Global Fishing Watch

# A Comparative Analysis of 2017 Reported Carrier Vessel Activity and Transshipments in the Inter-American Tropical Tuna Commission (IATTC) Convention Area using AIS Data

**Acknowledgments**

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**Prepared By: Global Fishing Watch**

# Contents

# List of Acronyms

AIS – Automatic Identification System

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

CVP - carrier vessel port

GFW - Global Fishing Watch

IATTC – Inter-American Tropical Tuna Commission

ICCAT - International Commission for the Conservation of Atlantic Tunas

IMO - International Maritime Organization

LSTLFV – Large Scale Tuna Longline Fishing Vessel

MCS – Monitoring Control and Surveillance

MMSI - maritime mobile service identity

NGO - non-governmental organization

PSMA – Port State Measures Agreement

RFMO – Regional Fisheries Management Organization

SPRFMO – South Pacific Regional Fisheries Management Organization

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

The Inter-American Tropical Tuna Commission (IATTC) permits at-sea transshipments between Large Scale Tuna Longline Fishing Vessels (LSTLFVs) and refrigerated cargo, or "carrier", vessels. IATTC *Resolution C-12-07* on transshipment is the measure that targets the monitoring of transshipments on the high seas by carrier vessels and LSTLFVs within the Eastern Pacific Ocean. These resolution requirements include, in part, both vessels being authorized by their respective flag State to transship at sea inside the IATTC Convention Area, all transshipments being monitored by an observer embarked on the carrier, and vessels providing advance notice and post-declarations to the flag State for all transshipments undertaken. Additionally, LSTLFVs and carrier vessels must both be included on the IATTC lists of authorized vessels. Transshipment of IATTC-managed species outside the bounds of this IATTC transshipment regulatory framework impacts proper overall oversight and control of the activity by flag State authorities of the vessels involved, likely posing significant risks to sustainability initiatives adopted by the Commission.

Due to gaps in Monitoring, Control, and Surveillance (MCS) capacity, IATTC management authorities are unable to easily detect and respond to anomalous behavior or suspected illicit activity. Additional control mechanisms, such as centralized Vessel Monitoring System (VMS) and robust information-sharing agreements with other Regional Fisheries Management Organizations (RFMOs) with overlapping Convention Area waters, would help to close those gaps in MCS efforts.

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 to conduct a comparative analysis of the track histories and potential activities of carrier vessels operating in the IATTC Convention Area in 2017. The objective is to provide IATTC policy makers with greater transparency and understanding regarding IATTC carrier vessel operations to better inform them on fleet movement patterns including spatial dynamics and encounters with LSTLFVs. It is hoped the results of this study will enable them to make better informed decisions regarding the management of transshipment occurring at sea within the IATTC Convention Area.

The AIS-derived data resulting from this study is also intended to be a source of additional information for the IATTC Compliance Committee and Contracting Parties (Members) and Cooperating Non-Contracting Parties (collectively known as CPCs) to consider when validating reported activity by authorized carrier vessels and identifying where anomalous or even potential unauthorized activity may be occurring.

Specifically, Global Fishing Watch (GFW) combined open source AIS data with IATTC and Western and Central Pacific Fisheries Commission (WCPFC) vessel authorization information to create a dataset of vessel identity information. GFW also developed a database of AIS-based detection of encounters between two vessels and loitering events by single carrier vessels that was used to detect possible transshipment activity. GFW used these AIS databases in conjunction with various publicly available IATTC documents related to the IATTC Regional Observer Program (ROP) to analyze possible transshipment activity within the IATTC Convention Area during 2017 which could then be cross checked by CPC management authorities and the IATTC Secretariat against transshipment declarations, vessel logbooks, observer reports, and vessel authorizations to identify any activity justifying further investigation.

**Key Finding 1:** Lack of complete publicly available historical IATTC registry with defined authorization periods causes difficulty in conducting comparative analyses to understand historical trends in vessel activity and authorization.

- *Recommendation*: IATTC should implement standardized publicly available current and historical authorized vessel lists that include complete authorization periods and vessel identity information

**Key Finding 2:** In addition to the 20 carrier vessels identified by ROP to have been involved with high seas transshipment, 33 carriers were detected through AIS data encountering LSTLFVs or loitering. It is likely any high seas transshipments involving IATTC-sourced catch associated with these additional carrier vessels went unreported to IATTC.

- *Recommendation:* IATTC should require CPCs to provide an annual report on all their respective flagged carrier vessels that operate in IATTC waters during a given year to account for their presence.

**Key Finding 3:** Analysis of AIS data confirmed the general trends of flag States, location, and ROP reported carrier deployments during 2017. Notably, five trips in IATTC waters by four different carrier vessels were observed on AIS but were not reported by the ROP. AIS analysis of the 42 carrier trips conducted by twenty different carrier vessels reported by the ROP in 2017 also identified discrepancies in reported trip activity for 22 percent of the carrier vessel trips.

- *Recommendation:* IATTC should mandate AIS use and use it as a supplementary tool to complement existing management resolutions and MCS tools.

**Key Finding 4:** AIS analysis detected potential transshipments occurring within WCPFC waters involving carrier vessels on IATTC trips which were not documented in IATTC ROP reports.

- *Recommendation:* In the absence of centralized VMS, IATTC should allow the ROP service provider to use AIS as a supplementary dataset to help monitor the ROP
- *Recommendation:* IATTC should update the protocols, processes, and procedures for how the ROP service provider manages the IATTC ROP to ensure effective management and information exchange between IATTC and WCPFC

**Key Finding 5:** AIS data can be used to effectively identify ports visited by carrier vessels, which may help to highlight important ports to monitor and regulate for IATTC-sourced fish product.

- *Recommendation:* IATTC CPCs that are often visited as port States by carriers with possible IATTC-sourced fished should consider implementing the Agreement on Port State Measures (PSMA) to help detect, deter, and eliminate illegal fishing. In addition, IATTC should implement port State measures to help minimize any landing of misreported or illicit catch

**Key Finding 6:** Over one-third of all AIS-detected encounters and loitering events attributed to carrier vessels reported by the ROP to be on IATTC trips occurred within the IATTC-WCPFC overlap area.

- *Recommendation:* IATTC should engage with WCPFC to conduct a collaborative formal review of how both organizations collectively manage the IATTC-WCPFC overlap area, and reported transshipments in IATTC and WCPFC Convention Areas should be shared publicly to ensure effective management of the IATTC-WCPFC overlap area.

**Conclusions:** The study determined that better monitoring is needed of transshipment activities occurring at sea within the IATTC Convention Area. Implementation of a more centralized IATTC VMS coupled with increased transparency in vessel tracking to drive compliance would help ensure that all transshipment activity is carried out as authorized. The key areas where transparency could help drive better transshipment regulation are the sharing of transshipment declaration data, more robust observer reporting protocols and standardized publicly available current and historical authorized vessel lists. These tools could also be supplemented by IATTC considering mandating the use of AIS by all eligible authorized vessels to provide even more comprehensive and transparent remote monitoring of vessels. Consequently, a much more effective and efficient way to monitor transshipments in the IATTC Convention Area could be implemented which would not only assist CPC flag State authorities in better controlling those vessels involved, but also

support interests of other IATTC stakeholders as well, such as the IATTC Secretariat and industry members.

The study also identified the urgent need for stronger data-sharing agreements between RFMOs that overlap in the area. These mechanisms would support the collective work of the Secretariats with conducting analyses of fishing vessels operating in the Eastern Pacific Ocean and their respective activities to validate catches, correctly attribute effort to the appropriate RFMO responsible, and maximize opportunities to detect anomalous activities and potential noncompliance.

# 1 Introduction

Global Fishing Watch (GFW), in partnership with The Pew Charitable Trusts (Pew), is undertaking an assessment of at-sea transshipment activity occurring in the waters of the Convention Areas of the global tuna RFMOs to help expand greater understanding of this activity and inform 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 analyses of AIS data and review of publicly available information and data specific to transshipment. These reports are designed to be RFMO-specific and cover calendar years 2017 through to 2019.

The second element of this work complementing the reports is the 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 an easy, single-access platform for data related specifically to carrier vessels and at-sea transshipments. Initially, the CVP is envisaged to display AIS data linked with RFMO vessel authorization data with intention to display 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 with a growing number of flag States mandating its use through their own national fisheries regulations such as the European Commission and the United States of America that require AIS on fishing vessels over a certain size. Carrier vessels registered as over 300 gross tons and on international voyages are already required to broadcast on AIS as mandated by the International Maritime Organization (IMO) (IMO 2002). This makes the use of AIS, and its subsequent analysis, very useful in understanding fishing activity and supports and complements existing national and RFMO MCS programs. One method of analysis provides for a greater understanding of fishing vessel interactions, especially when these involve differing flag States where VMS data is not publicly available or readily shared between authorities. To

help overcome this, intended users of the CVP are envisaged to access the publicly available data through the portal to assist investigations and risk assessments. Intended users include RFMO Secretariats and flag, coastal and port State authorities. However, the open nature of the platform and easily accessed, organized publicly available data will allow opportunities for other fishery stakeholders to conduct greater due diligence. The CVP will afford them a greater understanding of vessel activity and help recognize any potential risks of anomalous activity directly associated with their supply chains. CVP outputs could also provide the environmental Non-Governmental Organization (NGO) community tools for informing their own respective advocacy programs.

## Inter-American Tropical Tuna Commission (IATTC)

The IATTC is an intergovernmental organization made up of member governments that share mutual interests in managing and conserving tuna stocks in the eastern Pacific Ocean (Figure 1). The IATTC was established through the agreement between the United States of America and the Republic of Costa Rica in the Convention for the Establishment of an Inter-American Tropical Tuna Commission in 1949 (Acheson and Echandi 1949). In replacement of the original 1949 Convention, the Antigua Convention entered into force in 2010 (see IATTC Convention Review Working Group 2003). There are currently 21 Contracting Parties (Members) and five Cooperating Non-Contracting Parties that belong to IATTC (collectively termed CPCs)[1].

IATTC uses the term “carrier vessel” to refer to vessels that are duly authorized by their flag State and have been entered by the IATTC Secretariat on the IATTC Record of Carrier Vessels to receive tuna and tuna-like species and sharks from LSTLFVs. The current *IATTC Resolution C-12-07 Amendment to Resolution C-11-09 on Establishing a Program for Transshipments by Large-Scale Fishing Vessels* was adopted by IATTC at its 83rd Session (IATTC 2012). Per *Resolution C-12-07*, at-sea transshipments are banned except between LSTLFVs and authorized carrier vessels. The LSTLFVs that conduct at-sea transshipments must be on the IATTC list of authorized longline vessels and operate under the jurisdiction of CPCs that participate in the transshipment program established by *Resolution C-12-07* who finance the costs of implementation of the ROP. As part of the IATTC transshipment program, authorized carrier vessels are required to have an observer from the IATTC ROP onboard to observe each at-sea transshipment operation that occurs in IATTC waters and involves IATTC-sourced fish. The consortium of Marine Resources Assessment Group (MRAG) has implemented the ROP since 2009 (see IATTC document *CAF-06-03 Addendum 1*).

[1] https://www.iattc.org/homeeng.htm

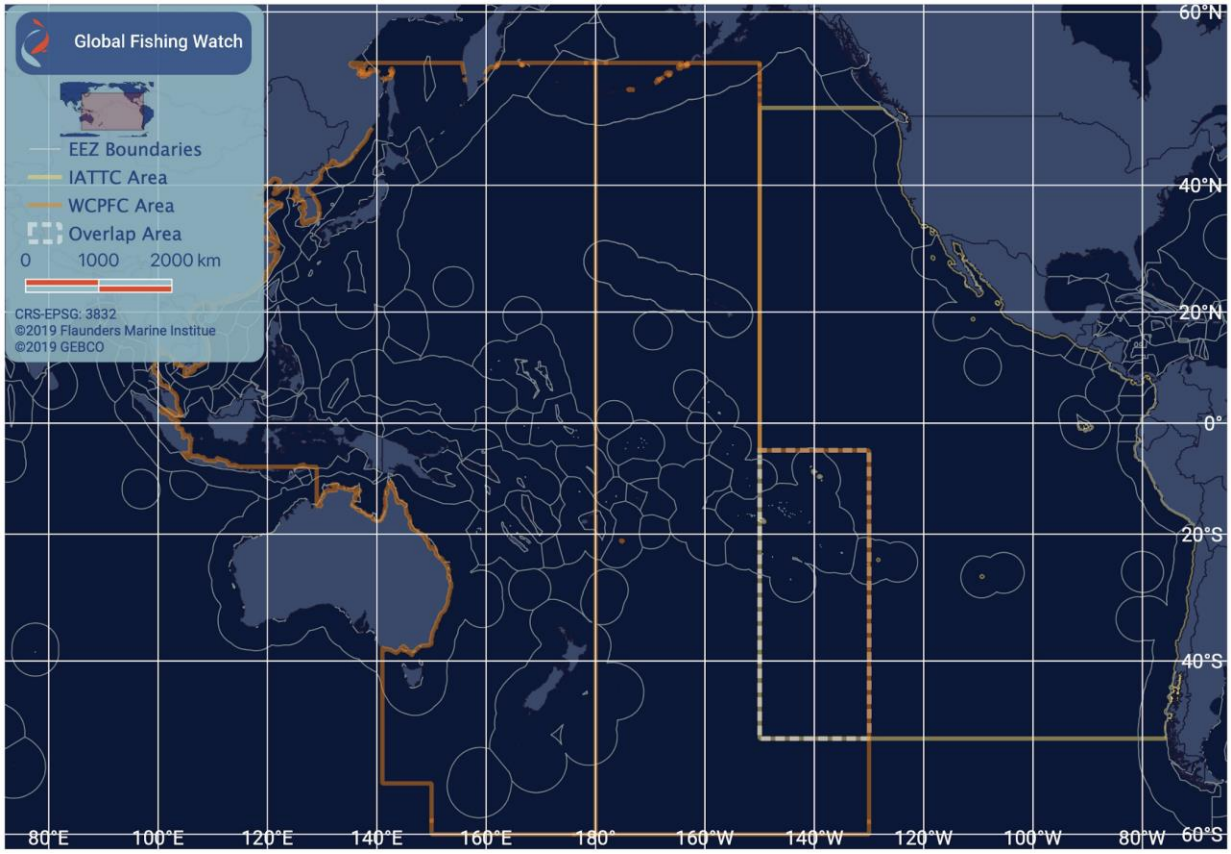



*Figure 1 – IATTC and WCPFC Convention Areas*

# 2 Study Objective

This study used commercially available satellite AIS data combined with the application of machine learning technology and analysis of publicly available information, to analyze the track histories of carrier vessels operating in the IATTC Convention Area in 2017 with the objective to strengthen understanding of transshipment activity in IATTC to help inform future policy decisions, specifically:

1. Provide IATTC policy makers with greater transparency and understanding of carrier vessel activities occurring within the IATTC Convention Area to better inform them on carrier vessel fleet movement patterns including spatial dynamics, encounters with fishing vessels, and highly frequented ports; and
2. Enable IATTC policy makers to make better informed decisions regarding the management of transshipment occurring at sea within the IATTC Convention Area to

strengthen the current IATTC transshipment regulatory framework where needed to address potential management gaps or loopholes related to shortfalls in transparency, 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 analysis can be used as a monitoring and analysis tool that complements the existing IATTC MCS structure using VMS, flag State authorizations, observer reporting, and transshipment 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 the data shows anomalous activity, or potentially unauthorized or unreported transshipment activity may have occurred; and
3. Complement development of the GFW 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 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 IATTC Convention Area occurring between carrier and LSTLFVs (i.e., 'donor' vessels) during the year of 2017. A full description of data methods is described in Annex 2 and explained in detail in Kroodsma 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 where two vessels meet at sea may indicate possible transshipment activity between two vessels. 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 where a fish carrier has behavior constant with encountering another vessel at sea but no second vessel is visible on AIS may also indicate a possible transshipment event 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 IATTC transshipment program is established for carriers and LSTLFVs, only encounters between carrier and LSTLFVs were examined for this report (See Annex 2).

