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Transhipment regulations and activities in tuna regional fisheries management organizations

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TRANSHIPMENT REGULATIONS AND ACTIVITIES IN TUNA REGIONAL FISHERIES MANAGEMENT ORGANIZATIONS

By

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Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): .....

(Date): **31/10/2020**

Supervised by: **.....**

Supervisor's affiliation**.....WMU**

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Abstract

Title of Dissertation: **Transhipment Regulations and Activities in Tuna Regional Fisheries Management Organizations**

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Transshipment is the at-sea transfer of goods from one vessel to another. It has been linked to unsustainable, industrialized fishing and international crimes such as human rights violations. The five tuna Regional Fisheries Management Organizations (RFMO) were formed to manage the highly migratory tuna stocks in the high sea areas. The management measures currently in place by the RFMOs currently in place to regulate this activity are ineffective in eliminating unauthorized, illegal transshipment.

Firstly, this study aims to compare the transshipment regulations by tuna RFMOs. Secondly, the information retrieved from the Global Fish Watch database, which utilizes data from Automatic Information Systems onboard fishing and carrier vessels engaged in transshipment activities, are used to understand the variations in transshipment encounters across tuna RFMOs.

The results of this study could be used in an advisory capacity to strengthen the regulations further to eliminate the illegal activities stemming from transshipment at sea.

KEYWORDS: Transhipment, Tuna Regional Fisheries Management Organizations, Global Fishing Watch, Fisheries Management Measures, Vessel Monitoring Systems

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List of Abbreviations

ABT	Atlantic Bluefin Tuna
AIS	Automatic Information System
ALB	Albacore
BET	Bigeye Tuna
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CMM	Conservation and Management Measures
CNCP	Cooperating Non-Contracting Party
CP	Contracting Party
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
FoC	Flag of convenience
GFW	Global Fishing Watch
HCR	Harvest Control Rule
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IMO	International Maritime Organization
IOTC	Indian Ocean Tuna Commission
IUU	Illegal, unreported, and unregulated
LSTV	Large-Scale Tuna Vessel
MCS	Monitoring, control and surveillance
MoU	Memorandum of Understanding
MSY	Maximum Sustainable Yield
NPFC	North Pacific Fisheries Commission
PBT	Pacific Bluefin Tuna
PSMA	Agreement on Port State Measures
RFMO	Regional Fisheries Management Organization
ROP	Regional Observer Program
SBT	Southern Bluefin Tuna
SKJ	Skipjack Tuna

UNCLOS	United Nations Convention on the Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
VMS	Vessel Monitoring System
WCPFC	Western and Central Pacific Fisheries Commission
YFT	Yellowfin Tuna

1. Introduction

1.1 Background and Context

1.1.1 Status of the Global Tuna Fisheries

Tunas, supporting both commercial and recreational fisheries, are one of the most economically important marine fish species. They are a highly migratory species with a wide distribution range across all of the world's oceans (Buentello et al., 2016). In addition to providing employment, tuna fisheries are also a critical source of nutrition and food security in many developing countries (Grewe et al., 2015). Global catches of tuna and tuna-like species, including billfishes and other similar species, reached an all-time high of 7.9 million tons in 2018. The most commonly caught commercial tuna species are skipjack (SKJ) (*Katsuwonus pelamis*) and yellowfin (YFT) (*Thunnus albacares*), which combined, accounts for 58 % of all tuna catches (Food and Agricultural Organization [FAO], 2020a). Due to their high levels of catches, high economic value, and extensive international trade, these species are of great importance worldwide.

Although statistics vary across regions, the Western and Central Pacific and Eastern Indian Ocean have seen increased catches of tuna and tuna-like species in recent years. The most commercially important tuna species are albacore (ALB) (*Thunnus alalunga*), bigeye (BET) (*Thunnus obesus*), SKJ, YFT, Atlantic bluefin (ABT) (*Thunnus thynnus*), Southern bluefin (SBT) (*Thunnus maccoyii*), and Pacific bluefin (PBT) (*Thunnus orientalis*) (Erauskin-Extramiana et al., 2019). According to the FAO, among these seven tuna species, 66.6% of their stocks were fished at biologically sustainable levels in 2017 (FAO, 2020a). However, six of these species are on the International Union for the Conservation of Nature Red List of Threatened Species. The global conservation status of these species currently is:

1. BET – Vulnerable (Collette, Acero, Amorim, Boustany, Canales Ramirez, Cardenas, Carpenter, Chang, et al., 2011)

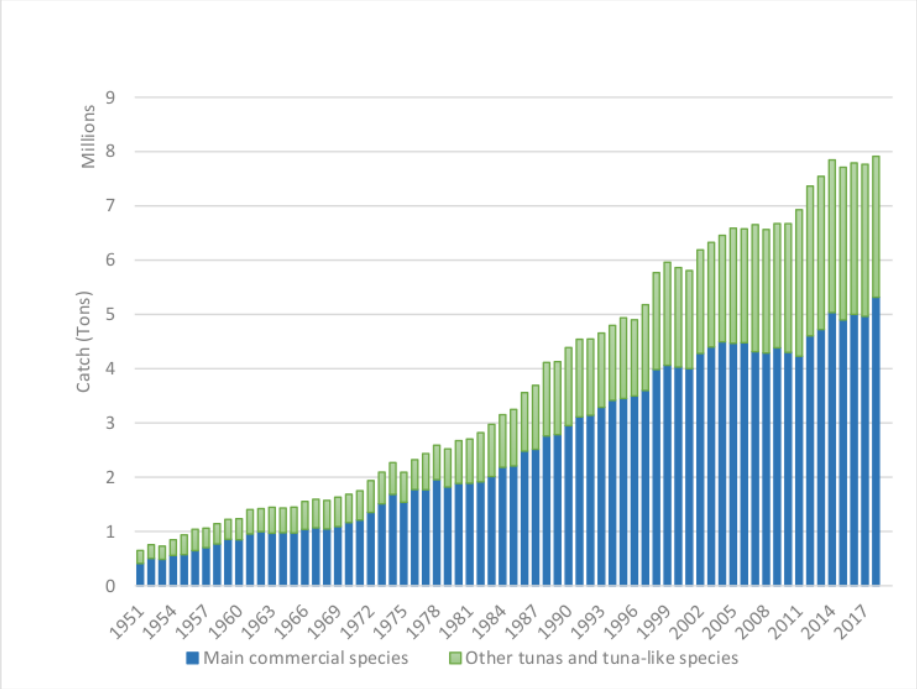
2. PBT – Vulnerable (Collette et al., 2014)
3. ABL – Near threatened (Collette et al., 2011a)
4. YFT - Near threatened (Collette et al., 2011b)
5. ABT – Endangered (Collette, Amorin, et al., 2011)
6. SBT - Critically endangered (Collette, Chang, et al., 2011)

Overfishing of these stocks is an existing and a worsening threat to the food security and livelihood of the people that depend on them, which are prevalently the coastal communities of developing states. In addition to the socio-economic effects, the adverse effects of overfishing also disrupt entire food webs and ecosystems (Miller et al., 2018).

1.1.2 Global Tuna Markets

Tunas are amongst the most consistently in-demand seafood products in the market. A steady growth of tuna supply has been maintained over the past decades. The main tuna markets in the seafood trade are canned tuna and sushi and sashimi markets. They could be differentiated in terms of harvesting techniques (Fernandez-Polanco & Llorente, 2016). SKJ, YFT and ALB targeted by the purse seine, gillnet, pole-and-line and troll fleets are intended for the shelf-stable canned markets. However, the more valuable of the tuna species, the bluefins, often caught using longline and handline, are targeted for the sushi and sashimi markets (McCluney et al., 2019). Approximately 75% to 80% of the global sashimi market is in Japan (Hamilton et al., 2011). Figure 1 shows the historical total global tuna production from 1950 to 2018 (FAO, 2020b).

