associated with non-CPC flagged carrier vessels provides ICCAT little opportunity to seek recourse with the flag State authorities of the carrier vessel involved.

Furthermore, numerous port visits to CPC ports by both CPC and non-CPC flagged authorized carrier vessels were identified. There is little transparency or understanding about the activities of these carrier vessels when they transship in-port as ICCAT does not require in-port transshipment reporting to the Secretariat by the carrier vessels themselves as well as the respective flag or port State. The lack of transparency is especially true of non-CPC flagged carrier vessels and their flag State authorities as they are under no obligation to provide transshipment reports to ICCAT even if their activities involve fish caught inside the ICCAT Convention Area. Further analysis is required to better understand the nature of these port visits. Strengthening the ICCAT in-port transshipment reporting requirements will help improve CPC compliance and increase the ability for relevant authorities to cross-check and verify the transshipment activities of those fishing vessels required to report on transshipments conducted in-port.

# 1. Introduction

Global Fishing Watch (GFW), in partnership with The Pew Charitable Trusts (Pew), is undertaking an assessment of at-sea transshipment activity occurring inside the convention areas of five global tuna Regional Fisheries Management Organizations (RFMOs) to help expand greater understanding of this activity and inform RFMO policy development directed at strengthening transshipment management and control in the global tuna fisheries. This work includes a series of annual reports covering transshipment-related activity that is observable from comparative analyses of AIS data with publicly available information and data specific to transshipment. These reports are designed to be RFMO-specific and cover calendar years 2017 through to 2019. This study is the third report of this series.

Complementary to this assessment is GFW and Pew's development of a publicly accessible web-based Carrier Vessel Portal (CVP) specifically focused on information and activities of carrier vessels authorized by the five tuna RFMOs. The purpose of the CVP is to provide users with a user-friendly, single-access platform for data specific to carrier vessels and at-sea transshipments. Initially, the CVP is envisaged to display AIS data linked with RFMO vessel authorization lists with the intention of displaying additional information as it becomes publicly available, such as Secretariat annual reports, RFMO transshipment declarations, observer reports or other related data.

AIS use in fishing fleets is increasing. A growing number of flag States mandate its use through their own national fisheries regulations, such as the European Commission and the United States that both require fishing vessels over a certain size install and use AIS. Carrier vessels over 300 gross tons in size on international voyages are already required to use AIS as mandated by the International Maritime Organization (IMO). These developments make use of the emerging technology of AIS, and its subsequent analysis, an increasingly important tool that could be used for greater understanding of fishing activity supporting and complementing existing national and RFMO Monitoring, Control and Surveillance (MCS) programs. One of its uses is providing for a greater understanding of fishing vessel interactions, especially when these involve differing flag States, especially where VMS data is not publicly available or readily shared between authorities. The CVP is envisaged to help overcome these limited data-sharing arrangements to help support the work of intended users such as RFMO Secretariats and flag, coastal, and port State authorities. The publicly available data held on an open platform will also allow opportunities for other fishery stakeholders to conduct their own due diligence as it affords them a greater understanding of vessel activity and potential risks that anomalous activities pose to sustainable sourcing where these are directly associated with their supply chains. CVP outputs could also provide the environmental Non-Governmental Organization (NGO) community with data that could help inform their own respective advocacy programs.

## **International Commission for the Conservation of Atlantic Tunas (ICCAT)**

ICCAT is an intergovernmental organization made up of member governments that share mutual interests in managing and conserving tuna stocks in the Atlantic Ocean (Figure 1). ICCAT was established in 1966 and is involved in the management of 30 different species including highly migratory tuna and tuna-like species. There are currently 53 Contracting Parties (Members) and five Cooperating Non-Contracting Parties (collectively called CPCs) that belong to ICCAT<sup>1</sup>. Importantly, ICCAT's Convention Area waters overlap with other RFMO waters, especially in the region of ICCAT waters where the majority of high seas transshipments occur involving ICCAT-sourced catch. These RFMOs include the Commission for the Conservation of Southern Bluefin Tuna (CCSBT), the South East Atlantic Fisheries Organization (SEAFO), Fishery Committee for the Eastern Central Atlantic (CECAF) and Western Central Atlantic Fishery Commission (WECAFC) as outlined in Figure 2. Transshipments at-sea by carrier vessels are known to occur under the management of these other RFMOs. However, Article 5 in the SEAFO System of Observation, Inspection, Compliance, and Enforcement requires that *'each Contracting Party shall ensure that its vessels are not involved in transshipment in the Convention Area on fishery resources covered by the Convention'* (SEAFO 2017).

ICCAT uses the term “carrier vessel” to refer to vessels that are duly authorized by their flag State and have been entered by the ICCAT Secretariat on the ICCAT Record of Carrier Vessels to receive tuna and tuna-like species caught in ICCAT waters. ICCAT *Recommendation 16-15* on transshipment is the measure that targets the monitoring of transshipments on the high seas within the Atlantic Ocean between authorized carrier vessels and LSPLVs. *Recommendation 16-15* requirements include, in part, both vessels being authorized by their respective flag State to transship at sea inside the ICCAT Convention Area, all high seas transshipments being monitored by an observer embarked on the carrier, and vessels providing prior notice and post-declarations to the flag State for all transshipments undertaken. The ICCAT Executive Secretary also issues to the flag State authorities of the carrier vessels a list of LSPLVs authorized to operate with its carrier vessels. In addition, authorized carrier vessels are required to be listed on a publicly available ICCAT Record of Carrier Vessels and vessel information can be submitted by both CPCs or Non-Contracting Parties (non-CPC).

It is important to note that ICCAT, similar to the Indian Ocean Tuna Commission, allows carrier vessels to be authorized even if they are flagged to a non-CPC country. This differs from WCPFC that only allow authorization of carrier vessels flying the flag of its Members or Cooperating Non-Members. Transshipment of ICCAT-managed species outside the bounds of the ICCAT transshipment regulatory framework impacts effective and complete oversight and control of the activity by the CPC flag State authorities responsible for the vessels involved and likely poses significant risks to sustainability initiatives adopted by the Commission. It also reduces the ability

---

<sup>1</sup> <https://www.iccat.int/en/contracting.html>

to cross reference the transshipment reports with other data sources such as catch and effort logbooks and therefore verify legal catch.

MCS requirements for authorized carrier vessels in ICCAT are similar to other RFMOs to include use of a ROP, a Catch or Statistical Documentation Scheme, and vessel monitoring via VMS in accordance with ICCAT *Recommendation 14-09* which is explicit for carrier vessels. *Recommendation 14-09* further requires VMS on all commercial fishing vessels authorized by ICCAT exceeding 20 meters between perpendiculars or larger than 24 meters in length overall or greater, which should include all LSPLVs. All high seas transshipments are required to be independently observed by an observer from the ROP that is placed onboard by the Secretariat and any unobserved transshipments are considered by ICCAT to be illegal. The transshipment program is implemented by a consortium comprising Marine Resource Assessment Group Ltd. (MRAG) and Capricorn Fisheries Monitoring (CapFish) under a contract originally signed in 2007. This contract has been renewed annually by ICCAT each year since then. The ROP is funded by the CPCs participating in at-sea transshipment.

ICCAT's Statistical Documentation Scheme requires flag State CPCs of LSPLVs to verify and validate that transshipment declarations and catch/statistical documents are consistent. All ICCAT transshipments are required to be accompanied by a catch/statistical document and the transshipment declaration must accompany the first point of landing of catch specifically in CPC ports. However, the wording used by ICCAT leaves a loophole where both CPC and non-CPC flagged carriers can legally land ICCAT-sourced catch in non-CPC ports without this documentation, thereby potentially laundering catches sourced from ICCAT waters. For transshipments in-port, flag State CPCs are required to provide an annual report to the ICCAT Secretariat with details of transshipments undertaken by their flagged fishing vessels. However, these annual reporting requirements do not extend to the activities of the carrier vessels of flag State CPCs involved in transshipments in port. The lack of reporting requirements specific to carrier vessels is a notable limitation that restricts the Secretariat's ability to cross-check and validate reported information on transshipments made in port by fishing vessels.

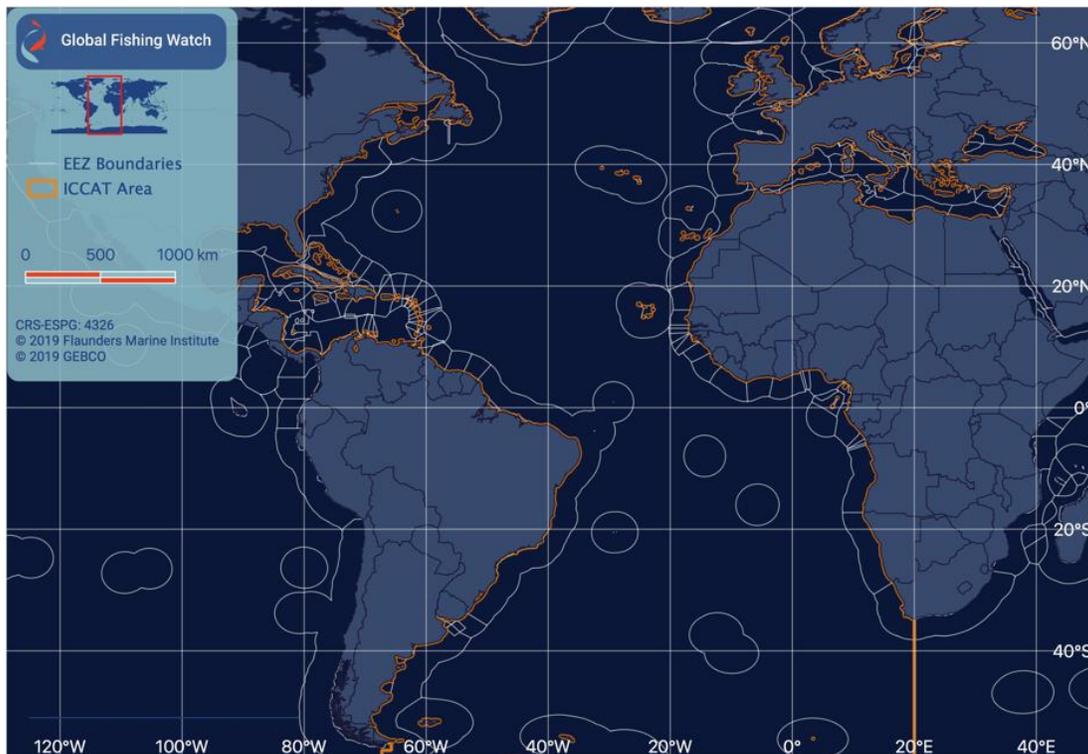


Figure 1 – Convention Area waters of the International Commission for Conservation of Atlantic Tunas (ICCAT)

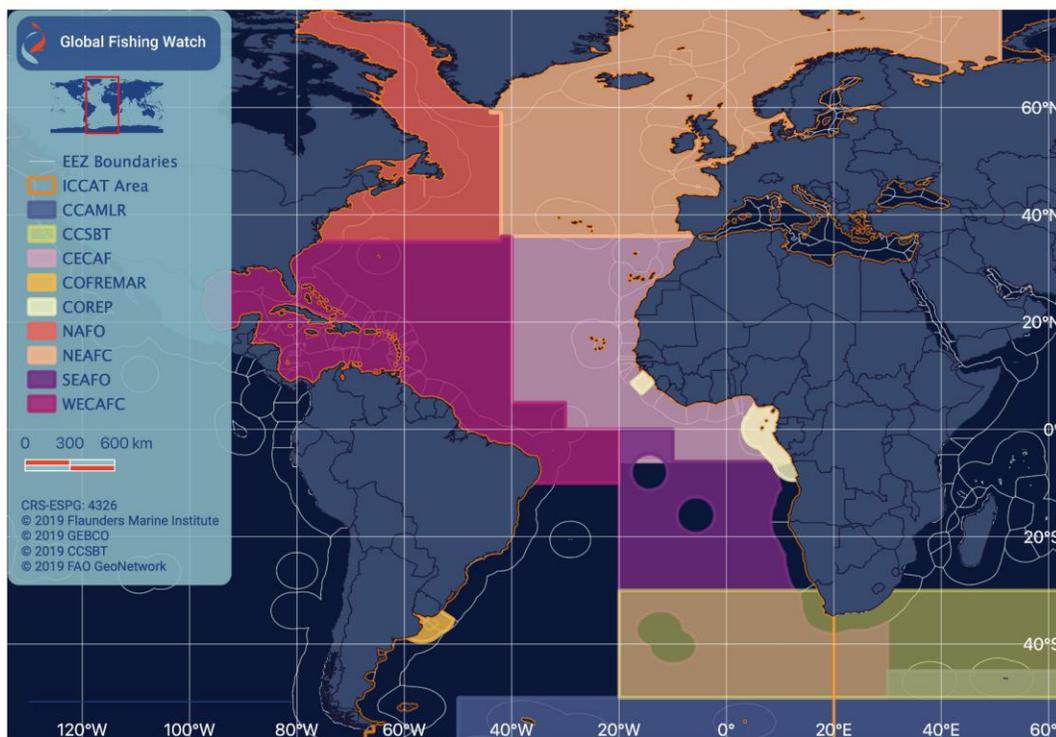


Figure 2 - Convention Areas of RFMOs overlapping ICCAT

## 2. Study Objective

This study used commercially available satellite AIS data combined with the application of machine learning technology and access to publicly available information to analyze the track histories of carrier vessels operating in the ICCAT Convention Area in 2017 with the objectives to:

1. Better inform ICCAT policy makers by providing them with greater transparency and understanding regarding carrier vessel activities occurring within ICCAT Convention Area waters through information on carrier vessel fleet movement patterns including spatial dynamics, encounters with LSPLVs, and highly frequented ports; and
2. Enable ICCAT policy makers to make better informed decisions regarding the management of transshipment within the ICCAT Convention Area to strengthen the current ICCAT transshipment regulatory framework where needed to address potential management gaps or loopholes related to reporting, monitoring and data-sharing.

In addition, the analysis also provides usable data on vessel activity consistent with transshipping which can:

1. Demonstrate how AIS analyses can be used as a supplementary monitoring and analysis tool that complements the existing ICCAT MCS structure using VMS, flag State authorizations, observer reporting, transshipment declarations and catch documentation;
2. Provide data that can be used by national or regional management authorities to initiate investigation of activities of carrier vessels where data shows anomalous behavior, or potentially unauthorized or unreported transshipment activity may have occurred; and
3. Complement development of the CVP that is intended to give RFMO fisheries stakeholders access to AIS data and relevant publicly available information related to transshipping within a single platform.

***Note: Any incident identified in this study as possibly anomalous or non-compliant should not be seen as definitive. This report acknowledges that AIS data is only one dataset and additional information available to the Secretariat and flag States would be needed to provide a complete understanding of any apparent non-compliance or unauthorized fishing activity. Further investigation by the Secretariat or relevant flag and coastal State authorities who have access to the additional non-public information would be needed to make that determination and take appropriate enforcement or regulatory action.***

### 3. AIS Analysis Methods

GFW uses AIS data to provide insight into vessel movements and fishing activity throughout the world, including possible transshipment behavior (i.e., Miller et al. 2018; Boerder et al. 2018; Sala et al. 2018). The GFW database was used in conjunction with public registry data to analyze possible transshipment activity within the ICCAT Convention Area occurring between carrier vessels and LSPLVs during the year of 2017. A full description of data methods is described in Annex 2 and explained in detail in Kroodsmas et al. 2018 and Miller et al. 2018. The GFW database contains a table of AIS-detected ‘encounters’ between two vessels and ‘loitering’ events by carrier vessels. Encounters may indicate potential transshipment activity between two vessels that both appear on AIS. Encounters are estimated using AIS data, including distance between the two vessels, vessel speeds, and duration in a given area. Loitering by a single carrier vessel may also indicate a potential transshipment in which AIS data is missing for the second vessel. Loitering is also estimated using AIS data, including vessel speed, duration in a given location, and distance from shore. Because the ICCAT transshipment program is established for carrier vessels and LSPLVs, only encounters between carrier and LSPLVs and loitering events of carrier vessels were examined for this report (See Annex 2).

The GFW database also contains an estimate of port visits conducted by carrier vessels (see Annex 2). The ports visits are estimated using AIS data, including vessel speed, location, and duration in a given anchorage. This information was used to establish carrier trip information to compare to carrier trips identified in the ICCAT ROP.

Vessel authorization was established by using the publicly available vessel registry produced by ICCAT<sup>2</sup>. It should be noted that the publicly available historical ICCAT vessel registry database is in the process of being updated by ICCAT. The carrier vessels listed in carrier deployments during 2017 by the ROP were assumed as authorized during 2017, even though not all were identified on the ICCAT public registry. For this reason, the carrier vessels are analyzed based on 2017 authorization (if the carrier was authorized during any time during 2017), and the specific authorization of an encounter and/or loitering event is included in the data analysis (whether or not the carrier was authorized during the specific time of the event). If a vessel was not identified as ‘authorized’ during an encounter or loitering event it should not be assumed that it was ‘unauthorized’. In addition, this analysis solely focused on the authorization of carrier vessels and does not detail the authorization of fishing vessels, primarily because the objective of this report is to review carrier activity and possible transshipments within the ICCAT Convention Area and to limit uncertainty in conclusions drawn by the analysis caused by the lack of complete authorization information. Improving access to publicly available historical vessel authorization lists would enable ICCAT and other RFMOs to have a more complete and accurate picture of

---

<sup>2</sup> <https://www.iccat.int/en/vesselsrecord.asp>

vessel patterns and movements available to all stakeholders in the fishery and ensure effective monitoring and control of fishing activities occurring inside the Convention Area.

The full version of the data analyzed, including event and vessel information details, is included in Annex 1 of this report.

## **4. Overview of ICCAT Transshipment Activity in 2017**

ICCAT provides a publicly available authorized carrier vessel list which includes a list of carrier vessels that LSPLVs are authorized to transship with at sea. GFW used this database along with publicly available ICCAT documents detailing transshipments to assess carrier vessel activity in the Convention Area in 2017. In addition to the authorized vessel list, the following primary ICCAT documents were used for this study:

- *ICCAT Report for the Biennial Period 2016 – 2017 Part II – Volume 4 - Secretariat Reports*
- *ICCAT Doc. No. PWG-402/2018 – Report on the Implementation of the ICCAT Regional Observer Programme (ROP) for Transshipment 2017/2018*
- *ICCAT Regional Observer Program Observer Reports (commencing with ROP trip number 188-16)*
- *ICCAT Regional Observer Program Observer Reports (commencing with ROP trip number 203-17)*

The *ICCAT Biennial Report* details transshipment information based on carrier vessel deployments that occurred between July 2016 and August 2017. *ICCAT Doc. No. PWG-402/2018* details transshipment information based on carrier vessel deployments that occurred between September 2017 and August 2018. Based on these two reports, 539 high-seas transshipments were reported by ICCAT to have occurred during calendar year 2017.

For this study, vessel identification was based on a uniquely identified Maritime Mobile Service Identity (MMSI) number and vessel name associated with an AIS transponder. Reported transshipments under the ROP in 2017 were conducted by 11 distinct carrier vessels flagged collectively to five flag States; the four CPCs of Liberia, Panama, Japan and Saint Vincent and the Grenadines and one non-CPC of Singapore. LSPLVs involved in the high seas transshipments were flagged to the CPCs of China, Taiwan, Korea, Japan, Senegal, Saint Vincent and the Grenadines, Belize and Côte d’Ivoire.

## **4.1 AIS Detection of Carrier Vessels and LSPLVs**

GFW identified a total of 331 carrier vessels on AIS that had movements within the ICCAT Convention Area at some point during 2017. However, 243 of these carrier vessels appeared to either only have movements consistent with direct and continuous transit or had AIS-detected encounters with other vessel types or vessels that could not be confirmed as LSPLVs.

ICCAT had a total of 96 carrier vessels that were authorized to transship in ICCAT waters in 2017 and listed on their authorized carrier list. GFW identified all 96 of these authorized carrier vessels transmitting on AIS in 2017. 43 of these carrier vessels were observed having encounters or loitering events inside ICCAT, the other 53 were only observed in direct transits in ICCAT waters or operated in other regions of the world in 2017.

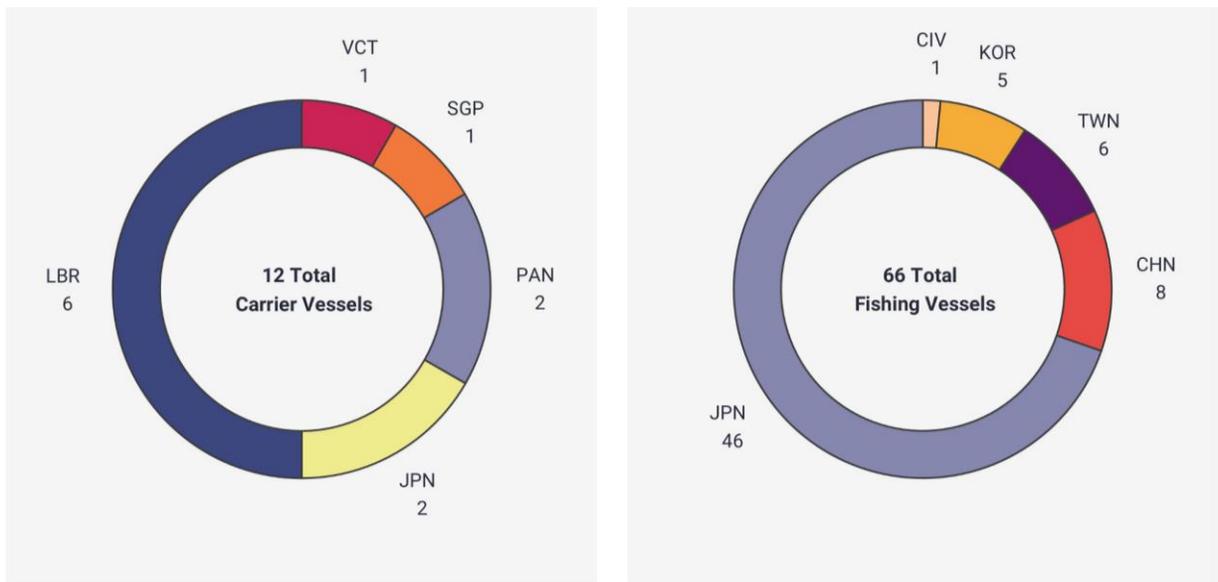
A total of 88 carrier vessels were observed on AIS to either have encounters with LSPLVs or had distinct loitering events while in ICCAT waters. One was not on the ICCAT authorized carrier vessel list and only 11 of the 88 carrier vessels were reported by the ROP to have conducted high-seas transshipments in 2017.

In addition to the 11 carriers reported by the ROP, 32 of the 96 authorized carrier vessels, flagged to four CPCs and one non-CPC, were observed on AIS to have 265 distinct loitering events in ICCAT waters. 54 of these loitering events occurred in waters in the same region as ICCAT-reported transshipments occurred. An additional 45 carrier vessels not listed as authorized by ICCAT and flagged to eight different CPCs were also observed on AIS to have distinct loitering events in ICCAT waters. 103 of these events occurred in waters in the same region as ICCAT-reported transshipments occurred.

## **4.2 AIS-Detected Encounters**

GFW identified 12 carrier vessels flagged to five different flag States that were involved in 120 AIS-detected encounters with LSPLVs on the high-seas in the ICCAT Convention Area (data available in Annex 1 0001-0120). These encounters were conducted with 66 different LSPLVs flagged to five different flag States (Figure 3). Most AIS-detected encounters involved Japanese-flagged LSPLVs (70%), followed by Chinese- and Taiwanese-flagged LSPLVs (Figure 3). 11 of the carrier vessels were reported to have an ICCAT observer onboard and transhipped ICCAT-managed catch under the ROP. The one remaining carrier vessel was flagged to Saint Vincent and the Grenadines and was observed to be involved in three of the 120 AIS-detected encounters. This carrier vessel was not listed on the ICCAT authorized carrier vessel list. None of the remaining 76 carrier vessels observed on AIS to have loitering events in ICCAT waters in 2017 were involved in AIS-detected encounters with LSPLVs. Further detail of the activity of the 11 carrier vessels that reported ROP transshipments are detailed in Section 5.