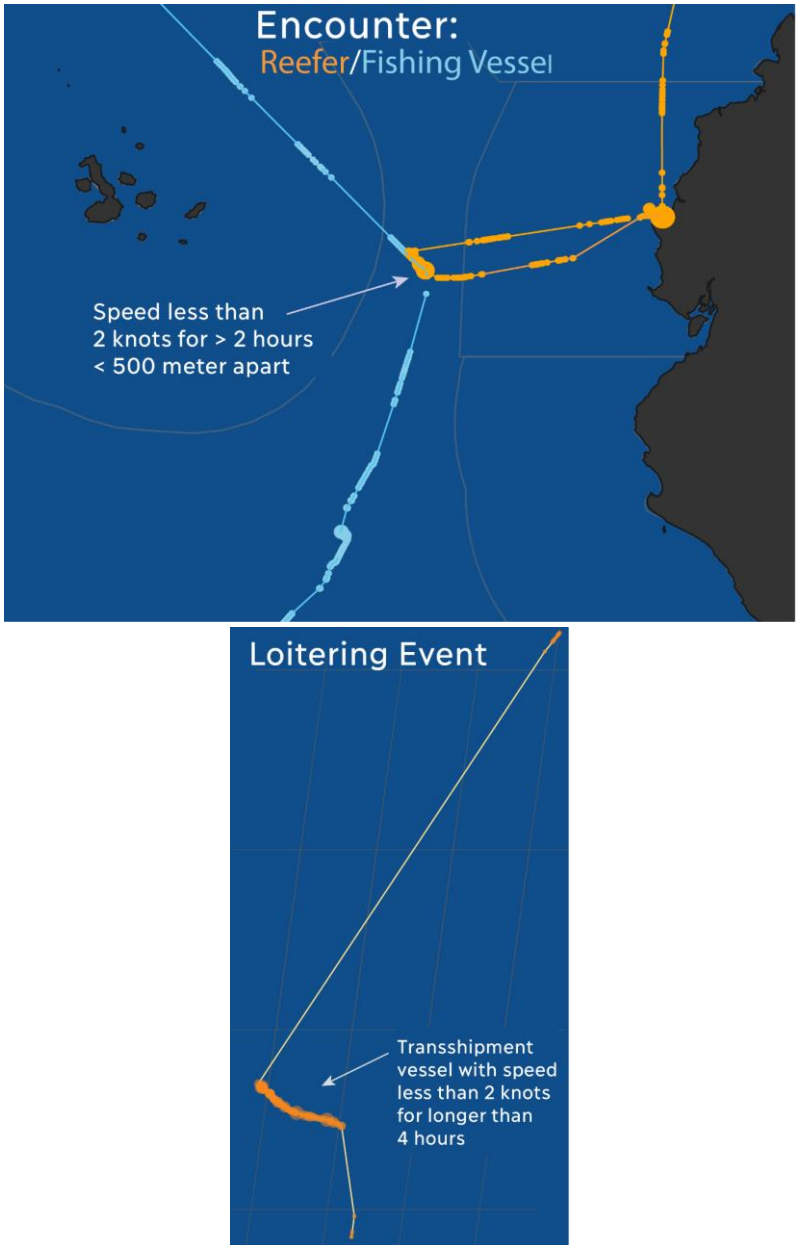



*Figure 2 - Examples of vessel tracks during typical 'Encounter' where two vessels meet at sea and 'Loitering' events where a fish carrier has behavior constant with encountering another vessel at sea but no second vessel is visible on AIS*

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 IATTC ROP.

Vessel-specific IATTC authorization information was not identified for 2017. The IATTC provides a public registry of authorized carrier and longline vessels, however the registry

does not provide historical data with explicit date ranges of authorization[2]. Therefore, GFW was only able to base carrier vessel identification on the list of authorized flag States from IATTC document *CAF-06-03 CORR* and the carrier vessels listed as conducting transshipment trips in IATTC documents *CAF-06-03 CORR* and *CAF-06-03 Addendum 1*. For the purposes of investigating AIS-detected carrier vessel activity in the IATTC-WCPFC overlap area, WCPFC authorization data was obtained from the publicly available vessel authorization list produced by WCPFC[3]. IATTC and other RFMOs should consider improving access to publicly available historical vessel authorization lists to enable a more complete and accurate picture of authorized vessel patterns and movements to all stakeholders in a fishery and ensure effective monitoring and control of fishing activities occurring inside respective Convention Areas.

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

[2] https://www.iattc.org/VesselRegister/VesselList.aspx?List=RegVessels&Lang=ENG

[3] https://www.wcpfc.int/record-fishing-vessel-database

# 4 Overview of IATTC Carrier Activity in 2017

A review of all satellite AIS data identified 155 unique carrier vessels that broadcast on AIS inside the IATTC Convention area at some point in 2017. There were 53 which were identified as either having an encounter with an LSTLFV or had a loitering event that could indicate an encounter with an unknown vessel, these 53 carrier vessels were further reviewed against the IATTC transshipment framework.

## 4.1 IATTC Transshipment Framework

IATTC provides a public list of fishing vessels authorized to catch tuna and tuna-like species within the IATTC Convention Area via a regional vessel register. However, carrier vessels authorized to transship IATTC-managed species within the Convention Area are not included in this registry. Instead, a list of carrier vessels currently authorized by IATTC is made publicly available by IATTC in a document separate from the IATTC regional vessel register and is updated monthly as required by *IATTC Resolution 12-07 on a Programme for Transshipment by Large Scale Fishing Vessels Section 3.6* which states: *"…the Commission shall establish and maintain a record of carrier vessels authorized by their respective flag CPCs to receive tuna and tuna-like species and sharks at sea from LSTLFVs in the Convention Area (IATTC Record of Carrier Vessels). For the purposes of this Resolution, carrier vessels not on this Record are deemed not to be authorized to receive tuna and tuna-like species and sharks in at-sea transshipment operations…".*

This list of authorized carrier vessels is not supplemented with specific authorization period information, nor are historical authorized carrier vessel lists made available and accessible once superseded. For this study, all carrier vessel activity reported by the Secretariat or the ROP in IATTC documents are assumed to be conducted by authorized carrier vessels. Further validation of this assumption should be made by either the IATTC Secretariat or flag State authorities of those carriers reported to have participated in the ROP during 2017.

Publicly available IATTC documents referenced which detail carrier vessel activity in the IATTC Convention Area during calendar year 2017 include:

> CAF-06-03 ADD. 1: Review of the IATTC Regional Observer Programme (ROP) Covering the period January 1, 2017 to February 15, 2018 ("*CAF-06-03-02 Addendum 1*")
>
> CAF-06-03 CORR: Implementation of the IATTC Regional Observer Program (ROP) for Transshipments at Sea ("*CAF-06-03 CORR*")

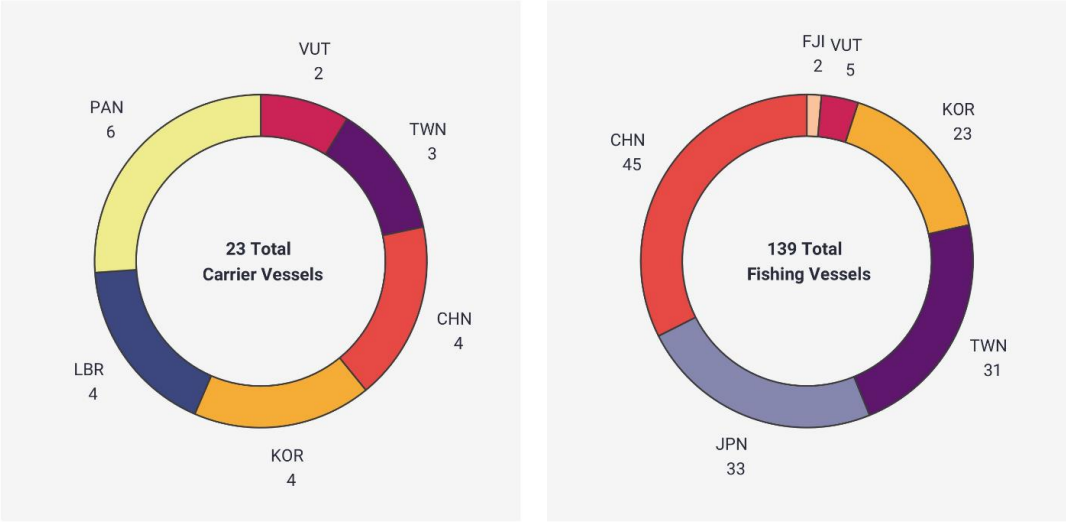
IATTC-92-06: Implementation of the IATTC Regional Observer Program (ROP) for Transshipments at Sea ("*IATTC-92-06*")

*IATTC 92-06* indicated at the time of its writing in 2017, the current IATTC authorized carrier vessel list had 64 carriers included. This specific authorized carrier vessel list, as well as all other carrier vessel authorization lists posted by IATTC in 2017, have been subsequently superseded by more current authorization lists thus preventing identification of these carrier vessels. Fortunately, *CAF-06-03 CORR* Appendix 2 identifies the carrier vessels used by the ROP for all observer deployments in 2017. These carrier vessels were flagged to the CPCs of Panama, Taiwan, Province of China (hereafter called "Taiwan"), Vanuatu, Kiribati, Liberia, Korea, and China. The ROP reported 622 transshipments took place involving 20 distinct carrier vessels which were monitored by IATTC observers during 42 trips that either began or ended in 2017.

Complementing these documents to provide a more comprehensive understanding of carrier activity in the IATTC Convention Area during 2017 was historical AIS data detailing the movements of carrier vessels that operated in IATTC waters. This AIS data was analyzed and then compared and cross-checked with reported information.

## 4.2 AIS-Detected Encounters

AIS analysis identified 232 AIS-detected encounters on the high seas in the IATTC Convention Area that occurred between carrier vessels and LSTLFVs where both vessels were transponding on AIS (see Annex 1-0001-0232). These encounters involved 23 distinct carrier vessels and 139 distinct LSTLFVs (Figure 3). Note that only 20 carrier vessels were reported by the ROP to have conducted transshipments in 2017. The three additional carrier vessels, all flagged to China, had vessel movements on AIS consistent with transshipping at-sea and were collectively involved in eight of the 232 AIS-detected encounters with LSTLFVs. The average duration of these 232 encounters was approximately seven hours with nearly three-quarters of them eight hours or less in duration which is consistent with the expected duration of a typical transshipment at sea. The relatively low number of encounters observed via AIS analysis (232) compared to the number of reported transshipments (622) is likely related to low uptake and use of AIS by the LSTLFV fleets operating in the IATTC Convention Area.




Source: Global Fishing Watch

*Figure 3 - Count of Distinct Carrier Vessels and LSTLFVs in AIS-detected Encounters in 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. The 23 carrier vessels identified in the AIS-detected encounters were all flagged to CPCs reported by IATTC to participate in the IATTC transshipment program. Except for the Fijian flagged fishing vessels, the other 5 flag States of the 137 AIS-detected LSTLFVs are consistent with the flag States of the vessels reported by the ROP to have transshipped on the high seas in 2017.

*CAF-06-03-02 Addendum 1* details transshipment activity in terms of numbers of transshipment conducted by LSTLFVs flagged to each specific CPC. It does not provide details 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, Korean-flagged carrier vessels and LSTLFVs appear to transship exclusively together. Chinese carrier vessels appear to transship exclusively with Chinese LSTLFVs, although the Chinese LSTLFVs themselves interact with other carrier fleets of different flag. Vanuatu-flagged carrier vessels (which are mostly Taiwanese-owned) predominantly interact with Japanese LSTLFVs and Taiwanese LSTLFVs interact with all carrier fleets except for Chinese carriers (Figure 4).

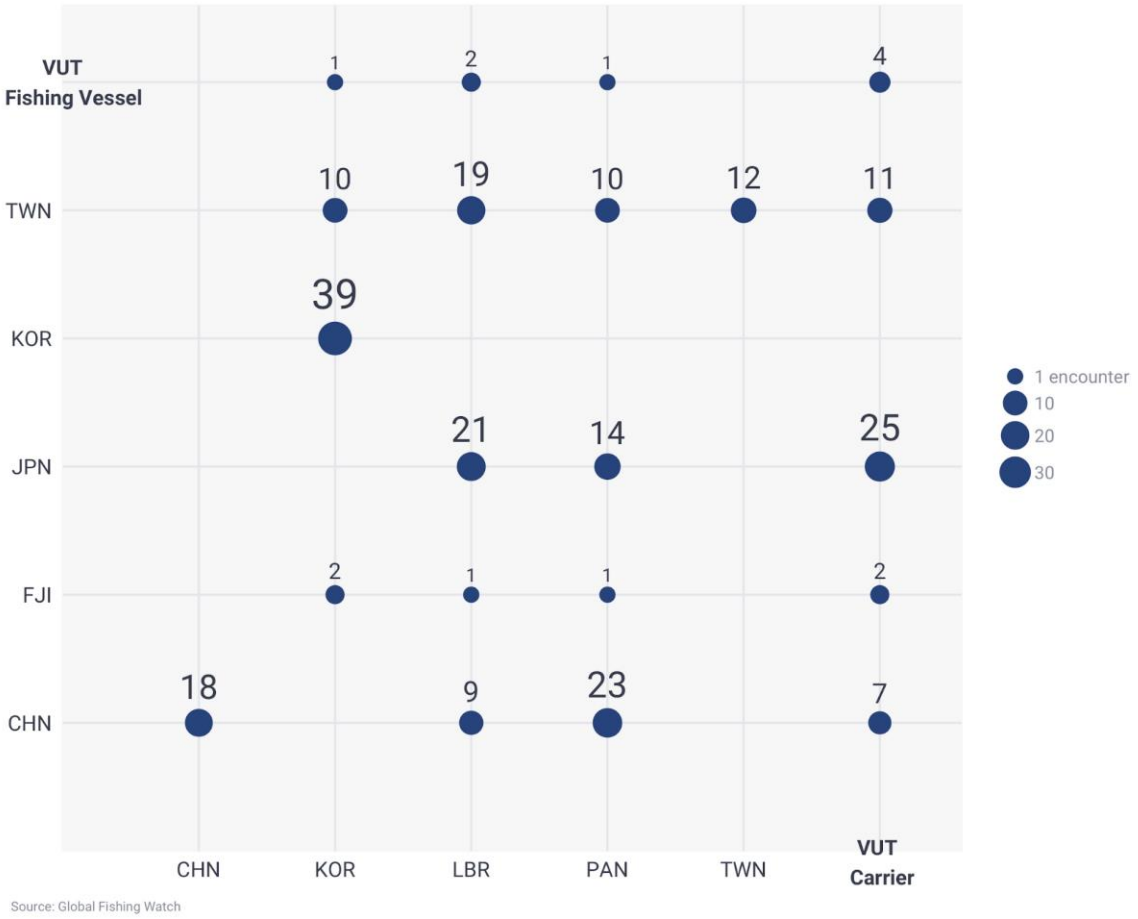



*Figure 4 - AIS-Detected Encounters between Carrier Vessels and LSTLFVs in 2017*

The spatial distribution of AIS-detected encounters is reflective of the pattern of transshipments as reported by the ROP in *CAF-06-03 CORR* Appendix 3. Most AIS-detected encounters occurred between the equator and 20 degrees South latitude of the IATTC Convention Area with a large proportion occurring within the northern portion of the IATTC-WCPFC overlap area (Figures 5 and 6). Chinese-flagged carrier vessels were the predominant fleet to have encounters with LSTLFVs in the southern portion of the overlap area (Figure 5) although Chinese carrier vessels had encounters with LSTLFVs in waters outside of the overlap area as well. However, when this occurred, these encounters were detected at the more northerly latitudes like that of the rest of the carrier fleets. AIS-detected encounters in the southern portion of the overlap area exclusively involved Chinese-flagged LSTLFVs (Figure 6). These spatial dynamics are possibly related to differences in species distribution, especially for encounters in the southern portion of the overlap area which may involve LSTLFVs specifically targeting southern albacore on the high seas in the southern latitudes of the Convention Area. AIS-detected encounters between carrier vessels and LSTLFVs also occurred north of the equator, although these encounters occurred no higher than 10.4 mean degrees North latitude.