Figure 1 Global Tuna Production from 1950 to 2018



Note: The graph shows the volume of tuna catches landed globally from 1950 to 2018. The main commercial species include SKJ, YFT, ABL, BET, SBT, ABT and PBT catches. All other tuna species except the seven mentioned prior, billfishes and bonito species are included in the other group.

Like most areas of the economy, tuna markets are also affected by globalization. The increase in global population and the changes in consumption patterns worldwide could suggest a future increase in demand for tunas (Miyake et al., 2010).

1.1.3 Global Valuation of Tuna

In the marine environment, tuna is a vital part of the ecosystem. Maintaining their stock and health is, therefore, of critical importance. Its importance as predators and prey in the food web is difficult to monetize. Estimating the value of the fisheries

informs and highlights the importance of the species to the economy and the fishing communities. Collectively, the seven oceanic tunas are one of the most economically valuable species on the market. Table 1 shows the estimated value of oceanic tuna landed in 2014 (Galland et al., 2016).

Table 1 Value of each Tuna Species in 2014

	Catch (Million Tons)	End Value (Billion USD)
SKJ	2.88	17.75
ALB	0.26	2.36
BET	0.43	5.17
YFT	1.37	14.92
ABT	0.015	0.81
PBT	0.017	0.77
SBT	0.012	0.45

Note: The catch values were gathered from the data reported submitted to tuna Regional Fisheries Management Organizations (RFMO) by their members. The estimated end values are the total amount paid by the final consumer calculated using market surveys.

When looking at individual species, the bluefins are far higher valued than any other tuna species, ABT being the highest-valued, followed by PBT and SBT. SKJ is the least valued species; however, due to the sheer volume of the catch landed, their end value is more compared to other species.

1.1.4 Fisheries Management in the High Seas

Prior to the adoption of United Nations Convention on the Law of the Sea (UNCLOS), large industrial fishing nations systematically overexploited many fish stocks (White & Costello, 2014). In 1994, when UNCLOS entered into force, it gave coastal states sovereignty over marine resources within 200 nautical miles. The convention allowed coastal states to exclusively manage the fisheries within their jurisdiction (United Nations, 1982). UNCLOS, however, stated that all states have the freedom to fish in

the high seas (Jacquet & Jackson, 2018). In order to address the subject of straddling and highly migratory fish stocks, United Nations Fish Stocks Agreement (UNFSA) was formulated (United Nations, 1995). The new agreement integrated the precautionary principle, enhanced the role of regional organizations in managing straddling and highly migratory fish stocks and promoted the consideration of fisheries in a broader sense of the environment.

The effectiveness of these conventions largely depends on the voluntary cooperation of the member states. Currently, UNCLOS has been ratified by 168 states and UNFSA by 91 countries (United Nations, 2020). The low participation in UNFSA has been attributed to the inclusion of effective enforcement mechanisms and a lack of contemporary political will to address Illegal, Unreported and Unregulated (IUU) fishing seriously (Clark, 2011). In the context of RFMOs, global ratification of UNFSA is vital, as vessels of non-member states participating in fishing under RFMO jurisdiction are not bound to the same level of cooperation and compliance with the Conservation Management Measures (CMM) as member states (Lodge, 2005). This has the potential to reduce the general effectiveness of RFMOs management efforts.

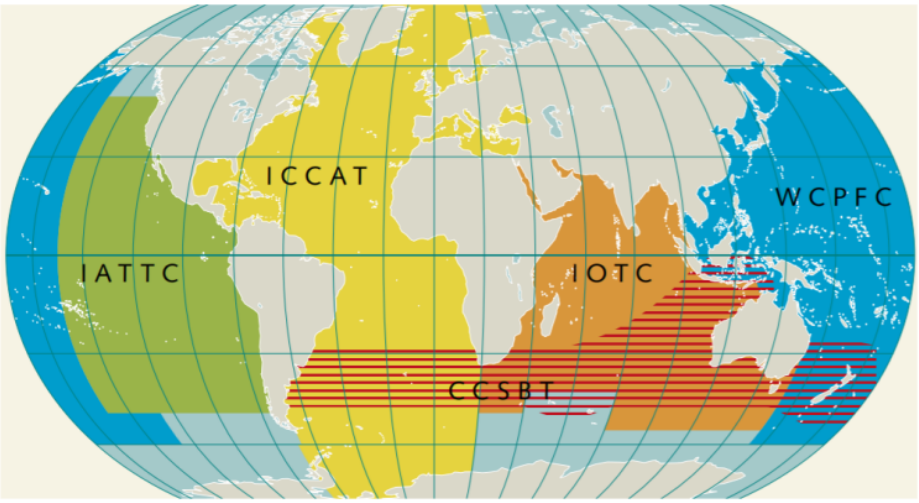
1.1.5 Regional Fisheries Management Organizations

Before 1994, when UNCLOS entered into force, fishing on the high seas was free for all states. The UNCLOS agreement mandated the member states to cooperate in the conservation and management of the resources beyond the Exclusive Economic Zones EEZ, in the high seas (Haas, 2020). UNCLOS, aided by UNFSA laid the foundation for establishing RFMOs across all the regions of the oceans to manage international fisheries. Currently, almost all areas of the high seas are under the jurisdiction of at least one RFMO (Cullis-Suzuki& Pauly, 2010). Broadly, the mandate of an RFMO is managing fisheries on the high seas and protecting the marine environment. They have management authority over member states to set catch and fishing effort limits, technical measures, and control obligations that are legally binding (Ásmundsson,

2016). Furthermore, they are also tasked with conducting scientific assessments to assess significant adverse impacts on the marine environment and the resources due to any fisheries exploitation, as per the precautionary approach, and implement measures to mitigate these risks (Bell et al., 2019).

RFMOs are mainly comprised of members from coastal fishing states and they differ from each other by geographic region and the species assigned. Due to the unique characteristics of tunas (e.g. highly migratory and widely distributed), they are assigned to specific RFMOs, known as tuna RFMOs. The formation of tuna RFMOs was made necessary due to the highly migratory nature of the species that require international cooperation to address the sustainability of the fisheries (Ásmundsson, 2016). There are five tuna RFMOs; (1) Commission for the Conservation of Southern Bluefin Tuna (CCSBT), (2) Inter-American Tropical Tuna Commission (IATTC), (3) International Commission for the Conservation of Atlantic Tunas (ICCAT), (4) Indian Ocean Tuna Commission (IOTC) and (5) Western and Central Pacific Fisheries Commission (WCPFC) (Shown in Figure 2). Except for CCSBT, which explicitly manages southern bluefin tuna, all other tuna RFMOs are not species-specific. These four RFMOs address the management of fisheries for all tuna and tuna-like species in their area of competence (Allen, 2010). Figure 2 shows the location of each tuna RFMO.

Figure 2 Map of Tuna RFMO Boundaries



Note: Tuna RFMO are spread across all ocean areas. Adapted from *World Ocean Review 2013: Living with the ocean: 2. The Future of Fish - The Fisheries of the Future* (p. 66) by M. Beveridge, A. Charles, U. Dieckmann, H. O. Fock, R. Froese, M. Keller, U. Löwenberg, G. Merino, C. Möllmann, R. E. Ommer, D. Pauly, M. Prein, M. Quaas, J. O. Schmidt, C. Schulz, R. Voss & C. Zimmermann, 2013, Maribus. Copyright 2013 by Maribus. Reprinted with permission.