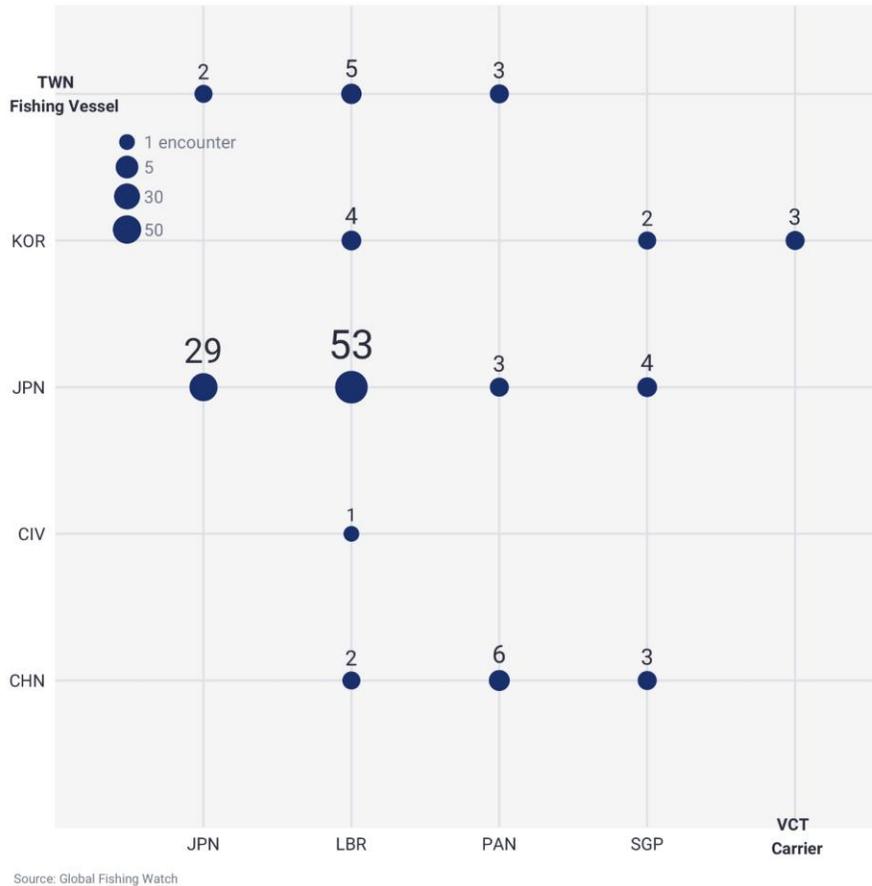
*PWG- 402-2018* and Addendum 1 to Appendix 2 in the Report to PWG in the *ICCAT Biennial Report* detail transshipment activity in terms of numbers of transshipments conducted by LSPLVs flagged to each specific CPC. The documents do not provide details of the flag State of the carrier vessels involved in the events. As such, it was not possible to compare trends of reported transshipments by flag States of both vessels involved. However, supplementary use and analysis of AIS data helped provide more clarity of these flag State interactions. For instance, Liberian-flagged carrier vessels conducted nearly all their transshipments with Japanese-flagged LSPLVs. Japanese-flagged carrier vessels almost exclusively transshipped with Japanese-flagged LSPLVs. The single Saint Vincent and the Grenadines-flagged carrier only had encounters with Korean-flagged LSPLVs (Figure 4).



Source: Global Fishing Watch

*Figure 3 - Count of Distinct Carrier Vessels and LSPLVs in AIS-Detected Encounters in 2017*

Japanese-flagged LSPLVs comprised a large proportion of the 539 high-seas transshipments reported by the ROP during 2017 (30%) although Taiwanese-flagged LSPLVs were the dominant fleet reported to have conducted transshipments (41%) during this time. While the ICCAT ROP reported high seas transshipments during 2017 with LSPLVs flagged to the CPCs of Belize, Saint Vincent and the Grenadines and Senegal, none of these LSPLVs were identified in AIS-detected encounters.



*Figure 4 - AIS-Detected Encounters of Carrier Vessels and LSPLVs by Vessel Flag in 2017*

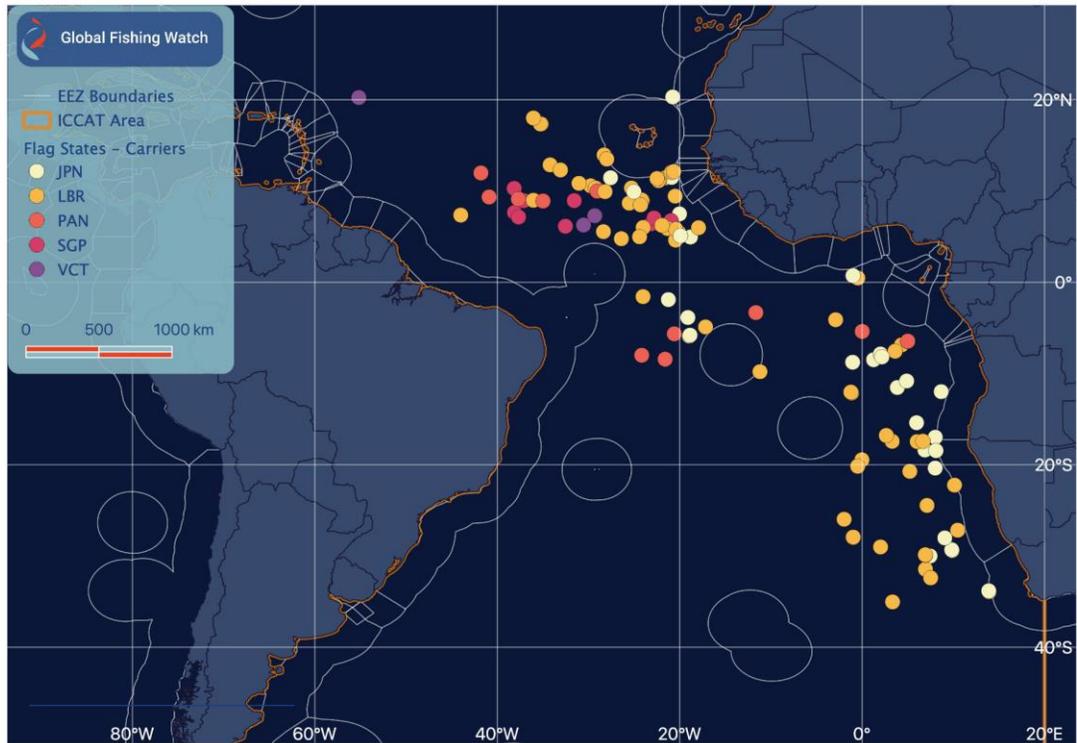
### 4.3 Spatial Analysis of AIS-Detected Encounters

All 120 AIS-detected encounters with LSPLVs attributed to the 12 carrier vessels occurred in the Atlantic Ocean between 20 degrees North latitude and 40 degrees South latitude largely outside of Exclusive Economic Zones (EEZs) of African countries on the eastern side of the Atlantic (Figure 5). Liberian- and Japanese-flagged carrier vessels were observed in encounters with LSPLVs throughout this region. However, Panamanian-flagged carriers did not have encounters south of 10 degrees South latitude. Two carrier vessels, one flagged to Singapore and one to Saint Vincent and the Grenadines were only involved in AIS-detected encounters with LSPLVs between the equator and 20 degrees North latitude (Figure 5).

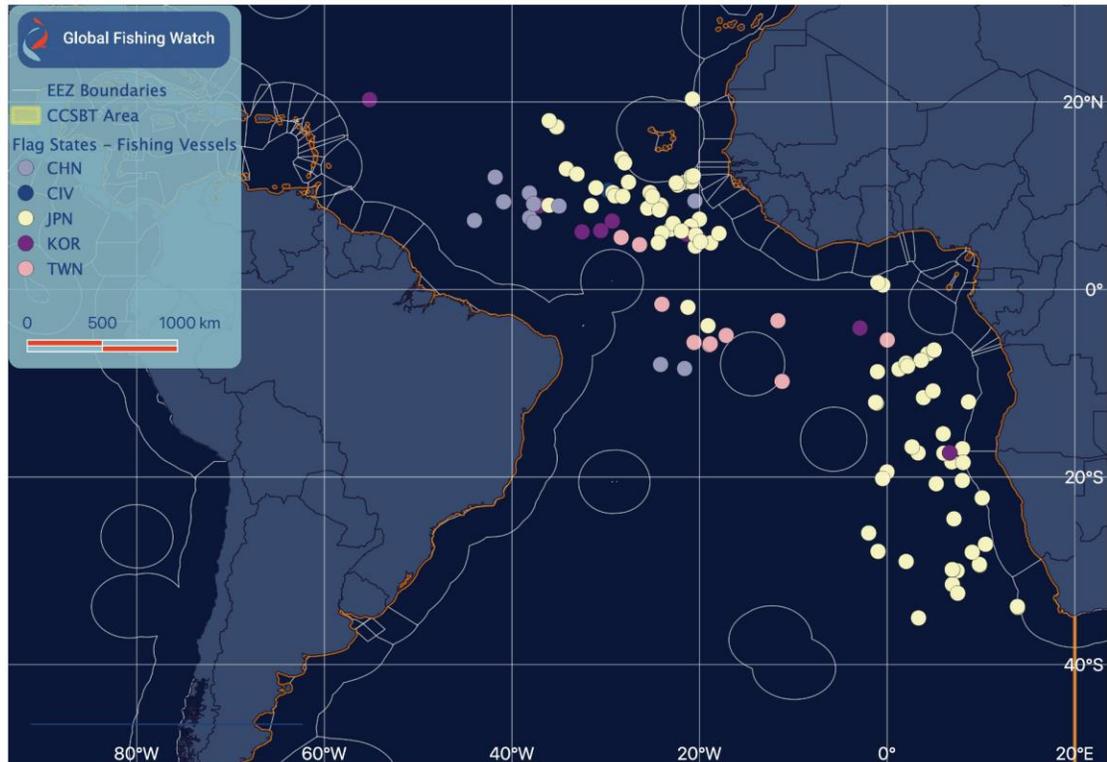
Japanese-flagged LSPLVs were observed in AIS-detected encounters throughout the ICCAT Convention Area; however, LSPLVs flagged to other States were slightly more constrained in their observed spatial dynamics (Figure 5). Taiwanese- and Chinese-flagged LSPLVs were only

observed in AIS-detected encounters north of the equator in the ICCAT Convention Area (Figure 6).

The relatively low number of AIS-detected encounters (120) compared to the number of reported transshipments (539) is likely related to low uptake and use of AIS by the LSPLV fleets operating in the ICCAT Convention Area. In particular, the piracy risk in the Gulf of Guinea region may be a factor that discourages vessel captains from operating AIS in that region.



*Figure 5 - Carrier Vessel Flags in AIS-Detected Encounters in 2017*



*Figure 6 - LSPLV Flags in AIS-Detected Encounters in 2017*

#### **4.4 AIS-Detected Loitering Events**

A total of 1,406 AIS-detected loitering events were observed associated with the 88 carrier vessels observed to have movements other than direct transit in ICCAT waters in 2017 (data available in Annex 1 0121-1526). For the purposes of this study, loitering events are defined as those events in which a carrier vessel's movements on AIS were consistent with behavior indicative of transshipment at sea, but for which no other vessel was observed on AIS in the immediate vicinity of the carrier vessel during the loitering timeframe. These loitering events provide an indication that transshipment may have occurred. Because loitering events only detail activity of a carrier vessel, it is important to note that these events may also indicate activities other than transshipment, such as a carrier vessel experiencing mechanical issues, possibly awaiting orders from its owners, or even transfers of crew, bait or supplies other than catch. Additionally, loitering events may also involve carrier vessel interactions with fishing vessels not related to ICCAT management such as those that may occur under CCSBT, CECAF or WECAFC.