These encounters predominantly  involved carrier vessels and LSTLFVs flagged to Korea and China.

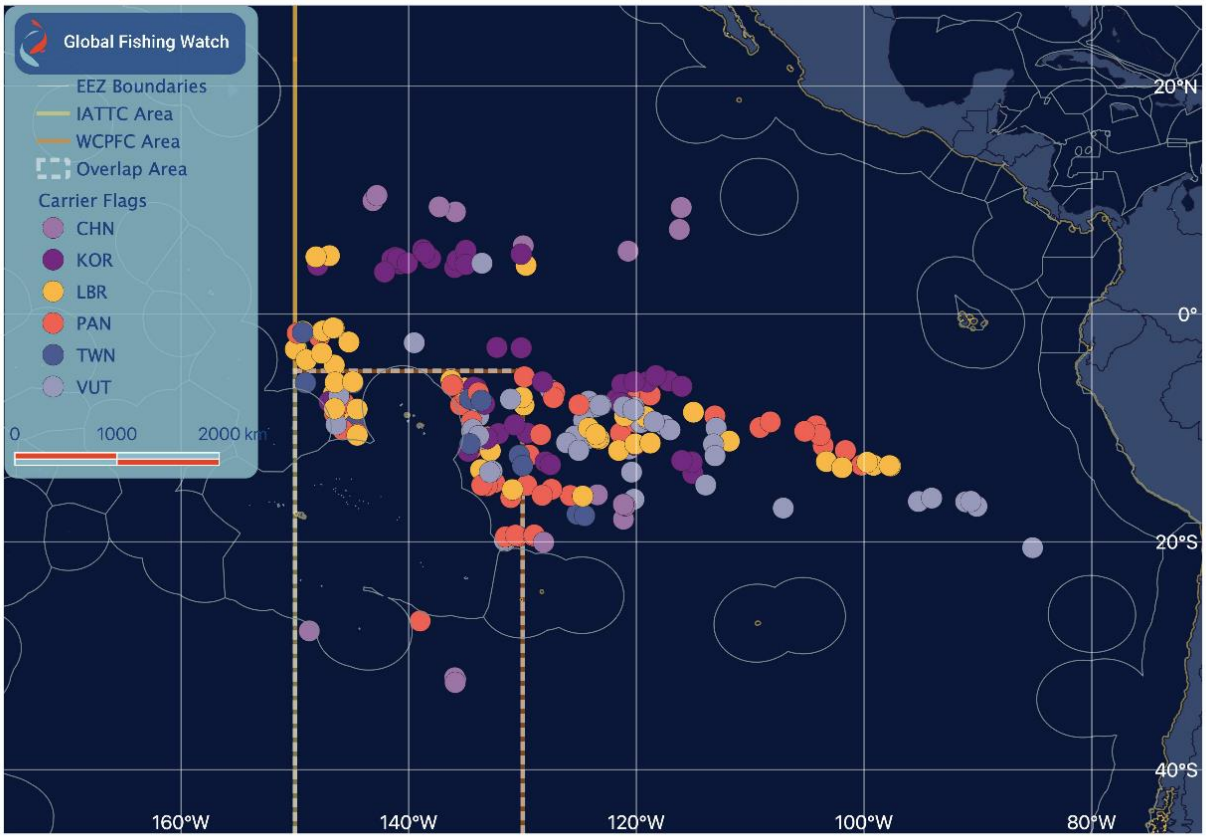



*Figure 5 - Carrier Vessel Flags in AIS-Detected Encounters in 2017*

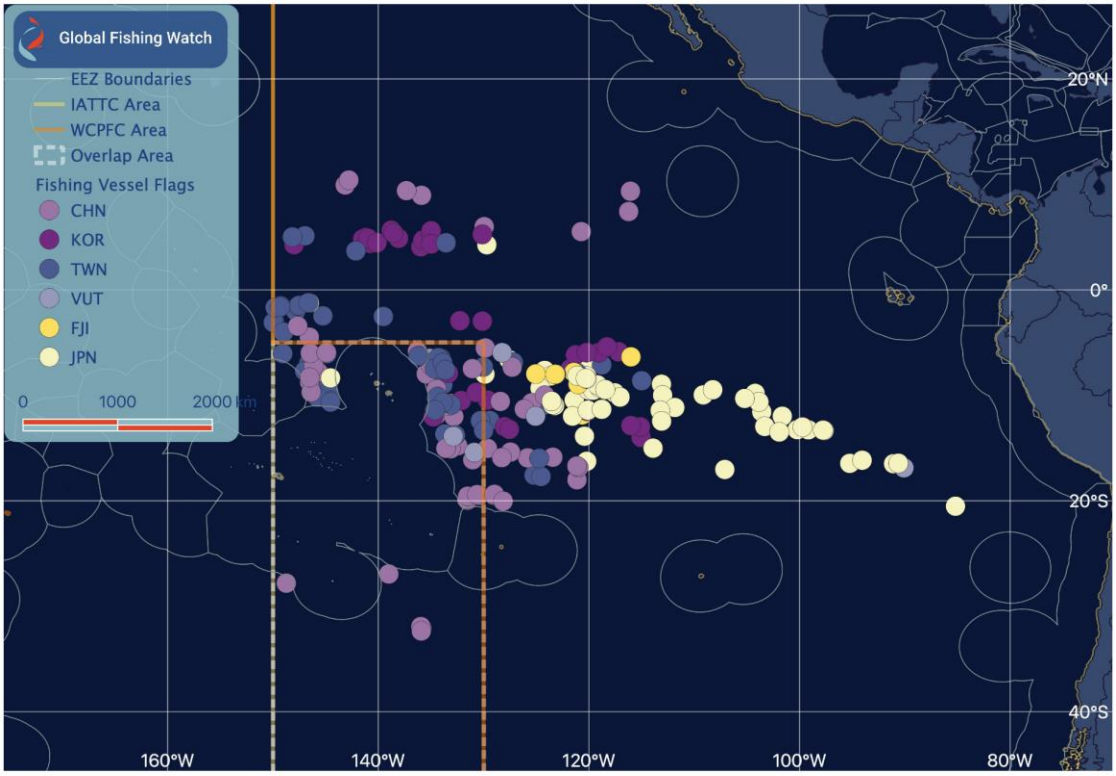



*Figure 6 – Fishing Vessel Flags in AIS-detected Encounters in 2017*

## 4.3 AIS-Detected Loitering Events

A total of 2,044 AIS-detected loitering events were observed to be conducted by 51 carrier vessels in IATTC waters in 2017 (See Annex 1-0278-2321). For 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 these events may also possibly 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. In addition, loitering events may also involve carrier vessel interactions with fishing vessels not related to IATTC management. The location of a loitering event, the duration and specific behavior of the carrier vessel in relation to tide and wind can all help an investigation determine the risk of loitering events and by using these techniques can lead to an intervention where the vessel is physically investigated at sea or in port.

Figure 7 indicates the loitering activity of all 51 carrier vessels observed, with loitering events in IATTC waters in 2017 was dominated by carrier vessels flagged to Panama (1,417 events), followed by carriers flagged to Liberia (227 events), China (163 events), and Vanuatu (121 events). The largest number of distinct carrier vessels observed with loitering events were flagged to Panama (Figure 8). Further review of carrier vessel activity during these loitering periods by relevant flag State authorities may provide additional insight, such as why the carrier vessels were loitering, what activity occurred during the loitering periods, and whether these activities were all compliant with RFMO management regulations.

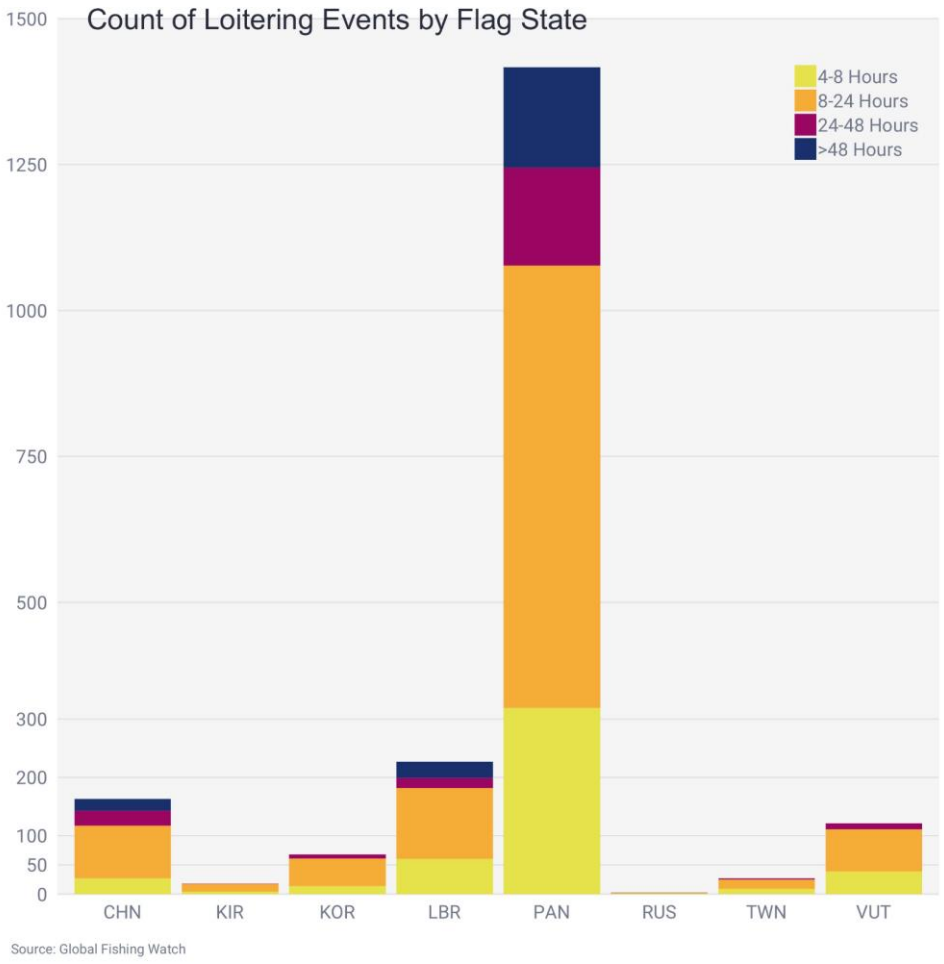



*Figure 7 - Loitering Events in the IATTC Convention Area by Flag State and Duration Category*

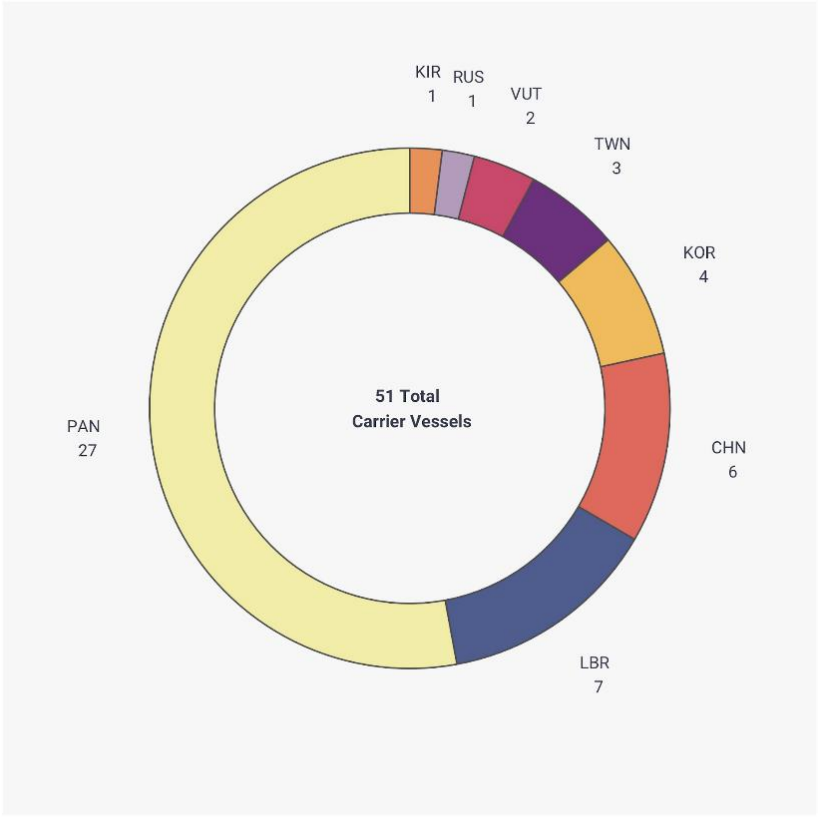



*Figure 8 - Distinct Carriers in Loitering Events by Flag State*

464 of these loitering events were associated with 19 of the 20 carrier vessels identified to have participated in the ROP. Two of the Chinese carrier vessels identified to have encounters also appeared to collectively loiter 18 times. The remaining 1,562 loitering events were associated with an additional 30 carrier vessels whose presence was detected by AIS in IATTC waters at some point during 2017. These additional 30 carrier vessels were flagged to Panama (21), Liberia (3), China (4), Russia (1), and Kiribati (1). Except for a single loitering event by the Kiribati-flagged carrier west of the Galapagos Islands, all loitering events by the Kiribati- and Russian-flagged carrier appeared just outside the southern border of Peruvian national waters. None of these 30 carrier vessels were reported by the ROP to have participated in the IATTC transshipment program which would indicate they did not carry an IATTC observer during 2017. Given the nature of IATTC's overlapping Convention Area south of the equator with waters of the South Pacific Regional Fisheries Management Organization (SPRFMO) as well as the formally recognized overlap area with WCPFC, the presence of these 30 carriers in the IATTC Convention Area may be related to transshipment activity with fishing vessels authorized under SPRFMO or WCPFC involving the transfer of SPRFMO- or WCPFC-sourced fish.