The group of fishes commonly referred to as tuna and tuna-like species is composed of true tunas, billfishes, sharks and other tuna-like species. Tunas are classified into 15 species altogether. The previously mentioned seven commercially important tuna species are also all oceanic. In addition to having a wide distribution range, they are capable of long migrations or movements. They are frequently subdivided into tropical (BET, SKJ and YFT) and temperate (ALB and bluefin tunas) tunas. The tunas that do not fall into the oceanic category are classified as neritic tuna as they are found living in water masses over the continental shelf. They include Longtail tuna, Blackfin tuna, Kawakawa, Black skipjack, Little tunny, Bullet tuna, Frigate tuna and Slender tuna. The billfishes are composed of marlins, sailfish, spearfish and swordfish. Some

essential species in the tuna-like group includes slender tuna (*Allothunnus fallai*), butterfly kingfish (*Gasterochisma melampus*), wahoo (*Acanthocybium solandri*), bonitos, Spanish and king mackerels and seerfishes. Table 2 shows the tuna, bonito and billfish species and their distribution in the oceans (Klawe, 1977; Collette & Nauen, 1983; Nakamura, 1985).

As several pelagic shark species are targeted and taken incidentally as bycatch by coastal artisanal to industrial fishing vessels, all tuna RFMOs have put in Conservation and Management Measures (CMMs) to address the issue (Tolotti et al, 2015).

Table 2 Occurrence of Tuna and Tuna-like Species across the Oceans

Common Names	Scientific Name	Areas of Occurrence
	TUNAS AND BONITOS	
SKIPJACK	*Katsuwonus pelamis*	Worldwide
YELLOWFIN TUNA	*Thunnus albacares*	Worldwide
BIGEYE TUNA	*Thunnus obesus*	Worldwide
ALBACORE TUNA	*Thunnus alalunga*	Worldwide
ATLANTIC BLUEFIN TUNA	*Thunnus thynnus*	Atlantic Ocean
PACIFIC BLUEFIN TUNA	*Thunnus orientalis*	Pacific Ocean
SOUTHERN BLUEFIN TUNA	*Thunnus maccoyii*	Southern parts of Atlantic, Indian and Pacific Ocean
LONGTAIL TUNA	*Thunnus tonggol*	Indian Ocean, western Pacific Ocean
BLACKFIN TUNA	*Thunnus atlanticus*	Western Atlantic Ocean
KAWAKAWA	*Euthynnus affinis*	Indian, western and central Pacific Oceans
BLACK SKIPJACK	*Euthynnus lineatus*	Eastern Pacific Ocean
LITTLE TUNNY	*Euthynnus alleteratus*	Atlantic Ocean

BULLET TUNA	*Auxis rochei*	Worldwide
FRIGATE TUNA	*Auxis thazard*	Indian and Pacific Oceans
SLENDER TUNA	*Allothunnus fallai*	Southern Ocean
	BILLFISHES	
SWORDFISH	*Xiphias gladius*	Worldwide
ATLANTIC SAILFISH	*Istiophorus albicans*	Atlantic Ocean
INDO-PACIFIC SAILFISH	*Istiophorus platypterus*	Indian and Pacific Oceans
BLACK MARLIN	*Makaira indica*	Indian and Pacific Oceans
INDO-PACIFIC BLUE MARLIN	*Makaira mazara*	Indian and Pacific Oceans
ATLANTIC BLUE MARLIN	*Makaira nigricans*	Atlantic Ocean
ATLANTIC WHITE MARLIN	*Tetrapterus albidus*	Indian and Pacific Oceans
STRIPED MARLIN	*Tetrapterus audax*	Indian and Pacific Oceans

For this study, only the seven oceanic tuna species are considered as they are more widely distributed across the oceans and require more collaborative management measures.

1.1.6 Illegal, Unreported and Unregulated Fishing

The definition used by the FAO for IUU fishing can be simplified to include any fishing and fishing-related activity that violates national, regional, and international laws concerning fisheries utilization, conservation and reporting (FAO, 2001; Ma, 2020). At a time when the fish stocks are already facing pressures of overfishing and habitat destruction, IUU activities undermine the efforts to sustainably manage and rebuild them (Le Gallic & Cox, 2006). Among some of the impacts of IUU fishing includes depletion of the targeted fish stocks, destruction of marine habitats,

weakening coastal fisheries communities and distortion of competition, especially in developing countries (Arias, & Pressey, 2016). A study conducted in 2009 estimated that 26 million tons of IUU fish were caught annually, accounting for an upper estimation of USD23.5 billion in revenues (Agnew et al., 2009). In addition to the ecological impacts, continued IUU fishing causes significant economic and social impacts to fishing nations, especially in the developing nations. IUU fishing is also connected to poor and unsafe working conditions for already impoverished communities (Schmidt, 2004).

Even though the prevention of IUU fishing has been a priority for many coastal states, this is a global issue that cannot be addressed by individual states and that requires international cooperation and regulation. One of the most significant actions to combat IUU fishing is the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (PSMA) by the FAO, which entered into force in 2016 (FAO, 2016). This agreement is a legally binding international agreement intended to prevent vessels known to be engaged in IUU fishing from using ports and landing their catches. The objective of this agreement was to improve the traceability of fish and fishery products and thereby combat IUU fishing. Despite these international efforts, one of the potential loopholes in global fisheries management is transshipment (FAO, 2020c).

1.1.7 Transhipment at Sea

One of the biggest challenges in combatting IUU fishing is transshipment at sea. FAO defines transshipment at sea as "transferring the catch from one fishing vessel to either another fishing vessel or to a vessel used solely for the carriage of cargo" (FAO, 1996). Furthermore, transshipment at sea enables vessels to stay at sea for extended periods in remote areas leading to human rights violations, such as human trafficking and forced labour (Miller et al., 2018; Marto, 2019). Transhipment at sea is an activity practiced globally in the industrial fishing sector. In different parts of the oceans, depending on the type of fishery and market logistics, transshipment at sea may be the

only means to make the fishery economically competitive. Transhipment at sea is justified as an economical way to reduce the operational costs by allowing fishing vessels to stay at sea for lengthy periods without coming to port by allowing cargo vessels to land the catch of several fishing vessels at port. The efficiency in fuel is further used to justify the need for transshipment (Ewell et al., 2017). The practice of transshipment can occur either from a fishing vessel to a carrier vessel, between carrier vessels or from a carrier vessel to a small boat (Satria et al., 2018). However, if regulations for transshipment operations are weak or weakly enforced, it can provide a loophole or laundering mechanism for IUU fishing (Chuaysi & Kiattisin, 2020) and allow illegally caught fish to enter the legal seafood markets, undermining the sustainable management of the fisheries.

Reforming how transshipment is carried out is crucial for healthy fisheries and for ensuring that illegal activities are detected or deterred before they can happen (Ewell et al., 2017). Without adequate monitoring and control measures, transshipment increases the risk of IUU fishing. The alternative is to prohibit transshipment when proper monitoring and control cannot be achieved. However, a prohibition would also require the implementation of effective surveillance and inspection activities to detect, deter and prevent unauthorized or illegal transshipment operations (Wold, 2019). Thus, a more practical alternative is to develop standards or guidelines that can identify and elaborate on specific measures to monitor and control to tranship effectively.