The 11 carrier vessels operating under the ICCAT ROP in 2017 accounted for 381 loitering events in addition to 117 of the 120 AIS-detected encounters (Figure 7). Of note are the similarities of geolocations between the 117 AIS-detected encounters and 381 AIS-detected loitering events of

the 11 carrier vessels (Figure 5 and Figure 7) with the ROP transshipments reported to have occurred in ICCAT waters between September 2016 and August 2017 (Figure 8). All reported transshipments as well as AIS-detected encounters and loitering events took place in ICCAT waters in a region between 20 degrees North latitude and 40 degrees South latitude.

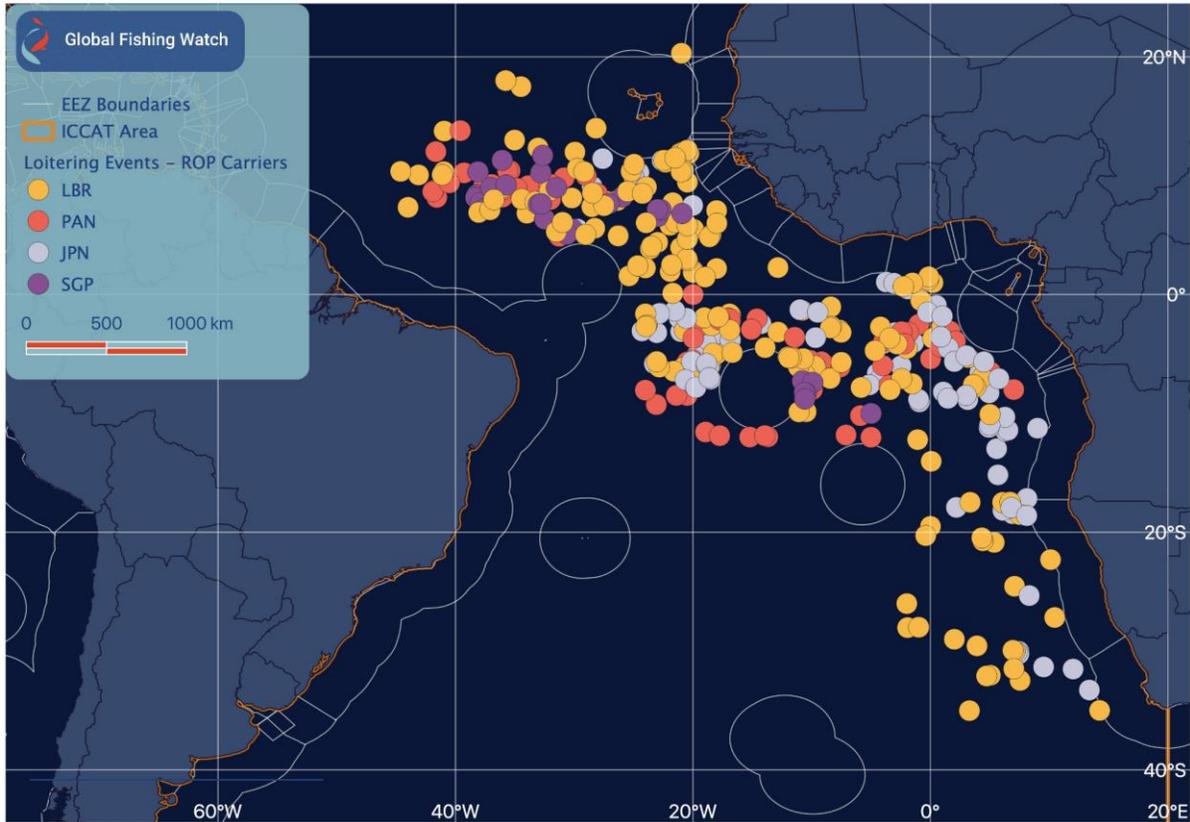


Figure 7 – AIS-Detected Loitering Events of 11 Carrier Vessels that had ROP Transshipments Reported

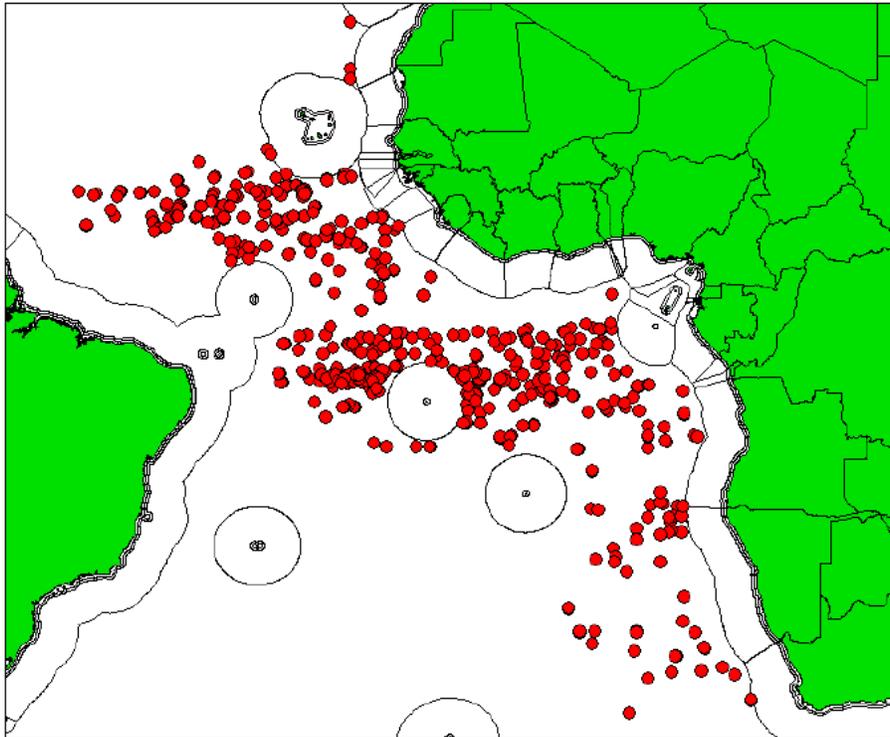


Figure 2. Locations of observed transshipments from deployments shown in Table 1.

Figure 8 – A copy of ‘Figure 2’ from ICCAT Document Addendum 1 to Appendix 2 of the *ICCAT Report for the Biennial Period 2016 – 2017 Part II – Volume 4 - Secretariat Reports* showing locations of ROP Transshipments Reported between July 2016 and August 2017

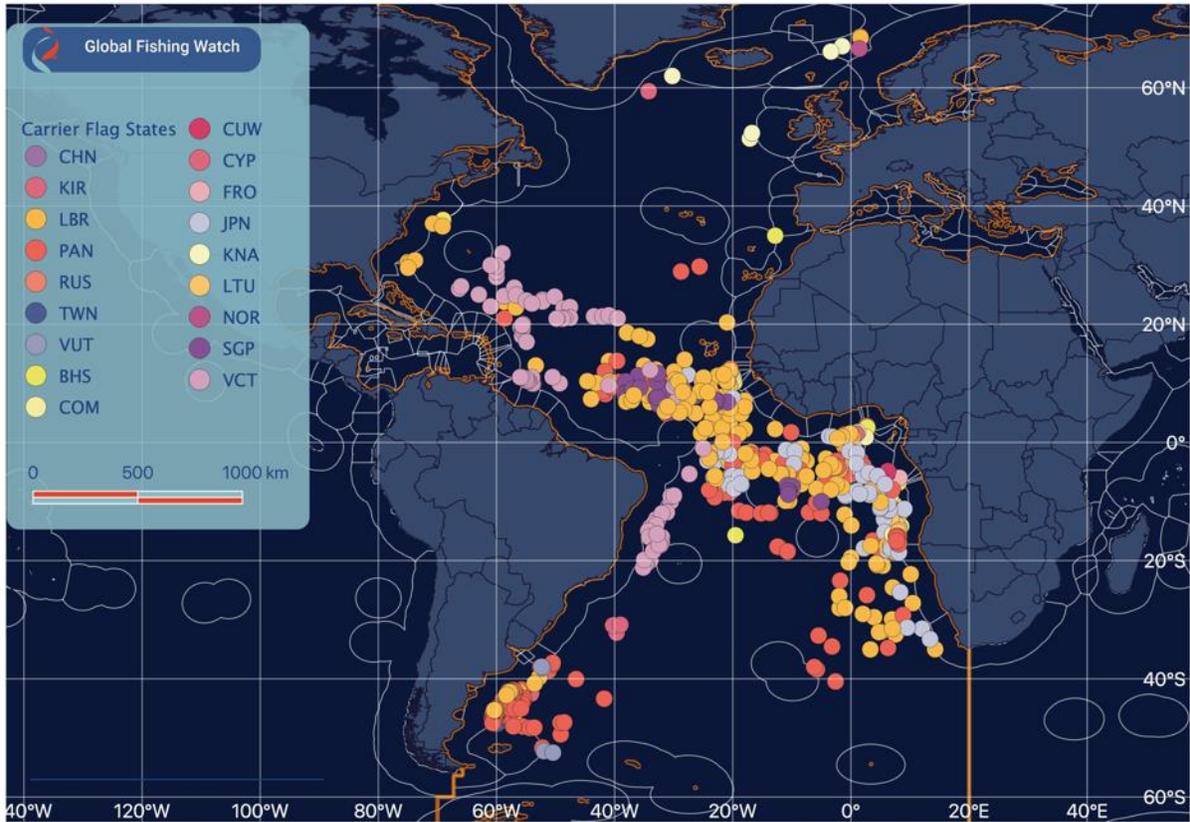
#### 4.5 Spatial Analysis of AIS-Detected Loitering Events

The AIS-detected loitering events were observed over a greater spatial range than were the AIS-detected encounters. Carrier vessels flagged to 18 different flag States were involved in the 1,406 total loitering events (Figure 9). 480 of the loitering events can be attributed to the 12 carrier vessels that were involved with AIS-detected encounters.

Of the remaining 926 loitering events, the vast majority occurred south of 40 degrees South latitude on the high seas off the (EEZ) of Argentina and are much more likely related to carrier vessel activity involving species not managed by ICCAT such as squid, hake or mackerel (Figure 9).

54 events were conducted by 18 different ICCAT-authorized carrier vessels flagged to five different flag States in the same region of ICCAT waters where ROP transshipments were reported (Figure 10). Of note are the number of loitering events by some of these carrier vessels on the high seas just outside the EEZs of several west African countries. Another 103 loitering events were conducted by 17 different carrier vessels of eight different flag States that were not included on ICCAT’s authorized list of carrier vessels (Figure 11). Of note with the 103 loitering events are

the large number of distinct loitering events conducted by one carrier vessel flagged to Saint Vincent and the Grenadines on the high-seas just outside the EEZs of Brazil, Suriname and Guyana in South America. Several other carrier vessels which were not found on the ICCAT list of authorized carriers were also observed with AIS-detected loitering events on the high seas just outside the EEZs of several west African countries (Figure 11).