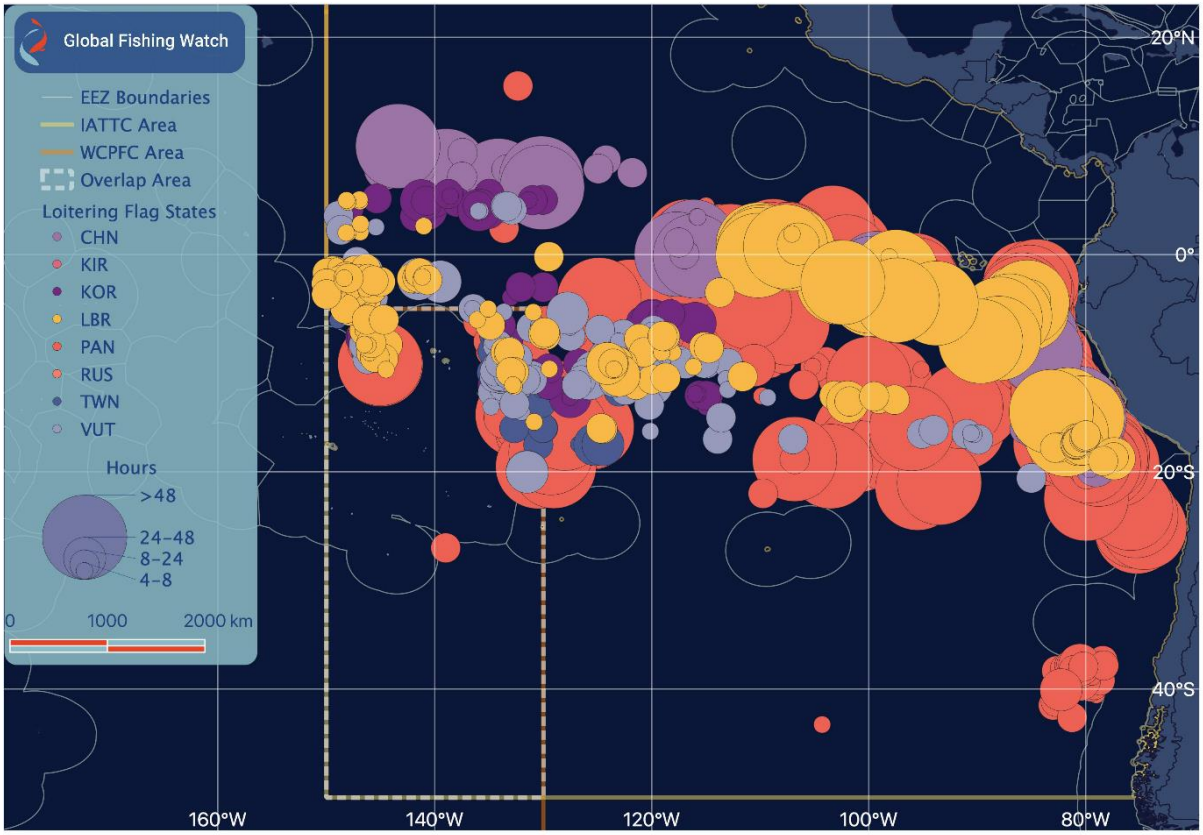



*Figure 9 - Loitering events within the IATTC Convention Area by Flag State and Duration*

The spatial distribution of loitering events is highlighted in Figure 9, indicating a large group of loitering events between the equator and 20 degrees South latitude and west of 95 degrees West longitude that were mostly carriers identified by the ROP (Figure 9 and Figure 10). A group of loitering events in the south at 40 degrees South latitude and close to the Chilean EEZ are expected to be associated with a squid fishery and under the management of SPRFMO. It is less clear what fishery may be associated with the loitering events observed north of 30 degrees South latitude which were conducted by carrier vessels not identified by the ROP (Figure 10). These loitering events may indicate transshipment events, in which case, there is a risk that the transshipment of IATTC-sourced catch went unreported.

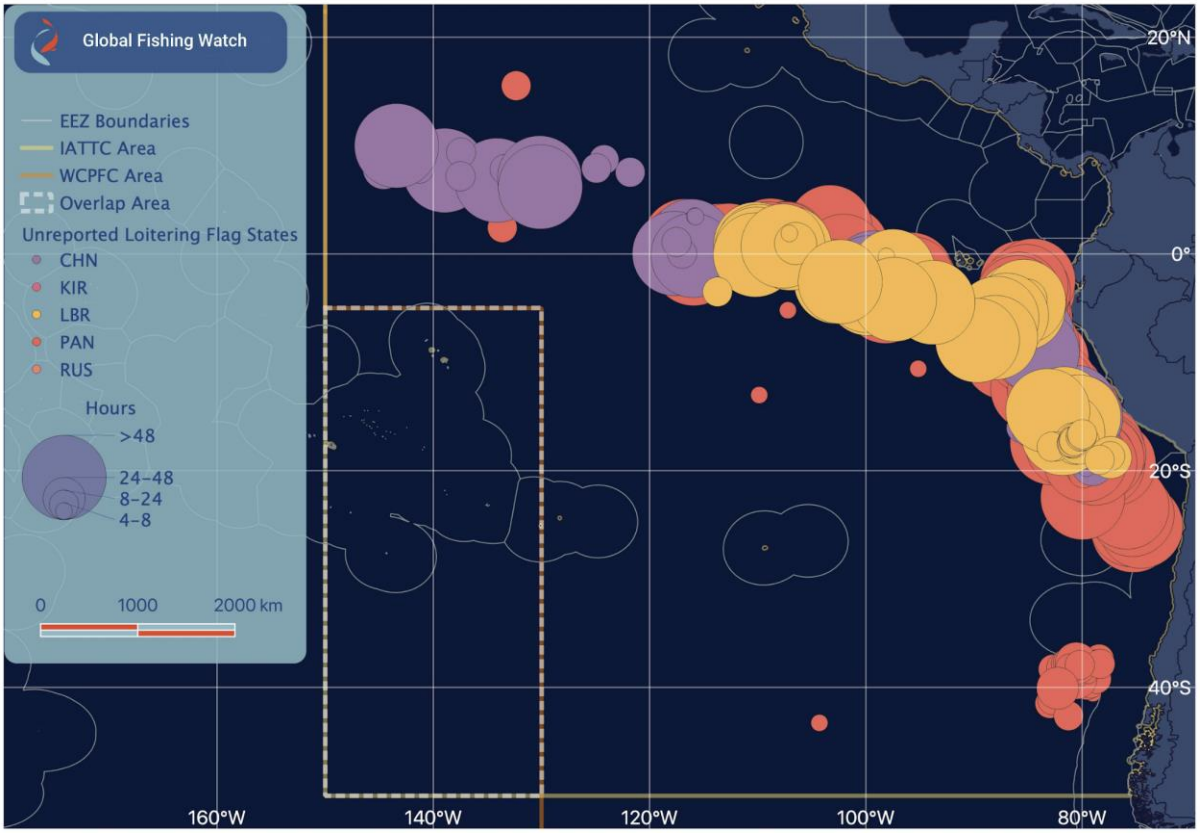



*Figure 10 - Loitering events for vessels not identified (unreported) by the ROP within the IATTC Convention Area by Flag State and Duration*

A review of reported data on high seas transshipments occurring between vessels involved in the ROP for the International Commission for the Conservation of Atlantic Tunas (ICCAT) indicate the typical length of time for the active transfer of fish product is under three hours (See ROP reports published during 2016/2017 at https://www.iccat.int/en/ROP.html). This timeframe is likely similar in all ocean regions. 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, the assumption was made that there is a higher likelihood 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 AIS-detected loitering events of 19 of the 20 carrier vessels with reported transshipment activity indicated 396 of the 464 total loitering events were 24 hours or less in duration. When this number is added to the 224 AIS-detected encounters associated with the same 20 carriers, the total accounts for 615 events, a number very similar to the 622 high seas transshipment events reported by the ROP to have occurred in 2017. As such, it is reasonable to assume that AIS-detected encounters and loitering events are good indicators of potential transshipment activity. As

to the other 32 carrier vessels observed on AIS in IATTC waters during 2017, these carriers accounted for the remaining 1,580 AIS-detected loitering events. 1,196 of these events, or nearly 76 percent, lasted 24 hours or less in duration. It is possible that some of these loitering events involved transfer of IATTC-sourced fish.

## Section Summary and Key Findings:

A total of 155 unique carrier vessels were identified on AIS present inside IATTC in 2017, of these carriers GFW identified the following groups;

- 102 of the carrier vessels were not observed to have any encounters with a LSTLFVs or had a loitering event with an unknown vessel inside the IATTC Convention Area. These vessels included ones that were transiting from port-to-port through the Convention area or were observed having encounters with other types of fishing vessel that could not be confirmed as an LSTLFV. These 102 vessels were not reviewed further in this study.

- 20 of the carriers had encounters with LSTLFVs and were identified by the ROP.

- 3 carriers were observed encountering an LSTLFV but were not identified by the ROP.

- 32 carriers had loitering events inside the IATTC Convention Area and were not identified by the ROP, including 2 of the 3 carriers not identified by the ROP that had AIS detected encounter events.

The following findings for this section are expanded further on in section 7, Key Findings.

- The lack of publicly available historical IATTC vessel authorization lists and data fields detailing respective vessel authorization periods makes it impossible to conduct retrospective analyses of vessel activity reflective of authorization status. This practice limits the overall usefulness of authorized vessel lists (see Section 8, Key Finding 1).

- The ROP reported only 20 carriers were involved with high seas transshipment in 2017. However, an additional 135 carrier vessels were present in IATTC waters in 2017 than the 20 identified by the ROP. Three of these additional carriers were detected in encounters with LSTLFVs and 30 additional carriers were observed loitering in IATTC waters in 2017. It is likely any high seas transshipments involving IATTC-sourced catch associated with these additional carrier vessels went unreported to IATTC (see Section 8, Key Finding 2).

- Analysis of AIS data was effective in determining flag States of carrier vessels involved in AIS-detected encounters and loitering events, as well as location of these events in IATTC Convention Area waters. AIS data analyzed for these parameters were comparable to ROP reported information (see Section 8, Key Finding 3).

- AIS-detected encounters, as well as AIS-detected loitering events less than 24 hours in duration, appear to be good indicators of potential transshipment activity in the absence of reported data (see Section 8, Key Finding 3).

- Many reported transshipments, as well as AIS-detected encounters and loitering events, take place on the high seas either adjacent to the maritime boundary lines of coastal State CPCs in the western portion of the IATTC Convention Area or the northern portion of the IATTC-WCPFC overlap area. These locations may represent higher risks for potential transshipment misreporting if the source of transferred catch is not first accurately determined (see Section 8, Key Finding 3 and 4).

# 5 Comparing AIS-Detected and Observer Reported Carrier Trips

Carrier vessel trips during calendar year 2017, as reported in *CAF-06-03-02 Addendum 1* and *CAF-06-03 CORR,* were analyzed in comparison with observed AIS data to audit the reported information. *CAF-06-03-02 Addendum 1* outlined a total of 39 carrier vessel trips which were reported to have occurred in the Convention Area between January 1, 2017 and February 15, 2018. *CAF-06-03 CORR* appears to update this information and cites 42 total trips having occurred during this time. These 42 trips were inclusive of the original 39 trips and includes three additional trips that either began in 2016 and ended in 2017 or began in 2017 and ended in 2018. Data on these 42 reported trips were compared and cross-checked with carrier vessels observed on AIS data operating within the IATTC Convention Area in 2017.

For this report, an ‘observed trip’ was defined as the activity observed on AIS by a carrier vessel occurring between a port of departure and a port of entry. Based on available AIS data for the Convention Area in 2017, GFW detected a total of 47 trips conducted by 23 distinct carrier vessels where an encounter with a LSTLFV occurred. These 47 trips are inclusive of the 42 reported trips; however, GFW detected an additional five trips conducted by four different carrier vessels which were not reported in either *CAF-06-03*

*CORR* or *CAF-06-03-02 Addendum 1*. Three of the four carrier vessels were Chinese-flagged carriers not listed in *CAF-06-03 CORR* Appendix 2 and these three carrier vessels conducted a total of four trips. The fourth carrier vessel was a Vanuatu-flagged carrier identified in *CAF-06-03 CORR Appendix 2* to have conducted three other reported trips in 2017, but AIS analysis indicated the carrier vessel also conducted an additional trip in IATTC waters not reported by the ROP. See Annex 1-0233-0277 for carrier trip information associated with AIS detected encounter events.

Of the 42 reported trips listed in *CAF-06-03-02 Addendum 1*, 26 trips were observed on AIS for which trip dates, ports visited, and vessel identification information appeared nearly the same as what was reported (Table 2). Reported transshipments as identified in *CAF-06-03-02 Addendum 1* Figure 3 for these 26 trips were compared with AIS data, and the two appeared to match where AIS detections of encounters and loitering activity occurred. Notably, the movements on AIS of carrier vessels for two of the reported trips (IATTC trip numbers 289 and 292) during which high seas transshipment occurred were only associated with loitering activity (See Annex 1-0278-2321 for all port visits associated with loitering events). These carriers had no AIS-detected encounters with other fishing vessels transponding on AIS. This observation supports the supposition that AIS-detected loitering activity can be used as a possible indication of transshipment. For the 26 trips, AIS observed trip start and end dates varied slightly and occasionally from reported IATTC observer embarkation and disembarkation dates, with observed trip dates varying no more than a few days of reported trip dates. These differences are not significant and may be due to a variety of factors including poor AIS reception in busy port locations, or AIS being turned off once carriers neared port.