Although most acts of transshipment are known to occur within the EEZ of states, approximately 40% of transshipment is estimated to occur on the high seas, which are managed by RFMO (Ewell et al., 2017).

1.1.8 Prohibition of Transhipment at sea

Transshipment at sea is commonly regarded as one of the main missing links in understanding where illegally caught fish enters the market. Unauthorized transshipment allows illegal operators to escape port controls and maximize benefits.

Though efficient, transshipment at sea is difficult and costly to monitor. Although many organizations recognize the importance of transshipment to fishing operations, they have called for stringent regulations to address IUU fishing and labor issues stemming from it. UN FAO International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated, International Labour Organization, United Nations Office on Drugs and Crime have emphasized the necessity for regulatory measures to address labor abuses along with stock sustainability concerns. Several environmental Non-Governmental Organizations and civil society groups have also recommended a total ban on transshipment at sea to prevent conditions that facilitate abuse (Ewell et al., 2017).

Societal and market pressure could also be used as an effective tool for prohibiting transshipment at sea. In 2014, after several allegations of IUU fishing and human rights violation on fishing vessels, Thai Union, the third-largest seafood company in the world, stopped buying fish from vessels involved in transshipments in Thailand's territorial waters (Derrick et al., 2017). Moreover, Marine Stewardship Council, a globally recognized independent non-profit organization that sets the standard for sustainable fishing, introduced the eco-certification scheme which is committed to the traceability of capture fisheries, addresses transshipment (Gulbrandsen, 2009).

Although placing a moratorium on transshipment is sure to create a challenge on flag states, focusing the attention instead on the long-term economic, social and ecological benefits may be an effective approach. The South East Atlantic Fisheries Organization placed an interim prohibition on transshipment at sea in 2006 and permanently banned in 2015 (Ewell et al., 2017). Although tuna RFMOs have established conditions on transshipment at sea, a complete ban is a sure way to prevent human trafficking and IUU catch laundering.

1.1.9 Application of in Satellite-Based Technology in Fisheries Monitoring

Ensuring vessel compliance with the CMMs at sea is challenging. The technological advances have expanded the number of options available for successful vessel monitoring. Satellite-based Automatic Identification System (AIS) and Vessel Monitoring Systems (VMS) are currently being utilized to ascertain the fishing vessel location and the type of activity it is engaged in (Winnard et al., 2018). These systems can verify fisheries statistics and other information through vessel tracking in real or near real-time, thus assisting the management authorities in complying with data collection obligations under international law and RFMO resolutions. They also enhance maritime safety (Malarky, L., & Lowell, B. 2018). Currently, only the flag states have the authority to access VMS information. The fishing industry has expressed concerns that, if vessel tracking data were made public, it would reveal important commercial information that affects their competitiveness in the market. This has led to creating data confidentiality agreements by the RFMOs (Hinz et al., 2013).

1.2 Research aims and objectives

Tuna fisheries across the world have proven difficult to manage, especially on the high seas, and while many are now fished at sustainable levels, problems remain, not least the threat of IUU fishing and specifically the role that transshipment plays in facilitating IUU practices. This research deals with relevant transshipment regulations that has been adopted by the five tuna RFMOs. The objectives included comparing RFMO policies on transshipment and analysis of catch and transshipment tracking data in different RFMOs. As such, two complementary approaches are used in the study. First, a comprehensive comparative analysis was conducted on the existing transshipment regulations by the main tuna RFMOs (CCSBT, IATTC, ICCAT, IOTC and WCPFC). Second, data from the public domain on catches and transshipment were obtained from the tuna RFMOs and the non-governmental organization, Global Fishing Watch (GFW), to analyse the variations in transshipment numbers per RFMO.

The study aims to provide a comparative analysis of the transshipment regulations that have been adopted by the RFMOs to address these concerns and to analyze the transshipment data of the five tuna RFMOs to understand the limitations and recommend further management measure.

The objective of the study includes:

1. To provide a comprehensive review of the reporting and monitoring framework for transshipment employed by the five tuna RFMOs;
2. Analyze the frequency of transshipment events to understand variation in different tuna RFMOs;
3. To provide recommendations to strengthen the existing management measures to prevent unauthorized transshipment.

1.3 Research Questions

The research methodology aimed to answer the following:

1. Do tuna RFMOs differ in their transshipment regulatory frameworks?
2. How do tuna RFMOs differ in the frequency of transshipment?
    a. Is this related to the volume of catch?
    b. How does this relate to the number of authorized and unauthorized transshipments?
    c. Is this related to the stock status?
3. What are the gaps in data reporting concerning transshipment at sea?
4. What are the different ways in which the transhipped catch data could be verified and validated?
5. What are the management measures needed to bridge the reporting gaps for at-sea transshipment?
6. Which management measures by the tuna RFMOs are most effective in enforcing legal transshipment at sea?

2. Research Methodology

2.1 A comparative review of Transhipment Regulations

Each tuna RFMOs have adopted resolutions to regulate transshipment operations that take place in their respective areas of competence. These regulations apply to different states in different regions of the oceans, and they are ideal for comparative analysis as they are similar in their applications and serve the same purpose. The latest adopted resolutions regarding transshipment regulations were obtained from the respective RFMOs. The nominal catch per species and gear information were also obtained from the public domain of the respective RFMOs.

2.2 Global Fishing Watch Carrier Vessels Public Portal

GFW (www.globalfishingwatch.org) is a web-based technology platform that tracks global fishing activity. Its mission is to improve transparency and traceability in the global fishing industry. It was launched in September 2016 by Google in partnership with Oceana and SkyTruth. GFW harvests their data from several vessel tracking systems, primarily the AIS (Global Fishing Watch, 2016). AIS operates similarly to a Global Positioning System device that transmits its position to detect marine traffic. Under the International Convention for the Safety of Life at Sea, in 2000, the International Maritime Organization (IMO) adopted the requirement for all ships over 300 gross tonnages engaged in international voyages to carry AIS devices that became effective in 2004 (IMO, n.d.). In addition to IMO, many national governments require large vessels to utilize AIS. Besides location data, AIS shows the information on vessel course and speed and the total number of AIS-fitted vessels in the area. To identify patterns, GFW runs the vast amount of publicly available AIS data through two neural networks using computer algorithms. This processed data is available on the web platform as an interactive online map and downloadable data (Global Fishing Watch, 2016). In a research collaboration with the Pew Charitable Trust, GFW is working to improve the understanding and management of transshipment at sea through greater

transparency, monitoring, and analysis of the activity. Without a public database, transshipment data has been challenging to verify, as the information is submitted to the government and then passed on to RFMOs in summary form annually. This made it easier to falsify and thus, it is probable that transshipment data has been under-reported (Linder, 2020).

The GFW Carrier Public Portal allows users to view and download data linked to transshipment encounters and what it terms 'loitering' events. This data can be categorized by RFMOs, EEZs, flag state of the carrier and donor vessel, time and the next port visited after the event. A transshipment encounter is identified from AIS data as locations where two vessels, a carrier and fishing vessels, are within 500 meters for at least 20 hours and traveling at a median speed of less than 2 knots, while at least 10 kilometers from a coastal anchorage. Loitering is when a single vessel exhibits behavior indicative of a potential transshipment encounter. This occurs when a carrier vessel travels at an average speed of less than 2 knots, while at least an average of 20 nautical miles from shore. At the time of this study, the database contains transshipment encounters and loitering data from January 1, 2017, to May 31, 2020. These encounters can be identified as (1) Authorized, (2) Partially Authorized, and (3) Unknown Authorization. Authorized events are when the carrier participating in the encounter has matching authorizations from all the tuna RFMOs where the event is taking place and during the time it took place. Partially authorized means when the carrier participation in the encounter has matching authorizations from at least one tuna RFMO where the event is taking place and during the time it took place. An encounter is considered as unknown authorization when both carrier and fishing vessel was not authorized to tranship in that RFMO, or for which the authorization status of both vessels was not found. The carrier and fishing vessel authorizations are obtained by the GFW from the historical and current records reported by the RFMOs on their public domain websites (Global Fishing Watch, n.d.-a). In addition to the interactive map of the data, the raw datasets could be downloaded for individual use.