*Figure 9 – Flag States of 88 Carrier Vessels in 1,406 AIS-Detected Loitering Events in 2017*

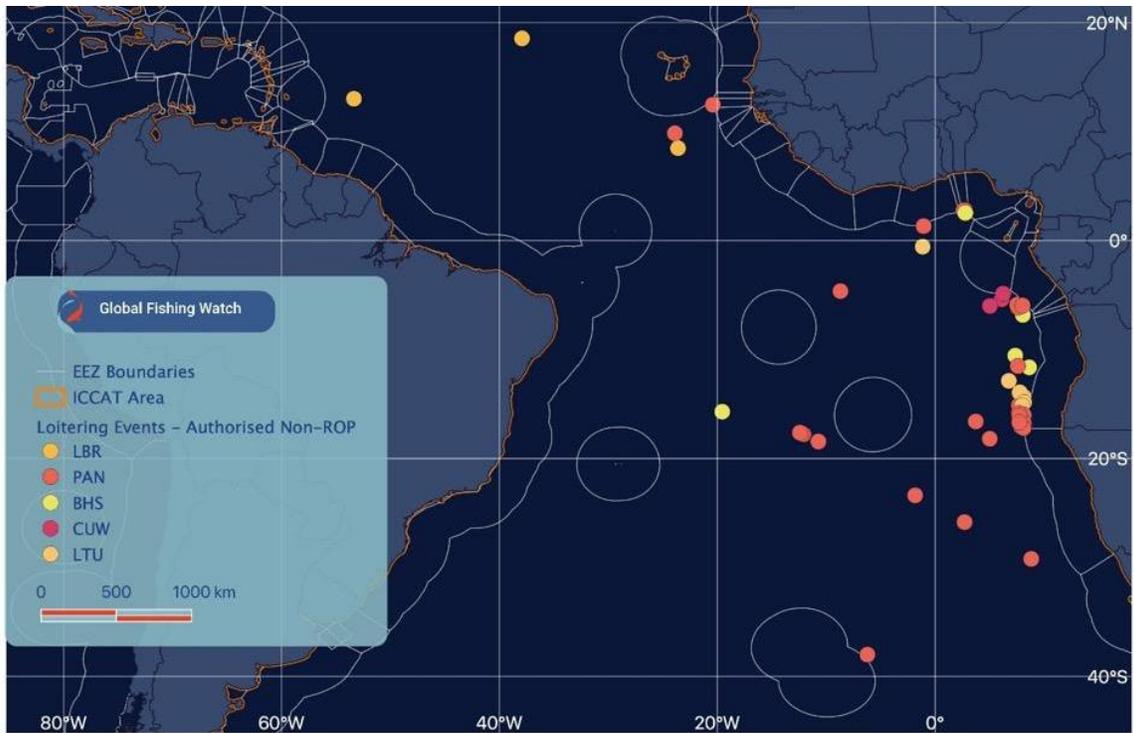
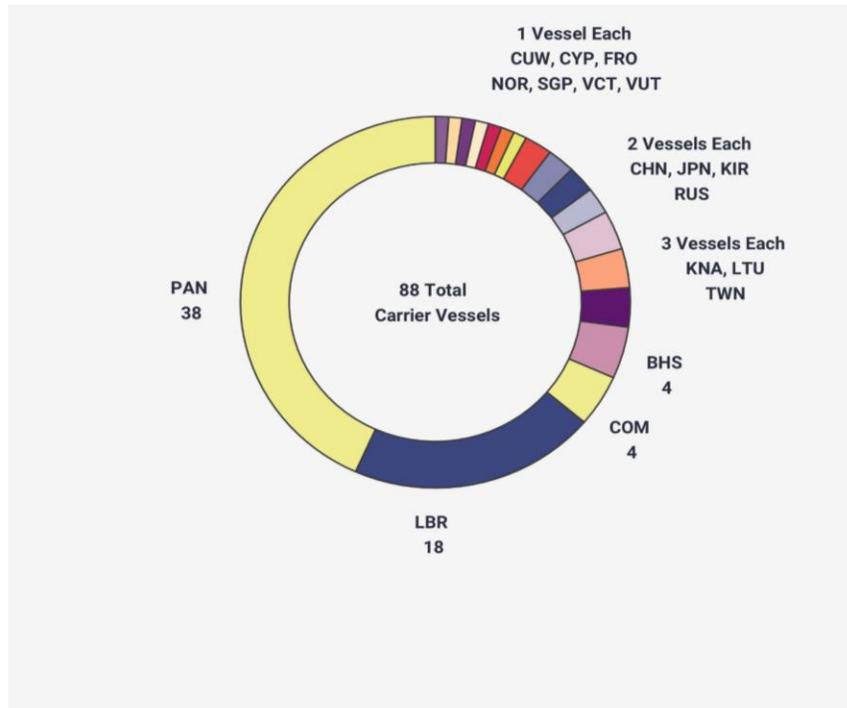


Figure 10 – Flag States of 18 Authorized Carrier Vessels with 54 AIS-Detected Loitering Events in 2017 in the Same Region as ICCAT-Reported Transshipments



Figure 11 - Flag States of 17 Carrier Vessels Not Listed by ICCAT as Authorized with 103 AIS-Detected Loitering Events in 2017 in the Same Regions as ICCAT-Reported Transshipments

The majority of AIS-detected loitering events were attributed to 84 Panamanian- and 18 Liberian-flagged carrier vessels (Figure 12) with nearly 74 percent of all loitering events detected on AIS. Taiwanese- and Chinese-flagged carrier vessels were also observed with numerous loitering events as were single carrier vessels flagged to Saint Vincent and the Grenadines and Singapore, who collectively accounted for over 13 percent of all loitering events (Figures 9 and 13).



Source: Global Fishing Watch

Figure 12 - Distinct Number of Carrier Vessels in Loitering Events in 2017

#### 4.6 Time Duration of Loitering Events

Further analysis of the time duration of loitering events may provide insight as to why carrier vessels were seen loitering and what type of activity the carrier vessels may have been involved in. The majority of AIS-detected loitering events were observed to have occurred between eight and 24 hours in duration (Figure 13).

Reported data on ICCAT high seas transshipments as reported by observers under the ROP indicate the typical length of time for the active transfer of fish product lasts no more than three hours (See ICCAT ROP Observer reports published during 2016/2017 at <https://www.iccat.int/en/ROP.html>). However, additional time should be considered for vessel maneuvering prior to and following transfers. Additionally, this timeframe does not consider multiple transshipments conducted in immediate succession. When these factors are all considered, an assumption can be made that there is a higher likelihood of AIS-detected loitering activity less

than 24 hours in duration is more indicative of transshipment than loitering activity greater than 24 hours.

Using this assumption, analysis of the 1,406 total AIS-detected loitering events of the 88 carrier vessels indicated 1,035 of the events were 24 hours or less in duration. 157 of the loitering events by carriers not reported to be involved in the ROP took place in the same geographical region where nearly all the 539 ICCAT-reported high seas transshipments took place, primarily between 20 degrees North latitude and 40 degrees South latitude. Of these 157 events, 82 events were 24 hours or less in duration involving 30 carrier vessels flagged to 11 different flag States (Figure 14). It is reasonable to assume that when carrier vessels exhibit loitering events on AIS less than 24 hours in duration, especially in the same region where all reported transshipments of ICCAT-managed species took place, these loitering events may be a good indicator of potential transshipment activity. As such, it is possible that some the 82 loitering events exhibited by these carrier vessels that were less than 24 hours in duration involved transfer of ICCAT-sourced catch that went unreported to ICCAT.

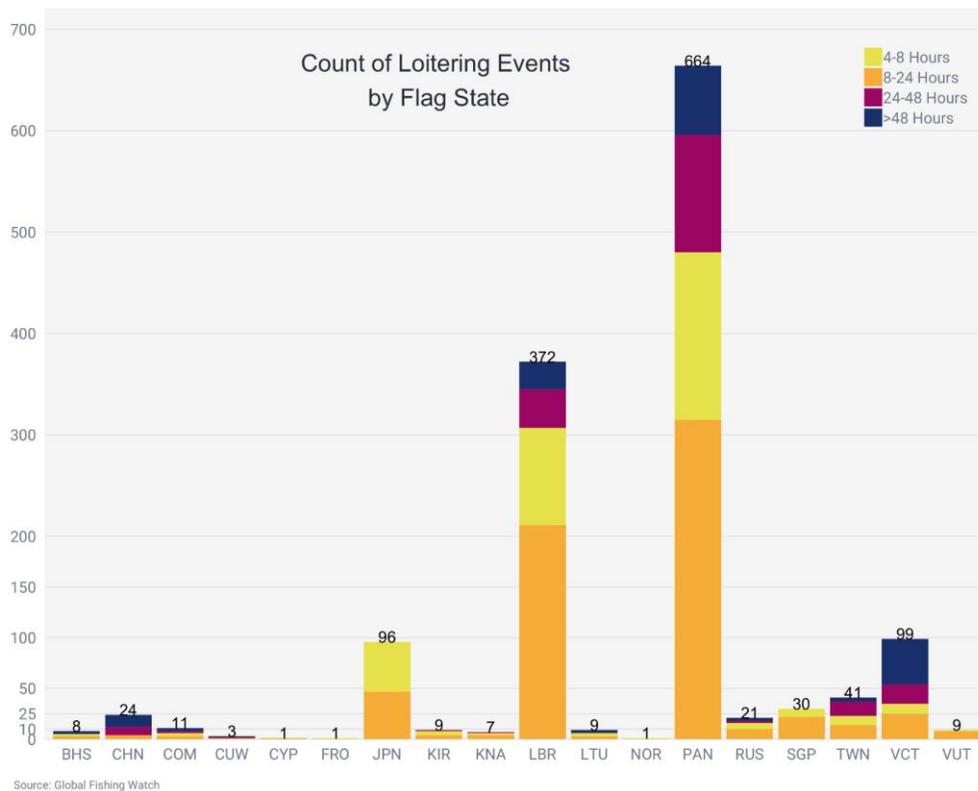


Figure 13 - Loitering Events by Carrier Vessel Flag State and Time Duration

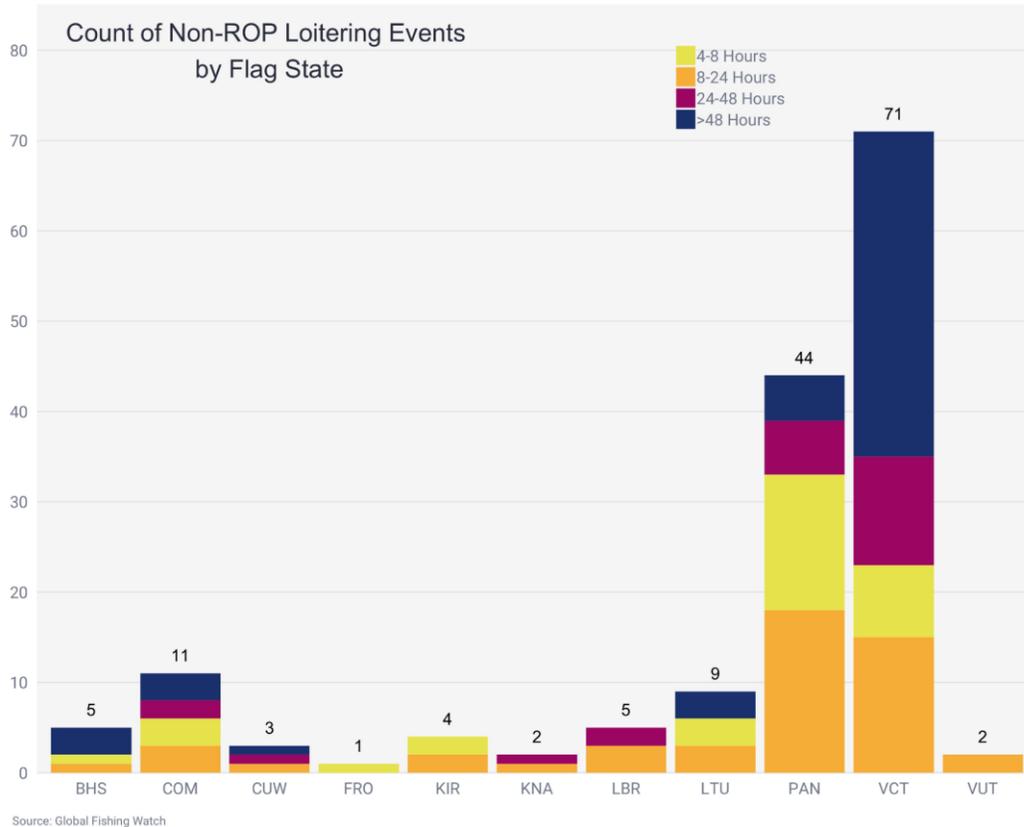


Figure 14 – Loitering Events of Carrier Vessels with No ROP Reporting in the Same Region as ROP-Reported Transshipments

#### 4.7 Section Summary and Key Findings

A total of 331 unique carrier vessels were identified on AIS present inside ICCAT waters at some point during 2017. Of these carrier vessels, the following subsets were identified:

- 243 carrier vessels were not observed to have any encounters with LSPLVs or had loitering events inside ICCAT waters based on the GFW methodology described in Section 3. These carrier vessels included ones in direct transit from port-to-port through ICCAT Convention Area waters or were observed having encounters with other types of fishing vessels that could not be confirmed as LSPLVs.
- 11 of the carrier vessels had encounters with LSPLVs or loitering events and were identified by the ROP.