*Table 2 – AIS Detected Trips Matched to Reported Trips by the IATTC ROP*

| Trip ID* | Carrier Flag | Trip Start | | | Trip End | | |
|---|---|---|---|---|---|---|---|
| | | Date | City | Country | Date | City | Country |
| 272 | TWN | 2016-11-26 | KAOHSIUNG | TWN | 2017-02-11 | KAOHSIUNG | TWN |
| 276 | KOR | 2016-12-02 | BUSAN | KOR | 2017-02-08 | BUSAN | KOR |
| 278 | LBR | 2017-01-10 | KAOHSIUNG | TWN | 2017-03-01 | BALBOA | PAN |
| 279 | PAN | 2017-01-06 | SHIMIZU | JPN | 2017-02-28 | PAPEETE | PYF |
| 280 | KOR | 2017-01-20 | MAJURO | MHL | 2017-04-01 | BUSAN | KOR |
| 281 | KOR | 2017-01-17 | BUSAN | KOR | 2017-03-22 | BUSAN | KOR |
| 282 | PAN | 2017-01-26 | KAOHSIUNG | TWN | 2017-04-17 | LEVUKA | FJI |
| 284 | LBR | 2017-02-17 | KAOHSIUNG | TWN | 2017-04-27 | MAJURO | MHL |
| 286 | TWN | 2017-09-28 | KAOHSIUNG | TWN | 2017-12-10 | KAOHSIUNG | TWN |
| 288 | VUT | 2017-04-19 | SUVA | FJI | 2017-06-06 | KAOHSIUNG | TWN |
| 289 | PAN | 2017-04-10 | VACAMONTE | PAN | 2017-07-15 | MANTA | ECU |
| 290 | KOR | 2017-04-12 | BUSAN | KOR | 2017-06-14 | BUSAN | KOR |
| 291 | LBR | 2017-05-18 | KAOHSIUNG | TWN | 2017-07-31 | BUSAN | KOR |
| 292 | LBR | 2017-05-11 | MAJURO | MHL | 2017-06-13 | PAPEETE | PYF |
| 293 | KOR | 2017-05-30 | BUSAN | KOR | 2017-08-15 | BUSAN | KOR |
| 295 | VUT | 2017-06-27 | KAOHSIUNG | TWN | 2017-09-22 | PAPEETE | PYF |
| 296 | KOR | 2017-06-30 | BUSAN | KOR | 2017-09-04 | BUSAN | KOR |
| 297 | LBR | 2017-06-21 | KAOHSIUNG | TWN | 2017-09-14 | YOKOSUKA | JPN |
| 298 | TWN | 2017-07-16 | KAOHSIUNG | TWN | 2017-09-24 | KAOHSIUNG | TWN |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 299 | PAN | 2017-09-06 | LEVUKA | FJI | 2017-11-26 | KAOHSIUNG | TWN |
| 300 | PAN | 2017-08-19 | BUSAN | KOR | 2017-10-24 | SUVA | FJI |
| 302 | KOR | 2017-08-21 | BUSAN | KOR | 2017-11-16 | BUSAN | KOR |
| 303 | PAN | 2017-08-18 | VACAMONTE | PAN | 2017-11-22 | VACAMONTE | PAN |
| 305 | KOR | 2017-09-04 | BUSAN | KOR | 2017-11-27 | BUSAN | KOR |
| 306 | CHN | 2017-09-15 | SUVA | FJI | 2017-11-26 | BUSAN | KOR |
| 307 | LBR | 2017-09-26 | MAJURO | MHL | 2017-12-04 | MAJURO | MHL |
| 308 | TWN | 2017-09-15 | KAOHSIUNG | TWN | 2017-11-26 | KAOHSIUNG | TWN |
| 310 | TWN | 2017-10-21 | KAOHSIUNG | TWN | 2017-12-27 | KAOHSIUNG | TWN |

*Trip ID originates from IATTC CAF-06-03 CORR

Of the remaining 16 trips, four appeared to have differences in AIS-observed trip duration compared to ROP-reported trip duration that varied up to a month in time. Additionally, carrier vessels involved in two of the trips were observed on AIS to have made additional unreported port visits that occurred between the ROP-reported trip start and trip end port locations, wherein these unreported port visits were made after the carrier vessel was observed having at least one AIS-detected encounter or loitering event (IATTC trip numbers 284 and 303). It is possible these encounters or loitering events were indicators of potential transshipment of IATTC-managed species, which in turn may have then been offloaded while the carrier vessel visited the additional unidentified port. Similarly, AIS analysis indicated that in 13 of the 42 reported carrier vessel trips, an additional port visit occurred after the initial reported trip start or prior to reported trip end. All port visits made by carrier vessels represent risks of possible unreported transfer of catch unless specific reporting protocols are established to require the carrier vessel master or embarked observer provide management authorities notification detailing the carrier vessel's activity during each port visit, including confirmation that no transfer of fish occurred.

AIS analysis also indicated that 10 of the 42 reported IATTC trips had differences in port locations between what was reported by the ROP and what was detected on AIS (Table 3). Nearly all differences were related to the reported port at trip end, although one of the 10 trips had a difference in the reported port of trip start. For instance, IATTC trip 271 had a reported trip end on January 10, 2017 in Yokosuka, Japan where AIS indicated on

January 10, 2017 the carrier vessel was in Ensenada, Mexico (Table 3 and Figure 11). IATTC trip 304 was also matched based on reported trip start and end dates; however, the carrier vessel was observed on AIS in the port of Busan, Korea four days after the vessel was reported to be there. At the time the carrier vessel was reported to be in Busan, Korea it was instead observed on AIS to be in the port of Shimizu, Japan. These port location differences may warrant further investigation to determine their cause, such as when multiple vessels broadcast the same MMSI number at the same time as well as whether unreported transfers of catch may have occurred while the carrier vessel was in these unreported port locations. These anomalies may highlight the need for IATTC to consider more robust monitoring protocols of carrier vessel port visits while they operate under the IATTC transshipment program.

Nearly all AIS-detected differences in reported carrier trips were due to either differences in ports visited or additional port visits not reported rather than noticeable differences in trip dates (Table 3). Understanding the nature of unreported port visits by carrier vessels occurring during an IATTC trip is critical not only for a deeper understanding carrier vessel behavior in the IATTC Convention Area, but also to determine whether risks associated with unreported offloads or onloads exist.

*Table 3 - Differences in Port Locations Between AIS-Detected Carrier Vessel Trips and ROP Reported Trip*

| Trip ID | Carrier Flag | Reported Trip Start | | | Reported Trip End | | | AIS-Detected Trip Start | | | AIS-Detected Trip End | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | City | Country | Date | City | Country | Date | City | Country | Date | City | Country |
| 271 | PAN | 2016-11-20 | YOKOSUKA | JPN | 2017-01-10 | YOKOSUKA | JPN | 2016-11-19 | YOKOSUKA | JPN | 2017-01-10 | ENSENADA | MEX |
| 274 | VUT | 2016-12-09 | KAOHSIUNG | TWN | 2017-02-18 | KAOHSIUNG | TWN | 2016-12-11 | KAOHSIUNG | TWN | 2017-02-18 | SHIMIZU | JPN |
| 275 | VUT | 2016-12-13 | PAPEETE | PYF | 2017-01-19 | PAPEETE | PYF | 2016-12-13 | PAPEETE | PYF | 2017-01-19 | MAJURO | MHL |
| 285 | KOR | 2017-03-01 | BUSAN | KOR | 2017-05-05 | BUSAN | KOR | 2017-03-01 | SHIMIZU | JPN | 2017-05-04 | BUSAN | KOR |
| 287 | VUT | 2017-03-08 | KAOHSIUNG | TWN | 2017-06-02 | YOKOSUKA | JPN | 2017-03-09 | KAOHSIUNG | TWN | 2017-05-31 | YOKOSUKA | JPN |
| 301 | PAN | 2017-08-29 | KAOHSIUNG | TWN | 2017-11-25 | MAJURO | MHL | 2017-09-01 | KAOHSIUNG | TWN | 2017-11-24 | MAJURO | MHL |
| 304 | KOR | 2017-09-21 | BUSAN | KOR | 2017-11-19 | BUSAN | KOR | 2017-09-21 | BUSAN | KOR | 2017-11-18 | SHIMIZU | JPN |
| 309 | VUT | 2017-09-29 | PAPEETE | PYF | 2017-11-07 | PAPEETE | PYF | 2017-09-29 | PAPEETE | PYF | 2017-11-06 | MAJURO | MHL |
| 311 | LBR | 2017-11-09 | KAOHSIUNG | TWN | 2018-01-20 | KAOHSIUNG | TWN | 2017-11-09 | KAOHSIUNG | TWN | 2018-01-19 | MAJURO | MHL |
| 312 | VUT | 2017-11-11 | KAOHSIUNG | TWN | 2018-01-19 | KAOHSIUNG | TWN | 2017-11-11 | KAOHSIUNG | TWN | 2018-01-19 | PAPEETE | PYF |

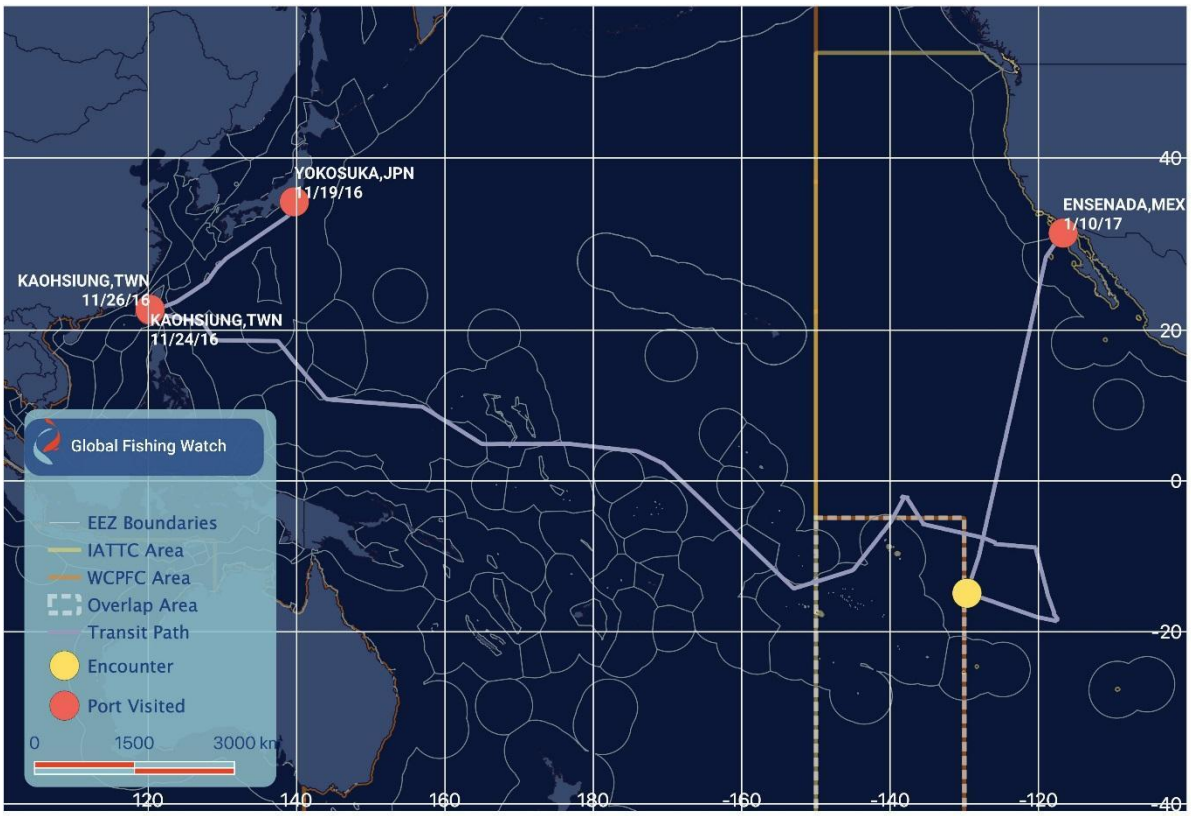



*Figure 11 – AIS Track History of Carrier Vessel on IATTC trip 271 with Observed Trip End in Mexico on Same Day as Reported Trip End in Japan*

Table 4 details five trips by carrier vessels observed on AIS which were not reported in either *CAF-02-03 Addendum 1* or *CAF-06-03 CORR*. For each of these trips, at least one AIS-detected encounter with an LSTLFV was observed to have occurred between port visits. Of the five carrier trips, four trips started and ended in China and were conducted by Chinese-flagged carrier vessels not listed in IATTC trip tables for the 42 trips reported by the ROP. Figure 12 details one of these trips as observed on AIS. The fifth trip was an unreported trip conducted by a Vanuatu-flagged carrier vessel that had conducted three other reported trips in 2017 (IATTC trip numbers 275, 288 and 309).

*Table 4 – AIS Detected Trips Not Reported by the IATTC ROP*

| Carrier Flag | Trip Start | | | Trip End | | |
|---|---|---|---|---|---|---|
| | Date | City | Country | Date | City | Country |
| CHN | 10/22/17 | DANGAN ISLAND | CHN | 12/30/17 | MINJIANGKOU | CHN |
| CHN | 11/3/17 | PO TOI ISLAND | CHN | 1/13/18 | MINJIANGKOU | CHN |
| CHN | 12/23/16 | MINJIANGKOU | CHN | 3/26/17 | MINJIANGKOU | CHN |
| CHN | 5/23/17 | PO TOI ISLAND | CHN | 8/25/17 | MINJIANGKOU | CHN |
| VUT | 8/16/17 | KAOHSIUNG | TWN | 9/25/17 | PAPEETE | PYF |

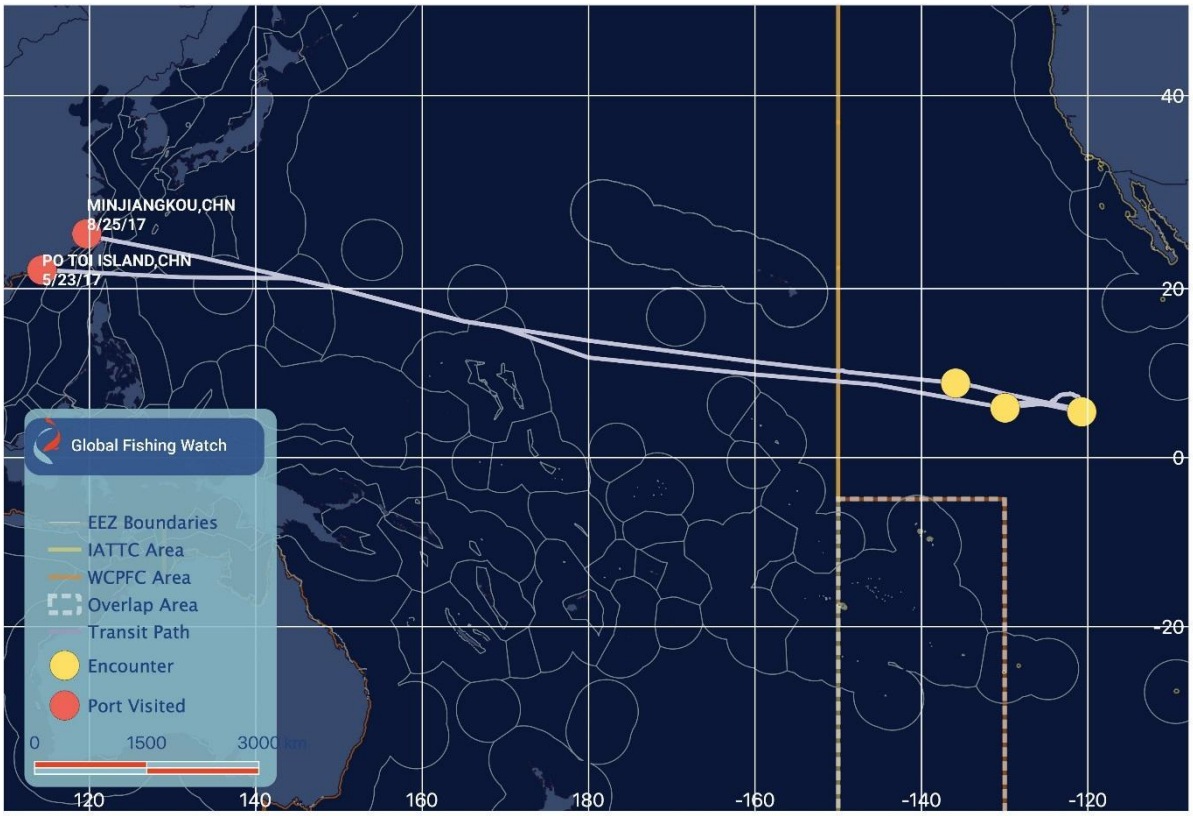



*Figure 12 – AIS-Detected Track History of one Chinese-Flagged Carrier Vessel Not Reported by the ROP to have Conducted Transshipment in the IATTC Convention Area in 2017*

## 5.1 AIS-Detected Port Visits by Carriers

An analysis of the port visits conducted by the 23 carrier vessels identified to have had AIS-detected encounters with LSTLFVs in the IATTC Convention Area during 2017 indicated that a relatively small group of ports were visited by the carrier vessels at the start and end of the 47 trips identified on AIS (Figures 13 and 14).