For this study, the transshipment operations were filtered by RFMOs to analyze the variations in the number of encounters by RFMO for the 2017 calendar year.

3. Research Findings

3.1 Membership for each tuna RFMO

RFMO membership is classified into two groups; Contracting Parties (CPs) and Cooperating non-Contracting Parties (CNCPs). The number of countries in each group for the RFMOs is shown in Table 3. CNCPs are subjected to the same standards as CPs but are not obliged to pay a financial contribution and they do not have voting rights on RFMO matters. Participating territories are non-independent territories of a CP. They have the right to participate in meetings of the commission and its subsidiary bodies but do not have the right to vote on commission matters (WCPFC, 2004). The CPs, CNCPs and the Participating Territories (if any) in any RFMO is collectively referred to as CPCs.

Table 3 Number of Member Countries in each RFMO

RFMO	No. of CPs	No. of CNCPs	Participating Territories
CCSBT	8	-	-
IATTC	21	5	-
ICCAT	53	6	-
IOTC	31	2	-
WCPFC	26	8	8

Note: The information in the table represents the status of the states for September 19 2020.

3.2 Existing Transhipment Regulations

Currently, all tuna RFMOs have transshipment regulations in place and four RFMOs have adopted PSMA. The breakdown of the year each RFMO adopted them is found in Table 4.

Table 4 RFMOs that have Adopted Measures to Regulate Transhipment at Sea

RFMO	Transhipment regulations in place	Port State measures in place
CCSBT	2009	2017
IATTC	2006	-
ICCAT	1997	2012
IOTC	2014	2011
WCPFC	2009	2018

Note: To date, IATTC has not adopted any Port State Measures.

3.3 Comparison of the Transhipment Regulations

The CCSBT transshipment program regulation was last amended in 2017. The Resolution on establishing a Program for Transhipment by Large-Scale Fishing Vessels dictates that carrier vessels must have an observer on board to receive transshipments (CCSBT, 2017).

At sea transshipment in IATTC is permitted between Large Scale Tuna Longline Fishing Vessels and refrigerated cargo vessels. IATTC Resolution Establishing a Program for Transhipments by Large-Scale Fishing Vessels was last amended in 2012. It states that transshipment must take place in IATTC Convention Area, should be monitored by an observer and have VMS in accordance with Resolution C-14-02 (IATTC, 2012).

In ICCAT, according to the Regional Observer Program (ROP), for carrier vessel to be allowed to tranship they must have a Memorandum of Understanding (MoU) with the implementing consortium and must pass a pre-sea inspection by the observer before embarkation (ICCAT, 2017).

IOTC Resolution on Establishing a Programme for Transhipment by Large-Scale Fishing Vessels (LSTVs) was adopted in 2018. It requires all transshipments by

LSTVs to take place in-port unless they are participating in the IOTC program to monitor transshipment at sea (IOTC, 2019).

Current WCPFC regulation on transshipment adopted in 2009. It prohibits transshipment on the high seas by purse seiners in WCPFC area unless under special circumstances. Carrier vessels must be authorized to tranship on the high seas and be listed on the WCPFC Record of Fishing Vessels. Carrier vessels flagged to CNCPs shall be responsible for reporting the vessel, unless it is operating under a charter arrangement. Transshipment activities that take place wholly in EEZs are excluded from these requirements (WCPFC, 2009).

The following summarization is drawn from the review of the existing regulations. The resolutions share several similarities. The comparisons are presented in Table 5.

Table 5 Comparison of Transshipment Regulations in Tuna RFMOs

	CCSBT	IATTC	ICCAT	IOTC	WCPFC
TRANSHIPMENT ACTIVITY					
Prohibition at Sea	✓	✓	✓	✓	✓
Conditional Authorization at Sea	✓	✓	✓	✓	✓
Authorization in Port	✓	✓	✓	✓	✓
***MCS MEASURES**					
Catch Documentation	✓	✓	✓	✓	✓
Joint Inspection Scheme	-	-	✓	-	✓
RFMO Access to VMS Data	-	-	-	-	✓

FISHING VESSEL					
Authorization	24 hrs. Prior	24 hrs. Prior	24 hrs. Prior	24 hrs. Prior	36 hrs. Prior
Notification	Within 15 days	Within 15 days	Within 15 days	Within 15 days	Within 15 days
VMS	✓	✓	✓	✓	✓
IUU List	✓	✓	✓	✓	✓
CARRIER VESSELS					
Authorization	24 hrs. Prior	24 hrs. Prior	24 hrs. Prior	24 hrs. Prior	-
Notification	48 hrs. Prior	48 hrs. Prior	48 hrs. Prior	48 hrs. Prior	-
VMS	✓	✓	✓	✓	-
IUU List	✓	✓	✓	✓	✓

* Monitor, Control and Surveillance (MCS) Measures

CCSBT only allows transshipment for longline fishing vessels with a freezing capacity of more than 500 kilograms of SBT at -30°C or below. In IATTC, only vessels fishing beyond EEZs and targeting tuna or tuna-like species can engage in transshipment. In ICCAT, large scale pelagic longline vessels measuring an overall length greater than 24 meters, targeting tuna and tuna-like species and other similar species caught in association with these species are exempt from the transshipment prohibition. IOTC only allows fishing vessels targeting tuna and tuna-like species over 24 meters to engage in transshipment. WCPFC has extended exemption to existing purse seine operations flagged to Papua New Guinea, the Philippines and New Zealand that meet certain conditions. Transshipment from longline, troll and pole and line fishing vessels are permitted only in cases where the prohibition of the operation would cause significant economic hardship.

3.4 VMS Application by RFMOs

The role of VMS in fisheries surveillance and enforcement has been revolutionary. It is a multi-purpose tool that can be used to study of the spatial and temporal distribution of fishing effort, providing high-resolution real-time data for large fishing vessels (Lee

et al, 2010). Although all RFMOs require their fishing vessels to be equipped with VMS, their application vary. The table 6 shows the brief summary of current VMS application in tuna RFMOs (Pontus Consulting Pty Ltd, 2019).

Table 6 Comparison of VMS regulations (2019) for the tuna RFMOs.

	CCSBT	**IATTC**	**ICCAT**	**IOTC**	**WCPFC**
Reported Entity	"relevant national and regional authorities" according to where they are fishing.	Flag State	Flag and Coastal State	Flag State	WCPFC Secretariat
Applied Vessel Size	According to requirements of the Convention area where they are fishing. IOTC in any other high seas, or req's of coastal State of any EEZ not covered.	All vessels >24m length operating in the East Pacific Ocean and harvesting tuna or tuna like species	All vessels >24m total length. Parties are encouraged to apply to smaller vessels.	All vessels >24m total length. Parties are encouraged to apply to smaller vessels.	All vessels fishing for Highly Migratory Species in the high seas of the Convention Area, and EEZs where the coastal State has requested inclusion in the scheme.
Reporting Frequency	At least every 4 hours	At least every 4 hours for LL, and 2 hours for other vessels	At least every 4 hours	At least every 4 hours	Default rate is every 4 hours. During Fish Aggregating Device closure periods, purse seine vessels between 20N 20S report every 30 mins.