- One carrier vessel was observed encountering an LSPLV but was not listed as authorized by ICCAT nor identified to be used by the ROP. This carrier vessel was also observed to have loitering events in ICCAT waters.
- 76 additional carrier vessels had loitering events in ICCAT Convention Area waters and were not identified to be used by the ROP. These carrier vessels consisted of 32 carrier vessels included on the ICCAT authorized carrier vessel list and 44 carrier vessels that were not included on the ICCAT authorized carrier vessel list.

The following findings for this section are expanded further on in section 8, Key Findings.

- Publicly available historical ICCAT vessel authorization lists greatly assist the ability for CPC authorities or other independent organizations to conduct retrospective analyses of vessel activity reflective of vessel authorization status. This practice improves the overall usefulness and practicality of the ICCAT authorized vessel lists.
- Analysis of AIS data was effective in determining flag States of carrier vessels involved in AIS-detected encounters with LSPLVs and loitering events as well as the geolocation of these events in ICCAT Convention Area waters.
- Not including the 11 carrier vessels that conducted ROP-reported transshipments in 2017, at least one additional carrier vessel had three AIS-detected encounters with LSPLVs. An additional 35 carrier vessels had 157 loitering events in the same region of ICCAT waters between 20 degrees North latitude and 40 degrees South latitude that the 539 reported ROP transshipments took place between September 2016 and August 2017. 17 of these carrier vessels were not listed on the ICCAT authorized list of carrier vessels.
- Analysis of AIS data indicated that the majority of the 157 different AIS-detected loitering events that occurred in the same region where ROP-reported transshipments occurred, took place on the high seas just outside of the EEZs of coastal State CPCs. It is possible that some of these loitering events exhibited by these carrier vessels were potential high seas transshipment events involving ICCAT-sourced catch that went unreported to ICCAT.

## **5 Comparing AIS-Detected and Observer Reported Carrier Activity**

Carrier vessel trips during calendar year 2017, as reported in *ICCAT Regional Observer Program Observer Report (commencing with 188-16)* and *ICCAT Regional Observer Program Observer Report (commencing with 203-17)*, were analyzed in comparison with observed AIS data to audit the reported information. During 2017, there were 18 ROP reported carrier vessel trips conducted

with an ICCAT observer deployed onboard. These trips were conducted by 11 carrier vessels which reported being involved in 539 high-seas transshipments in the ICCAT Convention Area.

## **5.1 Comparing Observer-Reported Carrier Trips and AIS-Detected Events**

For the purposes of this study, trips that began in 2016 or ended in 2018 were not included in the following comparative analysis. Also, not included in this analysis was one carrier vessel trip which was cancelled (trip 204), and two trips for which no transshipment information was provided in ROP reports (trips 202 and 205). The reported geolocations of transshipments made during the remaining carrier vessel trips were compared with AIS-detected encounters and loitering events to assess how well the GFW algorithms for AIS-detected encounter and loitering events alerted to and matched ROP reported transshipments (Table 2).

Based on available AIS data for the Convention Area in 2017, GFW detected a total of 19 carrier vessel trips were conducted by 12 carrier vessels in ICCAT waters. These 19 trips were inclusive of the 18 ROP-reported trips (data available in Annex 1 1527-1566). One additional trip was observed on AIS to be conducted by a Saint Vincent and the Grenadines-flagged carrier vessel which was not listed as authorized by ICCAT. This trip was not reported in any ROP reports (Table 1). GFW identified this carrier vessel having three AIS-detected encounters with LSPLVs in the Convention Area as well as 99 AIS-detected loitering events. It is unclear what activity occurred during these encounters and loitering events. However, as the carrier vessel's trip occurred in the same waters of the trips that were reported by the ROP, it is possible that these AIS-detected encounters and loitering events involved activities that included the transfer of ICCAT-sourced catch that went unreported to ICCAT.

*Table 1– AIS-Detected Carrier Vessel Trips Not Matched to ROP-Reported Carrier Vessel Trips*

Flag	Trip Start			Trip End			Count of Encounters	Count of Loitering Events	Count of All Events
	Date	City	Country	Date	City	Country			
VCT	2016-06-02	CHACAC HACARE	TTO	2018-03-20	DAKAR	SEN	3	99	102

The geolocations of the reported transshipments which occurred on trips included in the ROP reports were compared to AIS-detected encounters and loitering events within the Convention Area in 2017 and found to be very similar (Figure 15). It should be noted however, that the timeframe of the figure of reported transshipments provided by the ROP is not inclusive of all calendar year 2017. It provides geolocations of reported transshipments between September 2016 and August 2017. Despite this slight difference in timeframe, the matching of events proved very similar.

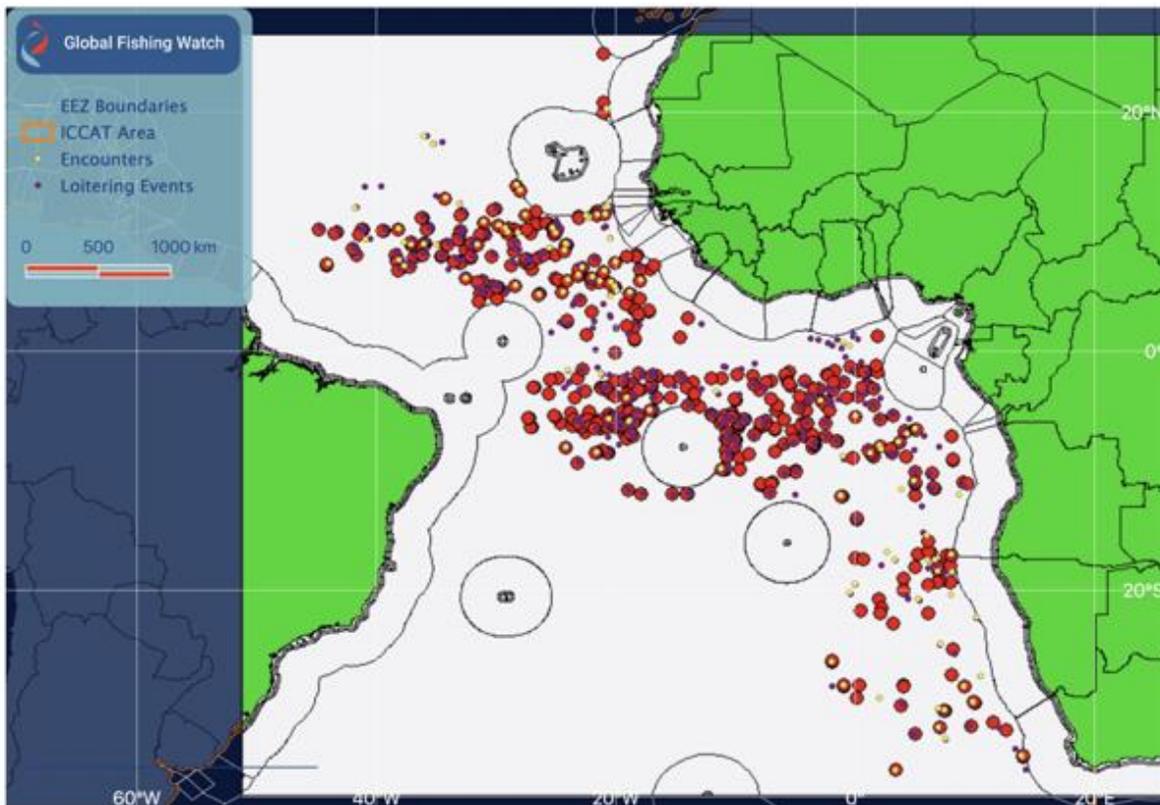


Figure 15 – Overlay of ROP-Reported Transshipments between September 2016 and August 2017 with AIS-Detected Encounters and Loitering Events in 2017 of 11 Carrier Vessels that Reported ROP Transshipments

Table 2– Comparative Analysis of AIS-Detected Events to ICCAT-Reported Transshipments (TS)

Trip ID <sup>+</sup>	Reported Transshipments Count <sup>+</sup>	AIS-Detected Encounters			AIS-Detected Loitering		
		Detected	Matched TS	% Matched*	Detected	Matched TS	% Matched
194	31	12	10	83.3	32	26	81.3
195	43	11	14	127.3	29	29	100
196	31	2	2	100	26	26	100
197	21	8	7	87.5	19	16	84.2
198	38	6	4	66.7	30	23	76.7
199	28	8	9	112.5	31	24	77.4
200	50	5	6	120	33	40	121.2
201	36	8	8	100	14	15	107.1
203	17	8	7	87.5	12	15	125
206	57	7	5	71.4	36	25	69.4
207	4	3	1	33.3	4	4	100
209	12	2	1	50	9	9	100

\* % Matched over 100% indicates that multiple reported transshipments may have matched with a single AIS encounter or loitering event.

% matched value under 100% indicated that not all AIS-detected encounter or loitering events matched to a reported transshipment.

+ Trip ID and Reported Transshipments Count are found in the *ICCAT Regional Observer Program Observer Reports*

Note: 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.

It is worth noting that only transshipments of fish product as reported by the ROP were investigated for the purposes of this analysis; no non-ROP transshipments were analyzed. On average, nearly 86 percent of AIS-detected encounters matched reported transshipments. Additionally, over 95 percent of AIS-detected loitering events matched reported transshipments. The reported transshipments which occurred on one of the trips analyzed is illustrated in Figure 16 with the AIS-detected encounters and loitering events overlaid to highlight the accuracy with which GFW could identify these events.

The high match rates for both encounters and loitering events indicates the effectiveness of using AIS data to detect and identify potential transshipment events at sea. The supplemental use of AIS data in the ICCAT Convention Area can help relevant management authorities monitor carrier vessel activity and help ensure carrier vessel compliance to ICCAT transshipment regulations. Additionally, this data can be used to cross-check and verify activity reported by observers embarked on carrier vessel deployments.



*Figure 16 – Comparative Analysis of ICCAT ROP Transshipment Data with AIS-Detected Encounters and Loitering Events - Trip 199*

## 5.2 AIS-Detected Port Visits by Carrier Vessels on ICCAT ROP Trips

The ports identified by the ROP to have been visited by carrier vessels were located in Cape Verde, South Africa, Namibia, Greece, Mauritius, Senegal, Panama, Spain, Trinidad and Tobago, Singapore, and Turkey. Cape Town, South Africa was the port most often observed as the commencement point of an ROP carrier vessel trip, followed by Porto Grande, Cape Verde, and Walvis Bay, Namibia (Figure 17). Porto Grande was the most frequented port at the conclusion of an ROP trip, followed by Walvis Bay, Cape Town, Port Louis, Mauritius and Singapore (Figure 18). The ports frequented at the end of a trip are most likely to be terminal ports, where ICCAT-sourced catch is first landed for processing. However, Porto Grande, Cape Verde had the same number of commencement and end port visits (13), because it was always visited as a stop during a longer carrier deployment. It is unclear if these visits involved the offloading of fish, or if this was a stop made solely for other reasons such as disembarking the ICCAT observer. Walvis Bay, Namibia and Port Louis, Mauritius were also ports that were often visited within longer carrier deployments (see Annex 1 for a detailed list of AIS-detected carrier trips matched to ROP Observer-Reported carrier deployments).