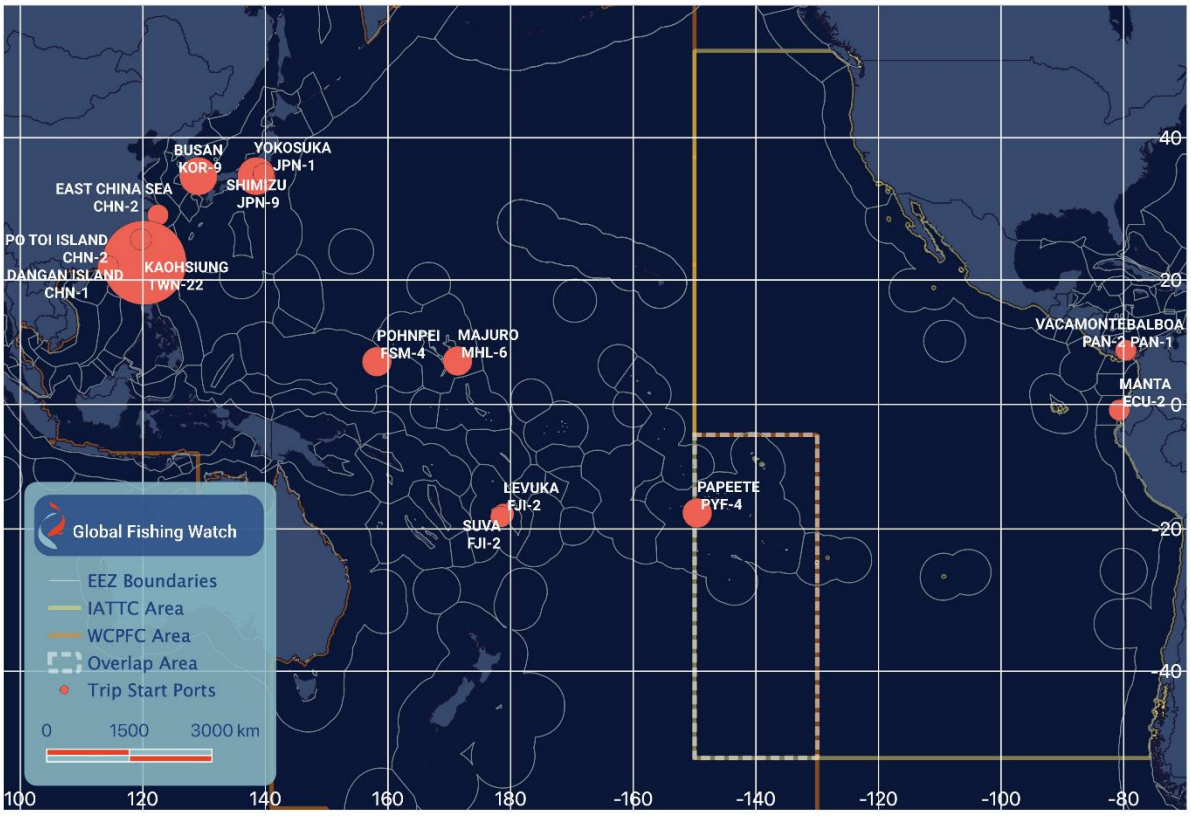



*Figure 13 – Ports Identified at the Start of an AIS-Detected Carrier Vessel Trip Inside the IATTC Convention Area in 2017*

The ports identified to have been visited by these carrier vessels were in Korea, Taiwan, Japan, China, Panama, Ecuador, the Marshall Islands, Fiji, French Polynesia, the Federated States of Micronesia, and Mexico. Kaohsiung, Taiwan was the port most often observed as the starting point of a carrier vessel trip, followed by Shimizu, Japan and Busan, Korea (Figure 13). Kaohsiung and Busan were the two most frequented ports at the end of a trip which are likely to be terminal ports, where fish is landed for processing. The next largest destination ports where Majuro, the Marshall Islands, and Papeete, French Polynesia (Figure 14) which are likely to be related to crew or observer changes or in-port transshipments with purse seine vessels.

Six of these eleven countries are party to the Agreement on Port State Measures (PSMA). China (inclusive of Taiwan, Province of China[4]), the Marshall Islands, Micronesia and Mexico have yet to accede to the PSMA. 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 IATTC-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 IATTC fish product. CPCs may be able to use this information to better understand the value of acceding to the PSMA, and having IATTC adopt and implement management measures specific to port state control, which could help ensure that illicitly caught fish or unreported transshipped catch sourced from IATTC waters have a greater chance of being detected when landed in port.

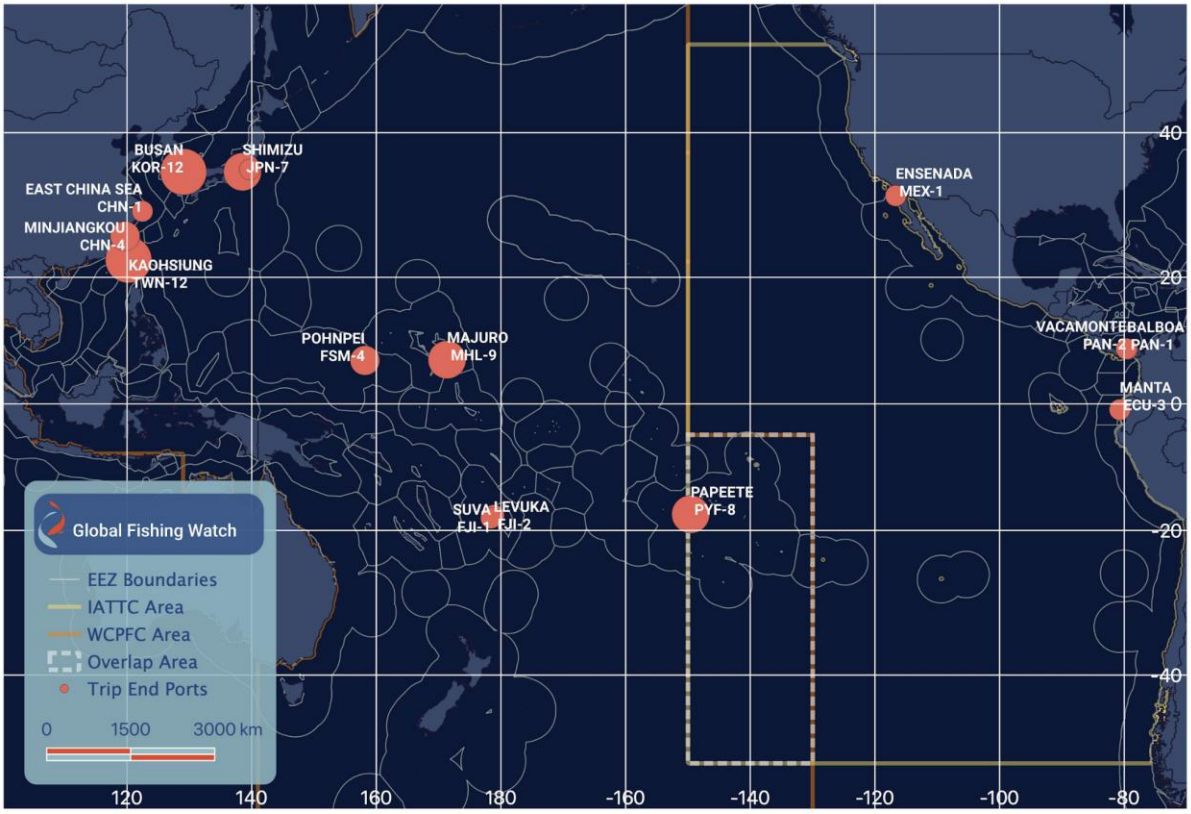



*Figure 14 – Ports Identified at the End of an AIS-Detected Carrier Vessel Trip Inside the IATTC Convention Area in 2017*

[4] As designated by the United Nations which implements the PSMA through its Food and Agriculture Organization

### 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 information supports the initial finding that more carrier vessels appeared to conduct high seas transshipment in IATTC waters in 2017 than the ROP reported (see Section 8, Key Finding 4).

- Comparison of AIS data with reported trip information indicated 22 percent of the reported trip data did not match up with vessel movements. AIS 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 (see Section 8, Key Finding 4).

- AIS analysis can be effectively used to identify port visit trends by carrier vessels and highlight those ports most often used for offloading of IATTC-sourced and transshipped fish species. These, in turn, may represent the most important port locations to monitor and regulate the landing of IATTC-sourced fish product (see Section 8, Key Finding 5).

# 6 IATTC Carrier Activity in WCPFC Waters and the IATTC-WCPFC Overlap Area

Tuna fisheries in the Pacific often transcend the designated boundaries between IATTC and WCPFC Convention Areas and in the south of each RFMO there is an area where their Convention Areas overlap. The nature of two separate management organizations across the same fish stock presents particular challenges that require strong cooperation. This section looks at the challenges facing the management of transshipment activity across the boundaries and in the shared area.

## 6.1 WCPFC Transshipments During IATTC Carrier Vessel Trips

As outlined in the June 2006 Memorandum of Understanding between IATTC and WCPFC, (WCPFC-IATTC-MoU-Jun-2006), both organizations established efforts to cooperate and collaborate on management efforts, to include fishing activities that occur within the overlap of their respective Convention Areas. As part of the MoU, both organizations agreed to cooperate through the *"…exchange of data and information…", "…information-sharing about stocks and species of mutual interest…",* and the *"…active*

*and regular exchange of relevant meeting reports, information, research data and results, project plans, documents, and publications regarding matters of mutual interest…"* (WCPFC-IATTC-MoU-Jun-2006).

The IATTC ROP reports that when carrier vessels on IATTC trips with an embarked IATTC observer conduct transshipments in the IATTC-WCPFC overlap area east of 150 degrees West longitude, these transshipments are classified as IATTC transshipments. When these carrier vessels transit west of 150 degrees West longitude into WCPFC-managed waters, the high seas transshipments are classified as WCPFC transshipments. This study examined IATTC carrier vessel activity reported to occur both within the area of overlap as well as west of the overlap in WCPFC-managed waters. Where possible, ROP reported information was compared with observations based on AIS.

The IATTC ROP reported transshipments occurred in WCPFC-managed waters by carrier vessels considered to be IATTC trips with an embarked IATTC observer. However, the IATTC ROP service provider (MRAG Americas) further reported in *CAF-06-03-02 Addendum 1* they do not *"…have an agreement with the WCPFC to collect data on transshipments in the Western Pacific…".* MRAG Americas further elaborated *"…the dividing line is the 150W line…if the carrier vessel takes transshipments west of 150W, these will be designated WCPFC transshipments. The observer is to observe these transshipments at the carrier vessel captain's discretion…"* Between January 2017 and February 2018, the ROP reported that IATTC observers were embarked on carrier vessels on IATTC trips during which 463 WCPFC transshipments occurred. Of these, 413 were fully observed by the embarked IATTC observer. *CAF-06-03-02 Addendum 1* indicated that 50 transshipments were not observed by the IATTC observer and no declaration documenting the event was provided to the IATTC observer by the vessel master. A review of publicly available documents produced by both IATTC and WCPFC covering 2017 transshipment activities provided no additional information to clarify this issue further or verify; (a) whether WCPFC observers were also embarked on carrier vessels during IATTC trips to observe transshipments occurring west of 150W as required by WCPFC, (b) how, and to what extent, information relative to the 413 WCPFC transshipments observed by IATTC observers was shared with, documented, and reported by the WCPFC Secretariat, and (c) whether the 50 WCPFC transshipments that went unobserved by IATTC observers where no transshipment declaration was provided were observed at all by a WCPFC observer and a transshipment declaration submitted. The manner by which these 50 WCPFC transshipment events were reported by the ROP leaves open the possibility that these events went fully unobserved by any IATTC or WCPFC observer and both the events, and amount of fish transferred, went undocumented by the vessel master on required transshipment declarations. As such, the details of these events may be wholly unreported to both IATTC and WCPFC.

*CAF-06-03-02 Addendum 1 Table 1,* which details 31 of the 42 reported IATTC trips that occurred in 2017, was referenced to determine which IATTC carrier vessel trips included WCPFC transshipments. Unfortunately, no additional publicly available IATTC document appears to provide information on WCPFC transshipments for the remaining 11 IATTC trips. As such, full analysis of the 42 trips could not be done. However, despite this gap, Table 1 indicates 24 of the 31 reported trips had WCPFC transshipments documented with the remaining seven trips showing no data that WCPFC transshipments occurred. An audit of this reported information was conducted using AIS to determine whether AIS showed indications that transshipments in WCPFC-managed waters occurred during the seven trips. This analysis indicated that three of the seven trips showed signs of transshipment activity in WCPFC-managed waters. During these three trips, 20 AIS-detected encounters and 50 loitering events were observed (Figure 15) (See Annex 1-2322-2323 and Annex 1-2324-2373 for complete data). These potential transshipments occurred during IATTC trips 284, 292 and 304 as outlined in Table 5.

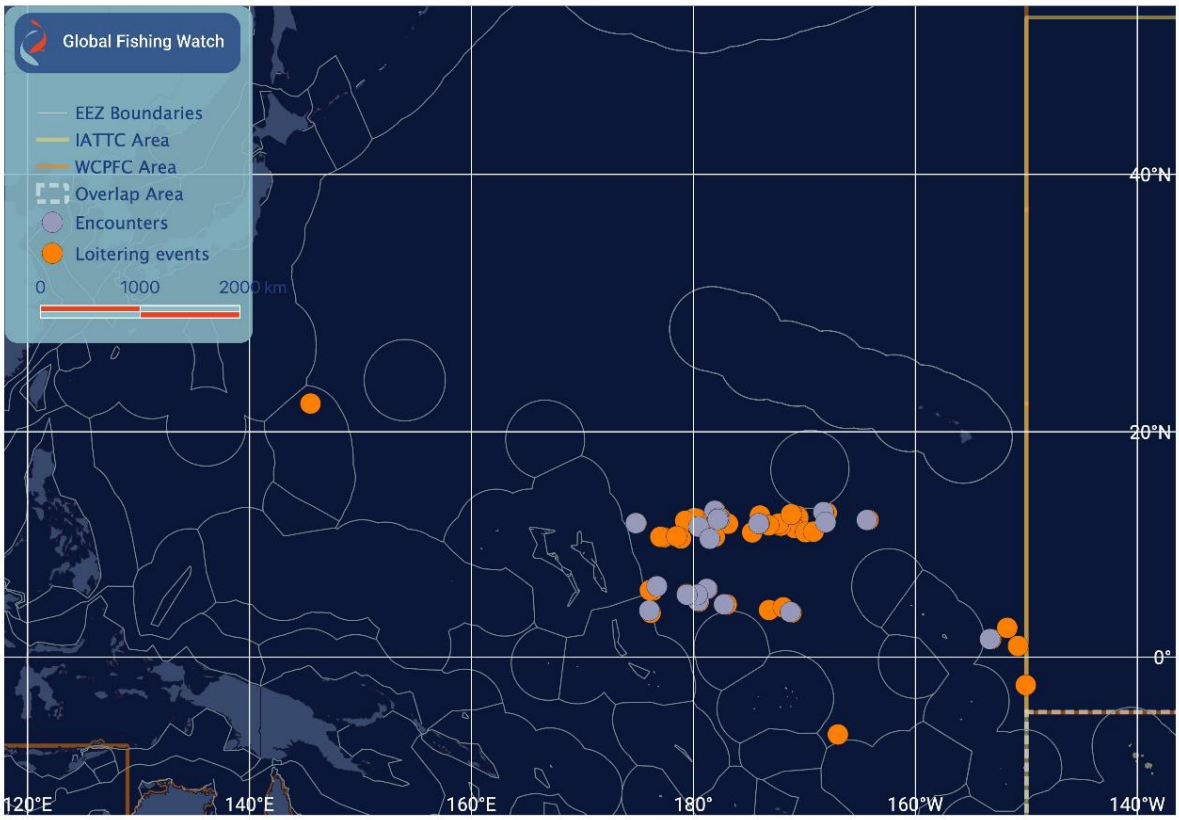



*Figure 15 – AIS-Detected Encounters and Loitering Events in the WCPFC Convention Area by Carrier Vessels on Three IATTC Trips*

*Table 5 – Count of AIS-Detected Encounters and Loitering Events in the WCPFC Convention Area by Carrier Vessels on IATTC Trips*

| Trip ID* | WCPFC Encounter Count | WCPFC Loitering Count | IATTC Reported WCPFC Transshipments+ |
|---|---|---|---|
| 284 | 7 | 24 | - |
| 292 | 2 | 13 | - |
| 304 | 11 | 13 | - |

*Trip ID originates from IATTC documents CAF-06-03 ADD. 1 for all trips within 2017 and CAF-06-03 CORR for all trips that begin in 2016 or end in 2018.