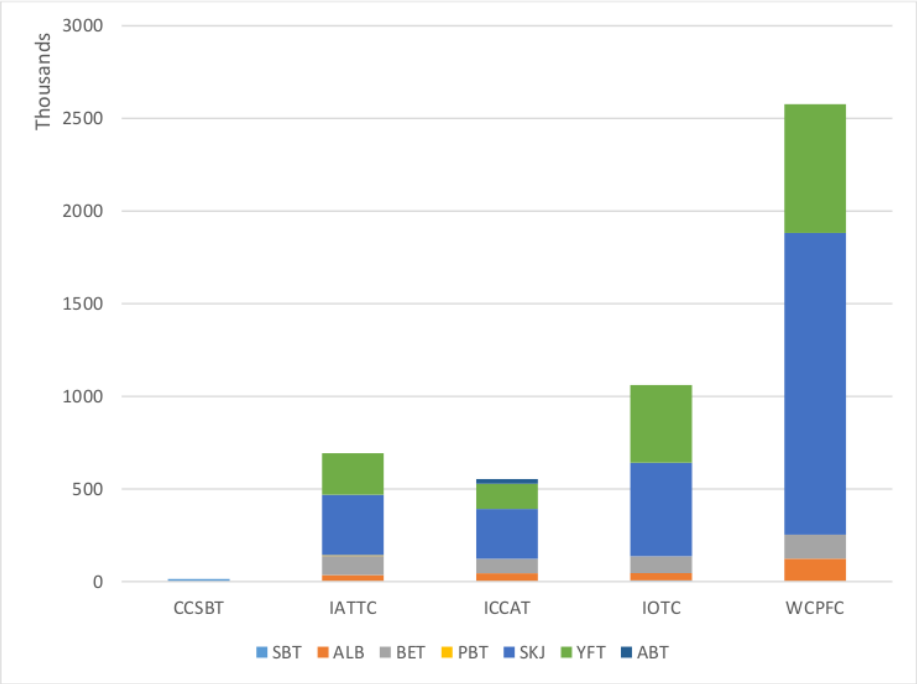
Data Sharing	Each CP and provide an annual report on their VMS to Commission. Provision for sharing where vessel is suspected to have operated in contravention of CCSBT CMMs.		If a vessel is within a coastal State's waters, then the vessel messages are to be automatically transferred by the flag State to the Coastal State. CP provides VMS messages from its bluefin tuna fishing vessels to ICCAT every 6 hours at least.		

Note: Artisanal and subsistence fishing vessels not requiring to have VMS can be justified due to their inability to carry the equipment. However, stating that vessels smaller than 24 meters does not require VMS, leaves the potential for non-compliance. Closing this loophole, with exceptions for the artisanal and subsistence fishing vessels, would further strengthen the regulation (Pontus Consulting Pty Ltd, 2019).

3.5 Catch by RFMOs

Figure 3. shows the main catches of each RFMO for 2017. Only the principal market tuna species are included in the figure. Catch data for the below figure was retrieved from the respective RFMO databases.

Figure 3 Catch (t) for the main tuna species taken in the five tuna RFMOs in 2017.



SKJ accounts for 47%, 48.5%, 47.6% and 63.2% for IATTC, ICCAT, IOTC and WCPFC, respectively. The second-highest catch species is the YFT, accounting 32.4%, 24.5%, 39.5% and 27% for IATTC, ICCAT, IOTC and WCPFC, respectively. The only RFMO, other than CCSBT, reporting SBT is IOTC, as 0.7% of their total catch. ICCAT, the only RFMO to report ABT, had catch of 4.6%. PBT was only reported by IATTC, as 0.7% of their total catch.

3.6 Stock Status for each RFMO

Tuna RFMOs usually use the Kobe plot to explain stock status. The Kobe plot is used to evaluate the status of a stock based on fishing mortality and biomass associated with Maximum Sustainable Yield (MSY). MSY is the theoretical maximum volume of catch that can be harvest from a stock without the population starting to decline

(Maunder, 2002). The plot is explained by Maunder and Aires-da-Silva (2011) as such;

1. If the current fishing mortality is above MSY, overfishing is judged to be occurring;
2. If the current biomass is below MSY, the stock is judged to be overfished;
3. If the current fishing mortality is below MSY, it is judged to be not subjected to overfishing; and
4. If the current biomass is above MSY, the stock is judged to be not overfished.
5.

The latest stock status for the seven oceanic tunas are shown in table 7 to 13, below. This information was retrieved from the Scientific Committee annual reports by each RFMO (CCSBT, 2019; IOTC, 2019b; ICCAT, 2019; IATTC, 2019; WCPFC, 2019; ISC, 2019).

Table 7. The stock status for SBT in CCSBT in 2017.

	Overfished	Not overfished
Subject to overfishing		
Not subject to overfishing	SBT	

Note: SBT has been subjected overfishing over many years; however, the stock has been rebuilding since the implementation of CCSBT Harvest Control Rule (HCR) in 2011(CCSBT, 2019)

Table 8. The stock status for YFT, BET, ALB and SKJ in IOTC.

	Overfished	Not overfished
Subject to overfishing	YFT	BET ALB
Not subject to overfishing		SKJ

Note: The last assessment for BET, YFT, SKJ and ALB in IOTC was done in 2019, 2018, 2017 and 2019, respectively. In 2019, IOTC adopted a resolution to establish an interim plan to rebuilt the YFT stock. Currently, there are no CMMs established specifically for BET and/or ALB stock (IOTC, 2019b).

Table 9. The stock status for BET, YFT, SKJ and ALB in ICCAT.

	Overfished	Not overfished
Subject to overfishing	BET	
Not subject to overfishing		YFT SKJ ALB

Note: The last stock assessment for BET and YFT was conducted in 2019 and 2018, respectively. In ICCAT area, SKJ has two stocks, Eastern and Western. The assessments for the two stocks were done in 2014. ALB has three distinct stocks in ICCAT area, Northern, Southern and Mediterranean. The stock assessment for Northern and Southern ALB stocks were done in 2016 while the Mediterranean stock assessment was assessed in 2017. In 2019, ICCAT established a binding CMM to address BET stocks (ICCAT, 2019).

Table 10. The stock status for ABT in ICCAT for 2017.

	Not overfished
Subject to overfishing	
Not subject to overfishing	ABT

Note: ICCAT recognizes of two stocks bluefin tuna; Western Atlantic and Eastern and Mediterranean. The last assessment for both stocks was done in 2017. Due to the scarcity of Catch Per Unit Effort and high levels of misreporting in the past, Standing Committee on Research and Statistics of ICCAT was unable to estimate biomass-based reference points for both stocks (ICCAT, 2019)

Table 11. The stock status for BET, YFT and SKJ in WCPFC.

	Overfished	Not overfished
Subject to overfishing		
Not subject to overfishing		BET YFT SKJ

Note: The last assessment for BET, YFT and SKJ in WCPFC was done in 2018, 2017 and 2019, respectively (WCPFC, 2019)

Table 12. The stock status for YFT, BET and SKJ in IATTC.