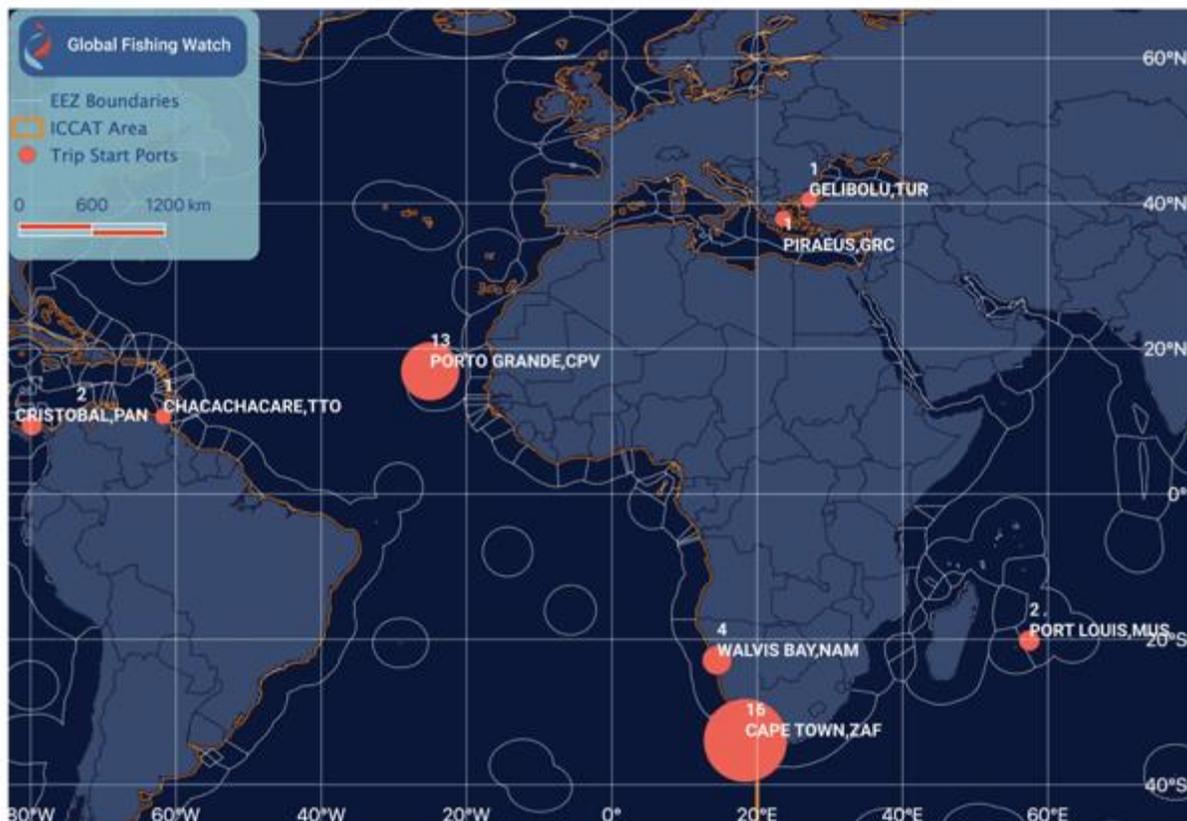


Figure 17 – Commencement Ports of AIS-Detected Carrier Vessel Trips in 2017



*Figure 18 – Ending Ports of AIS-Detected Carrier Vessel Trips in 2017*

Nine of these eleven countries are party to the Port States Measures Agreement (PSMA) (see Ortiz 2016 for PSMA details). Singapore and Trinidad and Tobago have yet to accede to the PSMA<sup>3</sup>. Having a better understanding of carrier vessel port visits helps to identify those ports more likely to have been used for offloading and in-port transshipping of ICCAT-sourced and transshipped fish species. Consequently, they may also represent the most important port locations to ensure effective port inspection programs are in place to monitor and regulate transfer or landing of ICCAT-sourced catch. CPCs may be able to use this information to better understand the value of acceding to the PSMA, and having ICCAT adopt and implement management measures specific to port State control. These actions could help ensure that illicitly caught fish or unreported transshipped catch sourced from ICCAT waters have a greater chance of being detected when landed in-port.

<sup>3</sup> <http://www.fao.org/port-state-measures/background/parties-psma/en/>

### 5.3 Section Summary and Key Findings:

The following findings for this section are expanded further on in section 8, Key Findings.

- A comparative analysis of AIS-detected encounters and loitering events with ROP reported transshipment information showed a high match rate of AIS-detected and ROP reported events. AIS data can be used effectively to cross-check and validate ROP trip information and highlight reporting anomalies or even detect potential noncompliant behavior that may warrant further investigation or follow up.
- AIS analysis can be used to effectively monitor port visit trends by carrier vessels and highlight those ports most often used for offloading ICCAT-sourced and transshipped fish species. These, in turn, may represent the most important port locations to monitor and regulate the landing of ICCAT-sourced catch.

## 6 In-Port Transshipment Reporting and Activity of non-CPC vessels in the ICCAT Convention Area in 2017

During calendar year 2017, there were 96 carrier vessels authorized by ICCAT to transship ICCAT-managed species at sea. 21 of these carrier vessels (nearly 22 percent) were flagged to two non-CPCs: Singapore and the Bahamas. AIS analysis indicated that many of these non-CPC flagged carrier vessels conducted numerous port visits to ports of CPCs. Although there is no specific information detailing the activities of these carrier vessels while in-port, they do on occasion appear to encounter ICCAT-authorized fishing vessels in port. It is possible that some of these port visits were conducted with the intention of transshipping ICCAT-sourced catch.

There are ICCAT reporting requirements specific to vessels involved in in-port transshipments in addition to reporting requirements for at-sea transshipments outlined under *Recommendation 16-15*. ICCAT *Recommendation 12-07 - For an ICCAT Scheme for Minimum Standards for Inspection in Port*, indicates fishing vessels are required to notify port State authorities in advance of intended in-port transshipments. In addition, the fishing vessels must notify their flag State authorities at the time of the transshipment. Following in-port transshipments, the fishing vessels are required once again to report to their flag State the details of the transshipment via a transshipment declaration.

For in-port transshipment, carrier vessels are required to provide notification to the port State that a transshipment occurred. They must also provide a transshipment declaration not only to the port

State, but also to authorities of the State where the product will next be landed. However, *Recommendation 12-07* provides no requirements for carrier vessels to notify the Secretariat of transshipments conducted in-port, the intended next port or report quantities of ICCAT-sourced catch landed in those subsequent ports. This means that despite prior reporting of at-sea transshipments, there is no way for the ICCAT Secretariat to monitor in-port transshipments of carrier vessels or their subsequent landings, especially if these landings occur in non-CPC port States. The lack of these reporting requirements creates a loophole in monitoring catches and transshipments of ICCAT-sourced species.

As to reporting requirements for CPCs, *Recommendation 16-15* does not require CPCs to submit annual reports on transshipment activity of their flagged carrier vessels for in-port transshipments or for subsequent landings of ICCAT-sourced catch in CPC and non-CPC landing States. This means that the Secretariat is again not afforded an opportunity to cross-check and validate landings of ICCAT-sourced species.

A lack of these in-port reporting requirements for carrier vessels limits the Secretariat's ability to cross-check and validate reporting data related to carrier vessels and what volumes and species of ICCAT-sourced catch is landed. The issue is further compounded by non-CPC flagged carrier vessels being authorized by ICCAT to conduct transshipment. Flag State authorities of non-CPC flagged carrier vessels are not bound to comply with any ICCAT management measures or reporting obligations to include providing ICCAT any information on the activities of their flagged carrier vessels. Although in-port transshipment reporting requirements for CPC-flagged carrier vessels and their flag State authorities could be bolstered by revisions to *Recommendation 12-07*, it would be difficult for ICCAT to extend any of these reporting obligations on to flag State authorities of non-CPC flagged carrier vessels even though these carrier vessels may be authorized by ICCAT to transship ICCAT-sourced catch.

AIS analysis for calendar year 2017 indicates that authorized carrier vessels flagged to two non-CPC flag States were active in ICCAT waters. Figure 19 provides an example of the movements on AIS of one of the non-CPC flagged carrier vessels in the Convention Area in 2017. The movements on AIS for other carrier vessels flagged to non-CPCs had similar track patterns in ICCAT waters. Three of these carrier vessels were observed on AIS with loitering events on the high-seas in ICCAT waters although no AIS-detected at-sea encounters were observed.



*Figure 19 - Example Track of Non-CPC Flagged Carrier Vessel and Port Visits*

The AIS-detected port visits of the non-CPC flagged carrier vessels were analyzed for the CPC port States highlighted in the summary of reports of in-port transshipment as presented in Table 3 on page 1222 of the *ICCAT Report for the Biennial Period 2016 – 2017 Part II – Volume 4 - Secretariat Reports*. AIS analysis indicated 19 non-CPC flagged carrier vessels not listed in ROP reporting operated in ICCAT waters and visited CPC ports. These vessels made 483 port visits to the 38 different CPC port States (where 15 of the port States fall under EU membership) as outlined in Table 3 (data available in Annex 1 1567-2049). Although many of the port visits may be related to the trade of non-ICCAT species such as small pelagic or demersal species, these vessels are on occasion observed encountering ICCAT-authorized fishing vessels in port. It is likely these carrier vessels transferred onboard purse seine and longline caught ICCAT-sourced catch when visiting some of these ports as well as made subsequent port visits to various CPC and non-CPC port States where any ICCAT-sourced catch onboard was likely landed.

*Table 3 – Non-CPC Flagged Carrier Vessel Activity in port States*

Port State <sup>+</sup>	Number of Ports Visited	Number of Visits	Distinct Number of Carriers	Reported TS by PS and LL <sup>+</sup>
Algeria	2	23	11	N/A
Angola	1	4	4	N/A
Cape Verde	1	1	1	No information
China	1	3	1	Received
Cote d'Ivoire	2	27	12	Received
Curacao	1	1	1	Received
Egypt	4	11	8	N/A
EU*	38	180	19	Received
Ghana	2	9	5	Received
Iceland	10	41	5	N/A
Korea	1	1	1	Received
Libya	1	3	2	N/A
Mauritania	1	8	6	No information
Morocco	2	3	2	N/A
Namibia	1	3	3	N/A
Nigeria	3	23	12	N/A
Norway	5	6	2	N/A
Panama	4	49	9	Not received
Russia	3	23	10	N/A
Senegal	1	2	2	N/A
South Africa	2	12	7	N/A
Tunisia	1	2	1	N/A
Turkey	12	23	11	N/A
USA	8	25	6	N/A

+ These columns are taken from Table 3 on Page 1222 of the ICCAT Report for the Biennial Period 2016 – 2017 Part II – Volume 4 – Secretariat Reports, the rest of the values in the table are established from GFW AIS detected estimates.

\* EU countries included Belgium, Bulgaria, Cyprus, Denmark, Germany, Greece, Ireland, Italy, Lithuania, Malta, the Netherlands, Poland, Spain, Sweden, and the United Kingdom.

Due to the exclusion of the Secretariat in current ICCAT carrier and flag and port State CPC reporting protocols for in-port transshipment, as well as the inability of ICCAT to extend any future obligations of in-port transshipment reporting requirements to non-CPC flagged carriers and their respective flag State authorities, there exists a loophole in ICCAT management for

comprehensive monitoring of in-port transshipments and subsequent landings of ICCAT-sourced catch.

This risk is confirmed by the analysis of AIS data indicating non-CPC flagged carrier vessels were active in many CPC ports in 2017 (Table 3). This level of activity suggests that ICCAT-sourced catch could very well have been transshipped by these vessels in-port and then landed during subsequent port visits. Further analysis of these vessels' activity in port, including any possible in-port encounters, is recommended.

## 6.1 Section Summary and Key Findings

The following findings for this section are expanded further on in section 8, Key Findings.

- ICCAT *Recommendation 12-07* does not include comprehensive reporting obligations related to carrier vessels transshipping in-port. While carrier vessels are required to notify the port State and their respective flag State of all in-port transshipments, the reporting obligation is not inclusive of the Secretariat. Likewise, flag State CPCs are not required to submit annual reports to the Secretariat on transshipment activity of their flagged carrier vessels for transshipments conducted in-port or for landings of transshipped fish caught inside the ICCAT Convention Area catch in subsequent landing States. Furthermore, flag State CPCs are not required to provide the number of in-port transshipments and port location information where their flagged fishing vessels transship ICCAT-sourced catch in port despite having requirements to report overall volume and type of species transshipped. This lack of transparency results in the inability for the Secretariat to cross-check and validate reporting data of fishing vessels transshipping in port as well as to effectively monitor carrier vessel landings of ICCAT-sourced catch.
- Similar to CPC-flagged carrier vessels, ICCAT documents provide no information or data related to transshipment activities of authorized non-CPC flagged carrier vessels while in-port. The Secretariat is not only excluded from in-port transshipment reporting requirements, but the lack of transparency is compounded by the inability of ICCAT to hold non-CPC flagged carriers and their respective flag State authorities accountable for any reporting obligations related to ICCAT management measures or ICCAT-sourced catch as these countries are not Members or Cooperating Non-Contracting Parties of ICCAT.
- 20 authorized non-CPC flagged carrier vessels were active in the ICCAT Convention Area in 2017. AIS analysis indicated nearly all of these carrier vessels made visits to ports that are known to be in-port transshipment locations for fishing vessels with ICCAT-sourced catch. These movements suggest these carrier vessels were likely involved not only in transshipment in port involving fishing vessels with ICCAT-sourced catch, but also subsequent landing of the ICCAT catch in various CPC and non-CPC port States.