+Document CAF-06-03 ADD. 1 Table 1 does not indicate any metric tons of WCPFC transshipped fish during these trips and MRAG indicates 50 transshipments occurred in WCPFC for which declarations were not provided.

The AIS data appears to confirm that unreported WCPFC transshipments did occur during these seven IATTC carrier vessel trips. It is possible these events may directly correspond to the 50 WCPFC transshipments reported by the ROP to have gone unobserved by IATTC observers, may represent additional unreported transshipments, or could be a combination of both.

The results of this analysis indicate that AIS data may be effectively used to provide the ROP with supplemental information that could be used to validate transshipment activity by carrier vessels on IATTC trips, possibly detect when unreported transshipments occur, and help ensure carrier vessels conducting IATTC trips are complying with all established IATTC transshipment management regulations.

## 6.2 Carrier Activity in the IATTC-WCPFC Overlap Area

Potential transshipment activity in the IATTC-WCPFC overlap area in 2017 was also assessed through the analysis of AIS data. This analysis showed that all carrier vessels identified in AIS-detected encounters and loitering events occurring within the overlap area were the same as those documented in *CAF-06-03 CORR* Appendix 2. In addition, all LSTLFVs in the AIS-detected encounters appeared to be authorized by WCPFC during 2017. IATTC authorization status of the same LSTLFVs could not be determined.

Of the total 232 AIS-detected encounters, 73 of them, or more than 31 percent, occurred on the high seas within the overlap area (See Annex 1-0001-0232). Additionally, 146 of the 482 loitering events attributed to these carriers with deployments reported in *CAF-06-*

*03 CORR* Appendix 2, more than 30 percent, also occurred within the overlap area (See Annex 1-0278-2321). Most of the 73 encounters were observed in the northern portion of the overlap area. The only encounters observed in the southern portion involved Panamanian- and Chinese-flagged carrier vessels and Chinese-flagged LSTLFVs (Figure 16 and Figure 17).

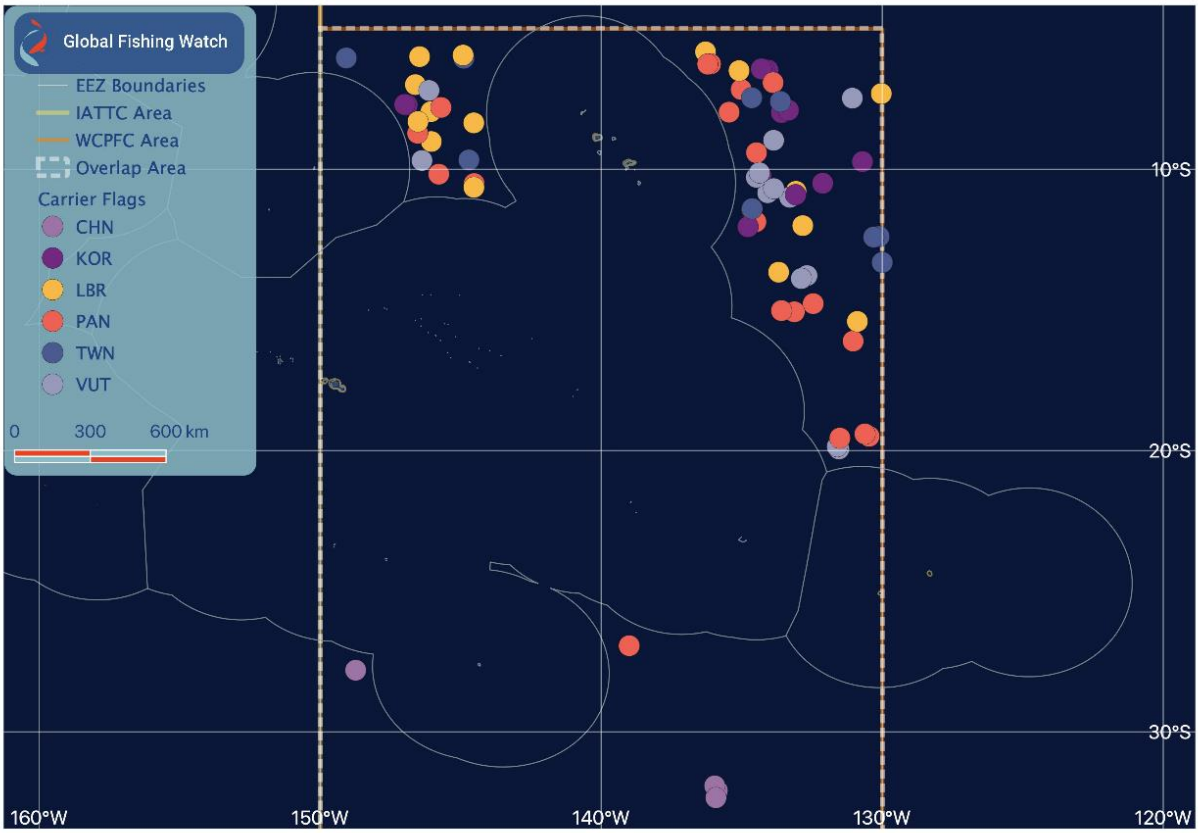



*Figure 16 – Carrier Flags in AIS-Detected Encounters within the IATTC-WCPFC Overlap Area*

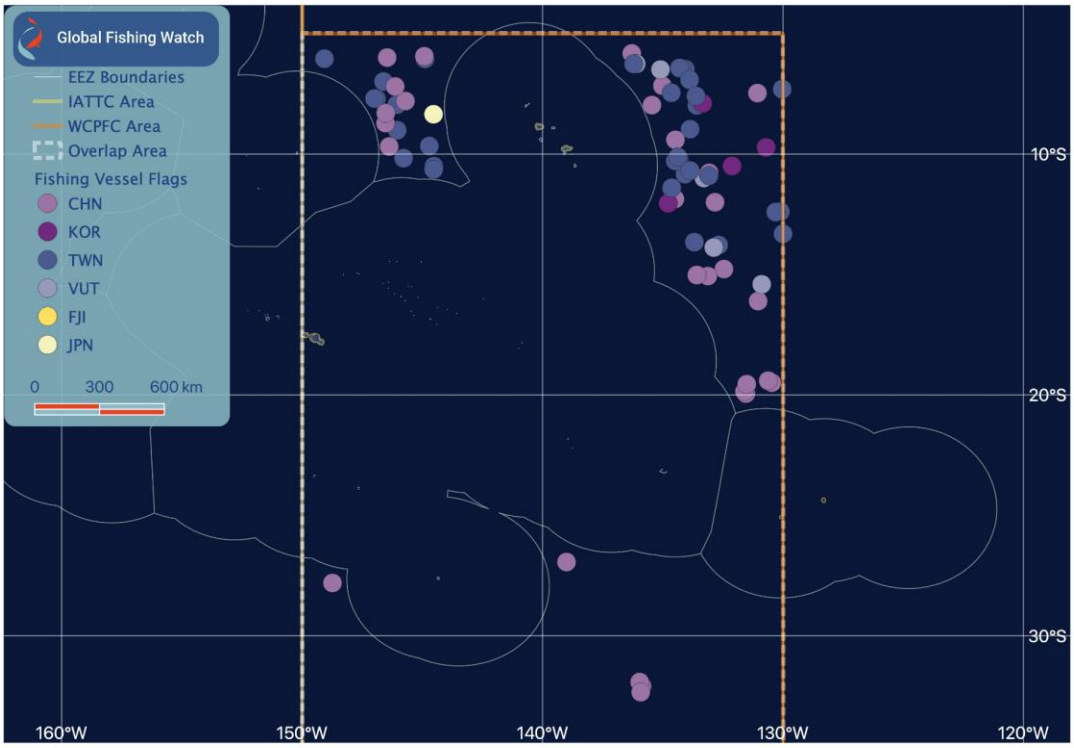



*Figure 17 – Fishing Vessel Flags in AIS-Detected Encounters within the IATTC-WCPFC Overlap Area*

Chinese- and Taiwanese-flagged LSTLFVs were involved in most of the AIS-detected encounters in the overlap area (Figure 18). Although Japanese-flagged LSTLFVs were detected in 26 percent of all AIS-detected encounters within the entire IATTC Convention Area, there was only a single AIS-detected encounter in the overlap area. The predominant number of encounters within the overlap occurred between Panamanian-flagged carriers and Chinese-flagged LSTLFVs (Figure 18). Taiwanese- and Chinese-flagged carriers were the only carrier fleets to have encounters exclusively with LSTLFVs of the same flag State (Figure 18). AIS-detected loitering events within the overlap area were primarily conducted by Panamanian-flagged carriers (Figure 19).

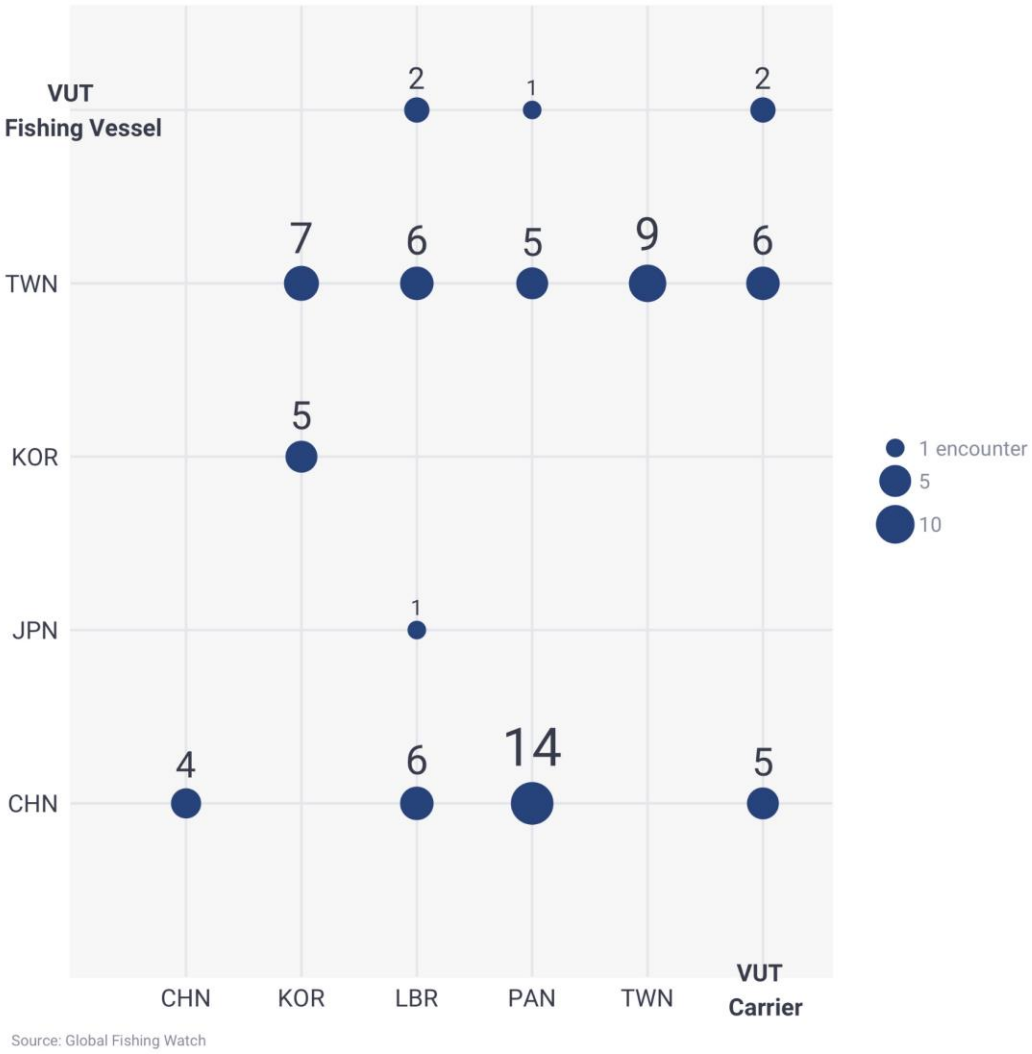



*Figure 18 – Count of AIS-Detected Encounters for Carriers within the IATTC-WCPFC Overlap Area*

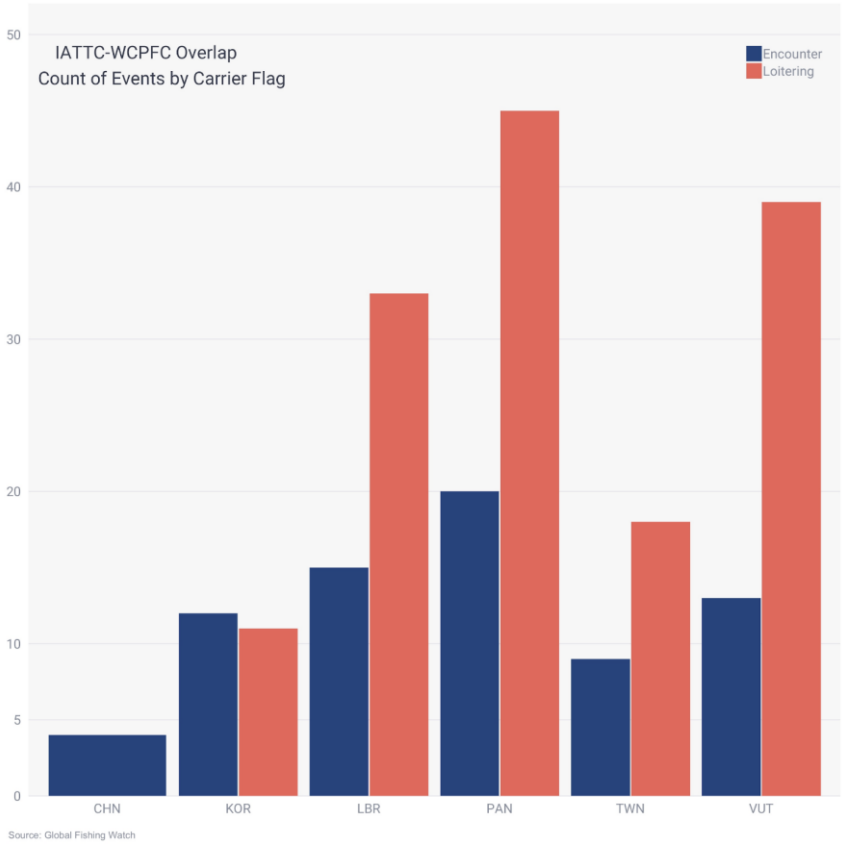



*Figure 19 – Count of AIS-Detected Encounter and Loitering Events by Carrier Vessel Flag within the IATTC-WCPFC Overlap Area*

As with AIS-detected loitering activity observed in the entire IATTC Convention Area, loitering events specifically in the overlap far outnumbered encounters for all carrier vessel fleets except for Korean-flagged carriers (Figure 19). The spatial distribution of the loitering events in the overlap area was very similar to that of encounters. As indicated earlier in this study, AIS-detected encounters and loitering activity in the IATTC area, especially where loitering is no more than 24 hours in duration, is indicative that transshipment is likely to have occurred.