	Overfished	Not overfished
Subject to overfishing	YFT	BET
Not subject to overfishing		SKJ

Note: The last stock assessment for BET was conducted in 2018, while for YFT and SKJ, it was done in 2019. A HCR for BET, YFT and SKJ was adopted in 2016, applicable to tuna purse-seine fisheries based on interim target and limit reference points adopted in 2014 (IATTC, 2019).

Table 13. The stock status for ALB and PBT in the Pacific Ocean.

	Overfished	Not overfished
Subject to overfishing		
Not subject to overfishing	PBT	ALB

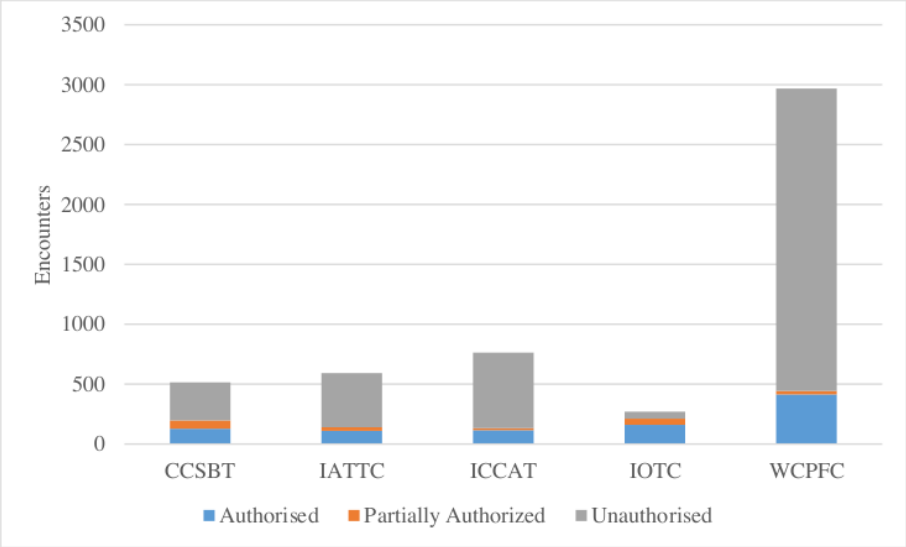
Note: In the Pacific Ocean ALB has two stocks, North Pacific and South Pacific. The last stock assessment for the North Pacific and the South Pacific ALB was conducted in 2017 and 2018, respectively. The PBT stock was last assessed in 2017. Heavy overfishing of PBT stock has caused its biomass levels to be near the lowest recorded in history. To rebuild the PBT stock, in 2019, WCPFC

adopted a CMM with the objective of implementing the harvest strategy. Due to the wide distribution of these three stocks in the Pacific Ocean, the responsibility for their management is shared by WCPFC and IATTC (WCPFC, 2019; ISC, 2019).

3.7 Transshipment Activity by RFMO

An official registry of transshipment operations is available in the public domains of the RFMOs. Commercially available AIS data can be used to identify possible transshipment encounters. Figure 4 shows the total number of encounters classified by legal status (derived from GFW's data sources) for each RFMO in 2017.

Figure 4 Legal status for encounters of transshipment operations by RFMO in 2017



Note: WCPFC has the highest number of unauthorized transshipment encounters with a total of 2524. In contrast, IOTC, with 58 encounters, has the least number of encounters.

4. Discussion

4.1 General Findings

This research highlights variation between tuna RFMOs in their regulation of transshipment and shows that transshipment rates vary a great deal, especially with respect to whether the transshipment was authorized by the RFMOs or not. Although without the detailed information on each authorized transshipment in each RFMO, it is challenging to identify definitive patterns with just AIS data. Upon first review, it seems RFMOs landing more volume of tuna was detected to have higher number of transshipment encounters, including unauthorized. This may be due to the smaller size of the carrier vessels in IOTC area, that is undected by AIS. Another reason for the volume to transshipment encounter variation by RFMO maybe due to the different values of the species. SBT in CCSBT area was identified to have high transshipment activity, one reason may be the distance of the stock to the ports of the flag states. SBT is also one of the more valuable of tuna species, managed under a quota system. This cap on allowable catch could create an opportunity for illegal fishing to meet the dimands of the market on limited supply. Thus, stocks of high values, which have historically been overfished, are more likely to be subjected to this activity. In addition to the violation of management measures, this could hinder the stock from rebuilding. More transparent data submission is crucial to confirm these patterns.

4.2 CCSBT

Despite having the lowest catch volume among the tuna RFMOs, CCSBT had a relatively high number of transshipment encounters in 2017, accounting for approximately 10% of all transshipment encounters detected in the tuna RFMO areas. Only a quarter of the confirmed encounters were authorized by both the donor and the carrier vessel. This high number of partially and unknown authorization transshipment encounters is concerning since SBT stock is a recovering overfished species (CCSBT, 2019). The cause of these high numbers could be attributed to several factors:

1. SBT is one of the most valuable of the tuna species commonly sold as fresh-chilled and frozen to the East Asian sushi and sashimi markets (Galland et al., 2016). The primary conservation measure adopted by CCSBT for the SBT stock is the Total Allowable Catch with allocation for each CPs. Currently, Japan and Australia have the largest quotas (CCSBT, 2019). The distant location of the stock from CPs could be a reason for the high number of transshipment encounters.
2. CCSBT is the only RFMO with no defined Convention Area boundaries, which makes it difficult to assess the spatial movement of carrier and fishing vessels with VMS and AIS data (Global Fish Watch, n.d.-b). The geographical spread of the SBT stock overlaps with all other tuna RFMOs. The high number of transshipment activity detected within the CCSBT could be attributed to the other RFMO catches with the SBT stock distribution. Furthermore, to avoid duplication of resources, CCSBT relies heavily on other RFMOs for the observation of transshipment operations within CCSBT boundaries. This reliance on secondary sourced data allows for underreporting of catch as well as unauthorized transshipment encounters.
6. Under the existing transshipment, the receiving vessels are not required to be a flagged vessel of a CP or Cooperating Non-Member (CNM). Carrier vessels of non-members are under no obligation to report or cooperate with the flag state of the donor vessel of the secretariate of the CCSBT. This gap in the transshipment regulation may be a reason for the high number of partially and unknown authorized encounters in CCSBT.
7. Although both carrier and fishing vessels engaged in the transshipment operation is required to have VMS on board, the information is only reported to the flag state. Therefore, the commission has no authority to verify the transshipment data independently.
8. As GFW relies on AIS for the detection of transshipment activity at sea, the strong reception of the Class-A AIS transmitters in the CCSBT statistical area

increases the probability of identification. It is important to note that the data is dependent on the vessel use of AIS (Global Fish Watch, n.d.-b).

4.3 IATTC

The AIS data from GFW show that most of the transshipment encounters occurred in the overlap area between IATTC and WCPFC. Even though both RFMOs have an MoU to cooperate and collaborate on management measures, the ambiguity in the ROP processes and protocols allows for transshipment encounters to go undetected in the overlap area (Global Fish Watch, n.d.-c). Similar to CCSBT, the existing transshipment, carrier vessels of non-members are allowed to receive transshipment. This might account for some of the partially authorized encounters.

4.4 ICCAT

The receiving vessels are not required to be a flagged vessel of a CP or a CNM, similar to CCSBT, IATTC and IOTC. Carrier vessels of non-members are under no obligation to report or cooperate with the flag state of the donor vessel of the secretariate of the ICCAT. This gap in the transshipment regulation may be a reason for the high number of partially and unknown authorized encounters in the ICCAT region. Similar to CCSBT, ICCAT has strong reception of the Class-A AIS transmitters, increases the probability of identification, 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. (Global Fish Watch, n.d.-d).