## 7 Data Caveats

The analysis presented in this report relies on commercially available AIS data and publicly available information. Therefore, AIS data is limited by those vessels that transmit on AIS and do so by providing accurate vessel identity information. Low satellite coverage of high-density areas can also limit AIS data usefulness, although the ICCAT Convention Area has relatively strong Class-A AIS coverage, with the exception of the Gulf of Mexico, parts of Europe outside the range of terrestrial receivers along the coast, and parts of the southern Atlantic Ocean (Kroodsma et al. 2018). However, AIS data tends to be sparser and more data limited for vessels equipped with a Class-B AIS device (Kroodsma et al. 2018). AIS device class often depends on flag State regulations, vessel length, and vessel purpose. Due to AIS data limitations, 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 accurately as possible but should be considered restrained estimates based on these limitations (See Miller et al. 2018 for further discussion).

## 8 Key Findings

Carrier vessel activity in the ICCAT Convention Area during 2017 was reviewed via a comparative analysis of commercially available satellite AIS data and publicly available information related to carrier vessels and transshipment. The resulting analysis produced three key findings. Recommendations relative to these key findings are provided for consideration by ICCAT CPCs as options for addressing the issues raised.

**Key Finding 1:** Analysis of AIS data can be effective in detecting reported transshipment events as encounters with LSPLVs or loitering events with high matching rates. Comparative analysis highlights the utility of AIS and machine learning algorithms as a supplementary tool in validating reported information on carrier vessels and detecting potential unreported or unauthorized transshipment activity.

- *Recommendation:* ICCAT should consider use of AIS as a supplemental tool to help monitor implementation of the ROP, validate transshipment activity, and assist in the early detection of potential noncompliant behavior that requires further follow up by the ICCAT Secretariat or flag State authorities. This would be further strengthened by mandating the use of AIS by ICCAT authorized vessels.
- *Recommendation:* Further strengthen clarity around high seas transshipment activity in ICCAT by consolidating the geolocation and date of all ROP-authorized transshipments reported to the Secretariat by calendar year in a singular document rather than in multiple references.
- *Recommendation:* Encourage more RFMOs follow ICCAT's lead in transparency of reported information. Transparency of information leads to improved compliance through self-correcting behavior. ICCAT CPCs should consider advocating that more publicly available information from the global tuna RFMOs will lead to improved management of tuna stocks and will help ensure greater compliance with global transshipment regulations.

**Key Finding 2:** While 11 carrier vessels reporting to the ROP were observed on AIS encountering LSPLVs, one additional carrier vessel was observed encountering an LSPLV but was not listed by ICCAT as an authorized carrier vessel or identified by the ROP. An additional 76 carrier vessels had loitering events inside the ICCAT Convention Area that included 32 ICCAT-authorized carrier vessels that were not reported by the ROP and 44 carrier vessels that were not reported by the ROP nor included on the ICCAT authorized carrier vessel list. Specifically, 157 AIS-detected loitering events by 35 of the 76 carriers were observed in the same region where transshipment of ICCAT catch has been reported and is most likely to occur. This finding could mean that transshipment activity has gone unreported.

- *Recommendation:* ICCAT should require CPCs provide an annual report on all their respective flagged carrier vessels that operate in ICCAT waters during a given calendar year to account for their presence. These reports should include confirmation that carrier vessels not involved in the ICCAT ROP did not conduct transshipment activity involving ICCAT sourced and managed species.

**Key Finding 3:** Carrier vessels flagged to non-CPCs were observed operating in many CPC port States. As these vessels are not flagged to ICCAT CPCs there is no requirement for the carrier vessels themselves, nor their flag State authorities, to report on their activity. Additionally, there is no requirement for CPC port States to report to the Secretariat on the activity of carrier vessels in their ports. It is possible that these non-CPC flagged carrier vessels transshipped ICCAT-sourced catch in port and landed these amounts in subsequent port visits.

- *Recommendation:* ICCAT should consider amending *Recommendation 12-07* reporting requirements for CPCs to expand reporting on in-port transshipment activity of their flagged longline and purse seine vessels to include not only volume and species transshipped in-port, but also number of transshipments and port locations where these transshipments took place. This would facilitate the ability of the Secretariat and other relevant authorities to cross-check and validate in-port reporting of fishing vessels.
- *Recommendation:* ICCAT should consider amending *Recommendation 12-07* reporting requirements for CPC-flagged fishing and carrier vessels to be inclusive of the Secretariat in addition to the relevant CPC flag and port State authorities. This would facilitate the ability of the Secretariat to compile annual data on in-port transshipment activity involving ICCAT-sourced catch and provide for more comprehensive monitoring and validation of in-port transshipments of ICCAT-sourced catch and details of their subsequent landings.
- *Recommendation:* ICCAT should prohibit non-CPC flagged carrier vessels from conducting at-sea or in-port transshipments of ICCAT-sourced catch prior to first point of landing. Non-CPC flagged carrier vessels themselves, nor their flag State authorities, are bound by ICCAT management measures or reporting obligations. Potential non-compliance with ICCAT management measures associated with non-CPC flagged carrier vessels provides ICCAT little opportunity to seek recourse with the flag State authorities of the carrier vessel involved.

## 9 Conclusion

Detailed analysis of AIS data related to transshipment activity within an RFMO area can provide valuable insight into fishing activity, including transshipment patterns, and can help identify potential gaps in or loopholes in management measures and how they are implemented on the water. AIS data can also provide an additional source of information for management authorities

that can be reviewed alongside existing transshipment declarations, VMS data, and authorization information. Collective use of these tools can ultimately help build a more complete picture of activities at sea and identify noncompliant activity that may be conducted outside of existing regulations.

By building a more complete picture of transshipment activity, policy makers can focus on strengthening management measures specific to what is happening on the water, far from direct oversight of management and inspection authorities. This study identified risks associated with at-sea and in-port transshipment in the ICCAT Convention Area and how those transshipments are monitored and reported by the ROP. This study shows that it appears that gaps in the current ICCAT transshipment regulatory framework and MCS structure are being exploited. Preventing transshipments linked to IUU fishing activity in the future will rely on effective management of the activity with the support of such tools as centralized VMS, robust data-sharing arrangements amongst relevant authorities and potential adoption of AIS as a supplemental and complementary monitoring tool.

The lack of implemented port State control has been identified as a potential weakness in detecting IUU fishing activity. There currently exists no regulatory requirement for non-CPC flag States to report transshipment activity, nor does there exist a requirement for CPC port States to report on the in-port transshipment activities of carrier vessels. Additionally, carrier vessels unauthorized to transship in ICCAT waters should be closely inspected on port arrival if there are indications the carrier vessel operated in ICCAT waters prior to arrival. If these countries are party to the PSMA, these carrier vessels should also be considered for denied entry if unreported or potentially unauthorized transshipments in ICCAT waters are identified. States not party to the PSMA that receive carriers in their ports which operated in ICCAT waters and are identified as not authorized by ICCAT to transship while in ICCAT waters should also be directly engaged by ICCAT to seek their cooperation to strengthen their respective port controls related to these vessels. These engagements may lead to these port States effectively responding to clear cases of any ICCAT-related activity that appears to be in contravention of ICCAT management measures.

The synthesis of AIS data with vessel authorization information to the extent presented in the report is not thought to generally be common practice by RFMO Compliance Committees. AIS data can provide an immense source of knowledge and insight into patterns of fishing behavior, including possible transshipments. Based on this, GFW intends to help facilitate more efficient and effective monitoring and regulation in RFMO Convention Areas by highlighting these patterns of activity in order to facilitate timely investigations into potential noncompliant activity. Hopefully this will increase the likelihood of successful intervention by flag, coastal, or port State authorities. A secondary intention of this study is to allow flag State authorities to directly use the AIS-based information to investigate anomalies and possible unauthorized activity on their own accord. This is especially true as most of the data needed to do this is not publicly available and requires direct engagement with other relevant authorities such as port State inspectors.

Incorporating AIS into compliance monitoring by ICCAT would be further strengthened by Commission members agreeing to mandate use of AIS by all eligible vessels of CPCs when these vessels operate in the ICCAT Convention Area. This study highlights the value of AIS data, and the high match rates of detected events to reported transshipments, to cross-check and verify carrier vessel activity as reported by the ROP. This shift towards data transparency in tuna fisheries can lead to a more complete understanding of transshipment activity and stronger controls against IUU fishing.

## References

Boerder, K., Miller, N. A., and Worm, B. (2018). Global hot spots of transshipment of fish catch at sea. *Science Advances* 4, eaat7159. doi:10.1126/sciadv.aat7159.

ICCAT (2012). 12-07 RECOMMENDATION BY ICCAT FOR AN ICCAT SCHEME FOR MINIMUM STANDARDS FOR INSPECTION IN PORT.

ICCAT (2014). 14-09 RECOMMENDATION BY ICCAT AMENDING RECOMMENDATION 03-14 BY ICCAT CONCERNING MINIMUM STANDARDS FOR THE ESTABLISHMENT OF A VESSEL MONITORING SYSTEM IN THE ICCAT CONVENTION AREA.

ICCAT (2016). 16-15 RECOMMENDATION BY ICCAT ON TRANSHIPMENT.

- ICCAT (2018). International Commission for the Conservation of Atlantic Tunas - Report for biennial period, 2016 - 2017 PART II (2017) - Vol. 4 Secretariat Reports.
- IMO. (2002). SOLAS regulation V/19, paragraph 2.4.
- INTERPOL (2014). Study on fisheries crime in the west african coastal region. Environmental Security Sub-Directorate.
- Kroodsma, D. A., Mayorga, J., Hochberg, T., Miller, N. A., Boerder, K., Ferretti, F., et al. (2018). Tracking the global footprint of fisheries. *Science* 359, 904–908. doi:10.1126/science.aao5646.
- Miller, N. A., Roan, A., Hochberg, T., Amos, J., and Kroodsma, D. A. (2018). Identifying Global Patterns of Transshipment Behavior. *Front. Mar. Sci.* 5:240. doi:10.3389/fmars.2018.00240.
- MRAG and CapFish (2018). ICCAT Doc. No. PWG-402/2018. REPORT ON THE IMPLEMENTATION OF THE ICCAT REGIONAL OBSERVER PROGRAMME (ROP) FOR TRANSHIPMENT 2017/2018.
- MRAG and CapFish Observers (2017). ICCAT Regional Observer Program Observer Reports - Previous.
- MRAG and CapFish Observers (2018). ICCAT Regional Observer Program Observer Reports - Current.
- Ortiz, A. J. (2016). Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing. *Int. leg. mater.* 55, 1157–1179. doi:10.1017/S0020782900030886.
- Sala, E., Mayorga, J., Costello, C., Kroodsma, D., Palomares, M. L. D., Pauly, D., et al. (2018). The economics of fishing the high-seas. *Science Advances* 4, eaat2504. doi:10.1126/sciadv.aat2504.
- SEAFO (2017). SYSTEM OF OBSERVATION, INSPECTION, COMPLIANCE AND ENFORCEMENT (2017).

## **Annex 2: Detailed Methodology**

### **AIS-Based Data Methods**

GFW uses publicly broadcasted AIS data to estimate vessel information and vessel activity, including encounters and loitering events. 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 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, Miller et al. 2018). Due to the unknown nature of encounter and loitering events close to shore we limited the analysis to events on the high seas.

The carrier and fishing vessels analyzed in this report were chosen based on the GFW database of fishing and carrier vessels. 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 (see 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). Any squid-jiggers and trawlers were removed from analysis. If a fishing class was not identified through the GFW algorithm, a review of vessel tracks and web search using all available vessel identifiers, including vessel name, MMSI, flag State, callsign, and IMO unique identifier were used to assess vessel class. The remaining fishing vessels were all identified as longliners. The carrier database is defined in Miller et al. (2018) and was curated using International Telecommunication Union and major RFMO, 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.

In addition, the study examined port visits by carriers after encounters or loitering events. 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.