Roughly one-third of all AIS-detected encounters and loitering events, all associated with 15 of the 20 carrier vessels that conducted IATTC trips in 2017, occurred in the overlap area (Figure 20 and Table 7) although none of the other 31 carrier vessels observed on AIS in IATTC waters in 2017 were observed loitering in the overlap area.

A large amount of carrier activity appears to be occurring in the relatively small region of the high seas in the IATTC-WCPFC overlap area compared to the rest of the IATTC Convention Area. The publicly available data for reported 2017 tuna and billfish catch

statistics for IATTC longline vessels shows 68,548 metric tons reportedly caught in IATTC with 18,999 metric tons (27.7 percent) of that in the IATTC-WCPFC overlap area[5]. It is not clear if these trends are due to high productivity of this area or if it suggests the overlap area is a region consciously chosen by some vessel fleets to conduct high seas transshipment and possibly misreport catch. These decisions may be driven in part by the way the IATTC-WCPFC overlap is managed collaboratively by the two RFMOs which could inadvertently facilitate the ability for noncompliant activity to occur, to include unreported transshipments or misreporting of WCPFC catch to IATTC to circumnavigate quota rules.

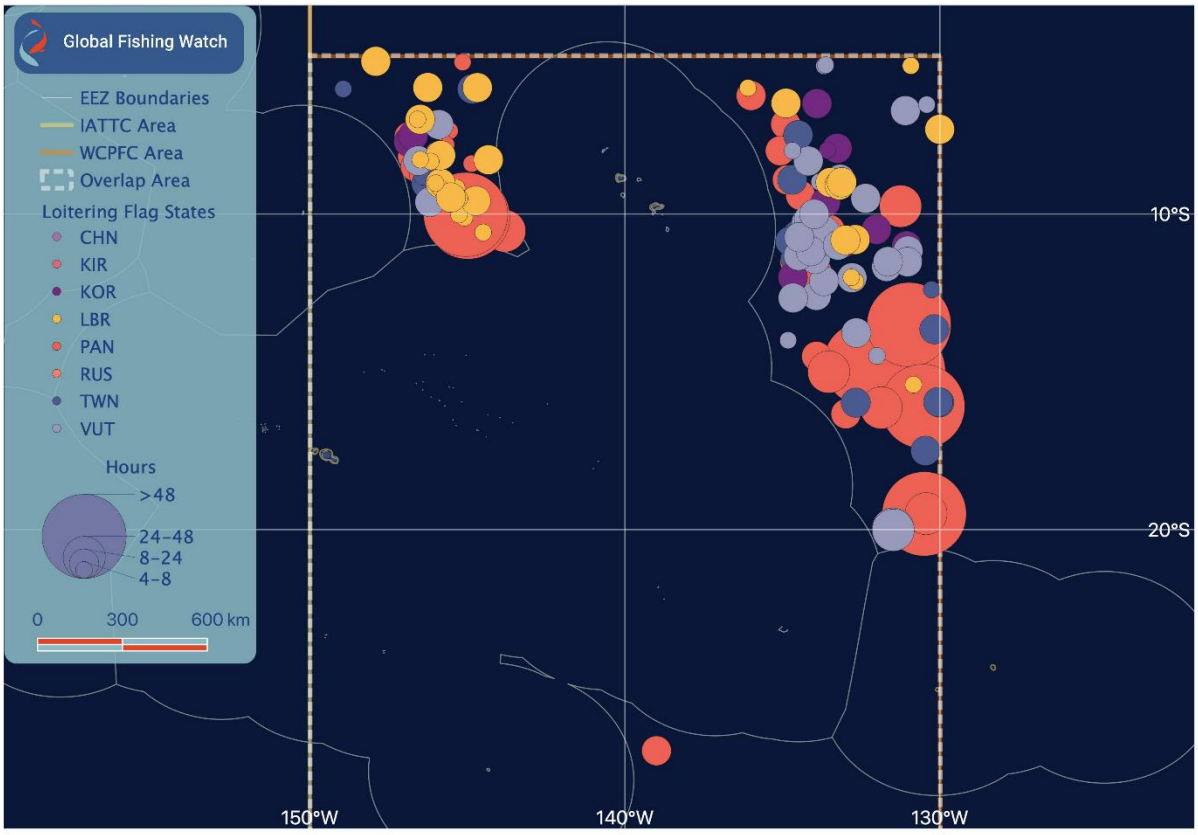



*Figure 20 –AIS-Detected Loitering Events by Carrier Flag and Event Duration within the IATTC-WCPFC Overlap Area*

[5] https://www.iattc.org/CatchReportsDataENG.htm - IATTC Public Tuna and Billfish EPO longline catch and effort data

*Table 7– Distinct Count of Carrier Vessels and LSTLFVs in AIS-Detected Encounters and Loitering Events within the IATTC-WCPFC Overlap Area*

| Vessel Flag | Distinct Carriers | Distinct Fishing Vessels | Total |
|---|---|---|---|
| CHN | 1 | 26 | 27 |
| KOR | 4 | 5 | 9 |
| LBR | 2 | 0 | 2 |
| PAN | 4 | 0 | 4 |
| TWN | 3 | 19 | 22 |
| VUT | 2 | 2 | 4 |
| JPN | 0 | 1 | 1 |

## Section Summary and Key Findings:

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

- ROP reported data related to transshipment activity by carrier vessels on IATTC trips whose voyages extend into WCPFC-managed waters indicate that the processes, protocols and procedures used by the ROP may provide opportunities for WCPFC transshipments to go unobserved, undocumented and unreported (see Section 8, Key Finding 4).

- A comparative analysis of ROP data with AIS-detected encounters and loitering events associated with carrier vessels on IATTC trips whose voyages extended into WCPFC-managed waters indicated that it is likely that some WCPFC transshipments occurred and went unreported (see Section 8, Key Finding 4 and 6).

- Over one-third of all AIS-detected encounters and loitering events attributed to carrier vessels reported to be on IATTC trips occurred within the IATTC-WCPFC overlap area. Three-quarters of the carrier fleet used for IATTC trips appeared to use the overlap area to conduct high seas transshipments. This suggest the overlap area is highly frequented area for transshipment activity with the highest density of transshipments in the IATTC Convention Area. (see Section 8, Key Finding 6).

# 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 or high-density areas can also limit AIS data usefulness, although the IATTC Convention Area has relatively strong Class-A AIS coverage (See Kroodsma et al. 2018). However, AIS data tends to be sparser and more 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. 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 Miller et al. 2018 for further discussion).

# 8 Key Findings and Recommendations

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

**Key Finding 1:** Lack of publicly available historical IATTC vessel authorization lists and data fields detailing respective vessel authorization periods makes it impossible to conduct retrospective analyses of vessel activity reflective of authorization status. This practice limits the overall usefulness of authorized vessel lists.

- *Recommendation:* IATTC should implement public access to both current and historical authorization lists for both carrier and fishing vessels. Historical lists should be made available for at least the three previous calendar years in time.
- *Recommendation:* IATTC should incorporate additional data fields in their carrier and fishing vessel authorization lists that detail the start and end dates of flag State authorizations as well as the IMO Numbers (a unique number assigned to vessels that does not change with ownership) of all eligible vessels.

**Key Finding 2:** AIS analysis identified a total of 155 carriers reporting entering the IATTC Convention area. By combining this data with the publicly available ROP data 20 were identified as reporting to the ROP. The analysis was further able to identify 33 carriers

that either encountered an LSTLFV (3 of the 33 vessels) or loitered in the ICCAT convention area (32 of the 33 carriers). It is likely any high seas transshipments involving IATTC-sourced catch associated with these additional carrier vessels went unreported to IATTC.

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

**Key Finding 3:** Analysis of AIS data was effective in determining flag States of carrier vessels involved in AIS-detected encounters and loitering events as well as the location of these events in IATTC Convention Area waters, with results comparable to ROP reported information. Furthermore, analysis of AIS data detected more carrier vessels appearing to conduct high seas transshipments in IATTC waters in 2017 than the ROP reported. As such, AIS data can be used effectively to cross-check and validate ROP information, highlight anomalies, and detect potential noncompliant behavior, all of which may warrant further investigation or follow-up.

- *Recommendation:* IATTC should strengthen its compliance assessments process by mandating AIS use and adopting AIS monitoring as a supplementary tool to complement existing management resolutions and MCS tools.

**Key Finding 4:** ROP reported data related to transshipment activity by carrier vessels on IATTC trips whose voyages extend into WCPFC-managed waters on the same voyage indicate that current processes, protocols and procedures used by the ROP may provide opportunities for WCPFC transshipments to go unobserved, undocumented and unreported. A comparative analysis of AIS data specific to these carrier vessel trips conducted in 2017 indicated that it is likely some WCPFC transshipments occurred and went unreported.

- *Recommendation:* In the absence of centralized VMS, IATTC should allow the ROP service provider to use AIS as a supplementary dataset 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 IATTC Secretariat or relevant flag State authorities.
- *Recommendation:* IATTC should update the protocols, processes, and procedures for how the ROP service provider manages the IATTC ROP to:
    - Ensure the ROP service provider is included as a component of the IATTC-WCPFC MoU on Cooperation to allow them to directly engage and communicate information to WCPFC;

- Release information on the carrier, time and location of each transshipment observed by the ROP publicly to strengthen the ability to crosscheck data sources with reported activity.
- Require the ROP to identify and confirm the presence of WCPFC observers embarked on carrier vessels on IATTC trips that then conduct WCPFC transshipments during the same voyage;
- Engage with WCPFC to collaboratively agree on expanding the scope of duties of IATTC observers to include observation and documentation of WCPFC transshipments, especially in those cases where no WCPFC observer is embarked on carrier vessels on IATTC trips; and
- Remove the ability for carrier vessel masters to have the discretion to determine whether a high seas transshipment should be observed or not by the IATTC observer. IATTC observers should be allowed to record and report to the appropriate RFMO all transshipments encountered, regardless of the Convention Area. This ability should not be hindered by the carrier vessel master.

**Key Finding 5:** AIS analysis can be used effectively to identify port visit trends by carrier vessels and highlight those ports most often used for offloading of IATTC-sourced and transshipped fish species. These, in turn, may represent the most important port locations to monitor and regulate the landing of IATTC-sourced fish product.

- *Recommendation:* IATTC should implement a management measure related to port State measures to help minimize opportunities for the introduction of illicitly caught or misreported IATTC-sourced fish from entering the seafood supply chain.
- *Recommendation:* IATTC CPCs that represent those countries most commonly associated with landings of IATTC-sourced fish should consider the benefits of ratifying and implement the PSMA as a means to help detect, deter and eliminate illegal fishing.

**Key Finding 6:** Over one-third of all AIS-detected encounters and loitering events attributed to carrier vessels reported by the ROP to be on IATTC trips occurred within the IATTC-WCPFC overlap area. In addition, three-quarters of the 20 carrier vessels used by the ROP for IATTC trips appeared to use the overlap area to conduct high seas transshipments. This suggests that the IATTC-WCPFC overlap area is highly frequented area for transshipment activity with the highest density of transshipments in the IATTC Convention Area.

- *Recommendation:* IATTC should engage with WCPFC to conduct a collaborative formal review of how both organizations collectively manage the IATTC-WCPFC overlap area to ensure that all management regulations, including those involving

transshipment, are clear, transparent, and provide enough management control and oversight that opportunities for noncompliant behavior to go undetected are minimized.

- *Recommendation:* Information on the time and location of transshipments reported by each IATTC and WCPFC carrier released publicly would eliminate confusion around which RFMO transshipments were being reported to and identify possible noncompliant behavior.

# 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 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, vessel tracking (such as 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 transshipment in the IATTC Convention Area and how transshipment is monitored and reported by the ROP. Apparent gaps in the current IATTC transshipment regulatory framework and MCS structure appear to be exploited to avoid oversight. Preventing transshipments linked to Illegal, Unreported, and Unregulated (IUU) fishing activity in the future will rely on effective management of the activity with the support of such tools as a centralized VMS, robust data-sharing arrangements amongst relevant authorities, and potential adoption of AIS as a supplemental and complementary monitoring tool. In addition, the current data-sharing MoU with WCPFC should also be strengthened to specifically include the sharing of all transshipment-related data as well as a means to conduct collaborative vessel monitoring and analysis, especially of fishing activities that occur in the dually managed IATTC-WCPFC overlap area.

The lack of implemented port State control has been identified as a potential weakness in detecting IUU fishing activity. Carrier vessels unauthorized to transship in IATTC waters should be closely inspected on port arrival if there are indications the vessels operated in IATTC waters prior to arrival. If these countries are party to the PSMA, foreign vessels can be denied entry if unreported or potentially unauthorized transshipments in IATTC waters are identified. States not party to the PSMA that receive carriers in their ports that have operated in IATTC waters and are identified as unauthorized to transship while in

IATTC waters should also be directly engaged by IATTC to seek their cooperation to help strengthen their respective port controls related to these vessels and effectively respond to clear cases of any IATTC-related activity that appears to be in contravention of IATTC management measures.

It is thought that the synthesis of AIS data with vessel authorization information to the extent presented in this report is not 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, within the RFMO Convention Areas by vessel type, flag State, authorization, port visits, and across space and time. GFW intends to help facilitate more efficient and effective monitoring and regulation in RFMO Convention Areas by highlighting these patterns of activity and providing access to the AIS data linked to possible transshipment events. By sharing this type of information, investigations into potential noncompliant activity are able to occur soon after these events are detected, thereby increasing 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 MCS by IATTC would be further strengthened by Commission members agreeing to mandate use of AIS by all authorized vessels of CPCs when these vessels operate in the IATTC Convention Area. This study highlights the value of improving the accuracy and depth of public availability of vessel registry information, transshipment authorization data, VMS/AIS data, and the exchange of this information between RFMOs and with flag, coastal and port State authorities. This shift towards data transparency in tuna fisheries would lead to a more complete understanding of transshipment activity and stronger controls against IUU fishing.

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# 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 km 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 h, 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, Maritime Mobile Service Identity (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 Regional Fisheries Management Organizations (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 three 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 four kilometers away from the previously entered port.