4.5 IOTC

Even though IOTC has the second-highest catch level among the five tuna RFMOs, it has the least number of transshipment encounters detected by AIS, fully authorized or otherwise. This low numbers could be due to several factors, including;

1. Carrier vessels in the Indian Ocean may not be equipped with AIS, due to smaller vessel sizes. As only vessels larger than 300 gross tonnage are required by IMO to be fitted with AIS (IMO, n.d.).
2. Piracy is more prevalent in the Indian Ocean than any other area of the world. As a precaution to minimize the risks, vessels only activate AIS when in port (Pinnock & Ajagunna, 2014). Moreover, the use of AIS by vessels largely depends on national regulations and enforcement, which is lacking in the Indian Ocean (Global Fish Watch, n.d.-e). Also, many of the longline vessels use the Class-B AIS device, which has relatively poor reception in the North Indian Ocean (Kroodsma et al. 2018). When these three aspects are taken into consideration, the low number of detected transshipment encounters is probable.

4.6 WCPFC

Among the five tuna RFMO, WCPFC has the highest volume of catches, by a large margin. They are also accountable for over 58% of encounters of transshipment between them. The cause of these high numbers could be attributed to several factors;

1. In the area where the North Pacific Fisheries Commission (NPFC) and WCPFC overlap, the transshipment encounters authorized by NPFC for NPFC managed species are misidentified as unauthorized WCPFC transshipment encounters (Global Fish Watch, n.d.-f). However, unlike IATTC, the is no data-sharing agreement with NPFC providing opportunities for vessels to conduct unauthorized transshipment operations.
2. WCPFC also has overlapping areas with IATTC, and about a quarter of the encounters occurred in this area. The current implementation of the ROP by both RFMOs is ambiguous enough to create a blind spot in this overlap for frequent unauthorized transshipments to occur (Global Fish Watch, n.d.-f).

It is worth noting that the GFW analysis of AIS data identified 27 transshipment encounters with purse seine vessels, which, except in several explicit exemptions, is prohibited under WCPFC transshipment regulation (WCPFC, 2019).

4.7 Data Caveats on GFW Data and limitations

In order to detect vessel movement, GFW relies on commercially available AIS data and other relevant data available in the public domain. Therefore, it should be noted that not all vessels operating in these areas utilize AIS on board. Thus, this data is limited to vessels transmitting accurate vessel identity information on AIS. Moreover, there are factors that limits the usefulness of AIS tracking, such as low satellite coverage or areas with high-density vessel traffic. Furthermore, different vessels carry different types of AIS transmitters. Vessels that utilize Class-A AIS have a higher reception, increasing the possibility of detection. Vessels that utilize the Class-B AIS tend to have a sparser and more limited reception (Kroodsma et al. 2018). The use of AIS and its specific application mainly depends on flag State regulations and requirements (Kroodsma et al., 2018; Miller et al. 2018). Due to these limitations, transshipment data acquired through GFW should be considered restrained estimates. Although the comparative review of all transshipment regulations by the RFMOs gives a snapshot how they differ in its implementation, the use of AIS data does not produce a complete picture of the transshipment encounters in any tuna RFMO area. The effectiveness of AIS data in detecting unauthorized transshipment is currently depended on several factors, such as vessel size and the type of AIS equipment. They are also more susceptible to tampering than some other types of vessel tracking technology (Matsumoto et al., 2014). Moreover, not every CPC requires their flagged vessels to have AIS. RFMO requirements or national legislature needs to be adopted in order for them to be most effective in detecting unauthorized transshipment encounters. Furthermore, only relying on AIS data to verify transshipment activity alienates one of the crucial aspects of the activity; determining the type and quantity of the fish product being transhipped (Boerder, 2018).

5. Conclusion

5.1 Research Conclusion

Ineffective monitoring and data collection of transshipment at sea undermines the efforts to rebuild fish stocks and maintain the sustainability of their fisheries. Unregulated transshipment operations allow unreported catches to enter the supply chain and disrupt the data traceability, compromising the accuracy of RFMO stock assessments. The comparative review of existing transshipment regulations showed four shared common components:

1. General provisions for gears & vessel sizes and species covered by the measure;
2. Authorization procedures;
3. Reporting requirements; and
4. Observer and other MCS requirements.

These regulations primarily apply to at-sea transshipment activity by large scale longline vessels. The AIS data from GFW detects varying numbers of unauthorized transshipment encounters across the tuna RFMOs. The probable reasons for these numbers include the species of tuna species being transhipped, involvement of non-member vessels in the operation, lack of an independent data verification procedure, lack of complete cooperation between tuna RFMOs in data sharing and overlaps with other tuna non-tuna RFMOs creating blinds-spots in the ROP. In addition, AIS data is not entirely accurate when viewed independently to verify transshipment encounters. The accuracy of this data depends on the assumption that all vessels engaged are equipped with AIS equipment and are equipped with level of technology. Thus, the effectiveness of the transshipment regulations is challenging to assess with just the AIS data as the factors related to transshipment are different for each RFMO.

Due to its ties to human rights violations and facilitation of IUU fishing, international and civil society organizations have called on to prohibit transshipment at-sea. However, the fishing industry has adamantly defended its stance on its necessity. Given that a total ban on transshipment on the high seas would support the ability of enforcement agencies to detect and prevent illegal fishing, while also reducing human trafficking and forced labour, each RFMOs should weigh their obligations and make individual assessments on the issue.

5.2 Recommendation

Tuna RFMOs could consider the following recommendations to amend existing regulations in order to increase compliance and transparency in transshipment operations:

1. VMS regulations – Typically, VMS information is only accessible to flag states. RFMOs should consider moving to a partially centralized VMS, where the information would be provided to the flag states as well as the relevant RFMO, simultaneously. Such a system would contribute to greater transparency (Detsis et al., 2012; Muench et al., 2018). This system would improve the timeliness of the data. More frequent reporting rates for would ensure unauthorized transshipment cannot occur undetected. Table 13 shows the brief summary of current VMS application in tuna RFMOs.

2. Encourage adoption of PSMA – Currently, only 66 countries have ratified PSMA (FAO, 2020b). Wide-spread ratification and effective implementation of the agreement would be a useful tool in ensuring unreported transhipped catch are detected when landed in-port (Saraphaivanich et al., 2017). CCSBT, IATTC, ICCAT and IOTC allows non- members to receive transshipments at sea. WCPFC allows non-member flagged vessel to tranship only if it is under charter, lease or other arrangements. However, no RFMO currently has a regulation in place to address mandatory transshipment data reporting by non-member states. If the port state is party to PSMA, the port state has the authority

to refuse entry into their ports or access to port services if they have been suspected to have been engaged in IUU fishing. Such vessels are subject to immediate inspection upon entering port, and these findings are shared with other related States and organizations to promote cooperation in compliance actions (FAO, 2016).

3. Only CPC flagged vessels authorized to transshipment – RFMOs that authorize carrier vessels flying the flag of a non-CPCs runs the risk of non-compliance as they have no obligation to cooperate and ensure compliance with CCSBT management measures. This oversight in the current regulation allows vessels flying the Flag of Convenience (FoC) to be involved in RFMOs fishing operations. A FoC is the process of registering a ship to fly the flag of a country other than the country of its ownership (Alderton & Winchester, 2002). Although not illegal, this allows the vessels to circumvent fisheries and legal maritime restriction (Bruce, 2019).

4. Data transparency - Effective monitoring of transshipment involves two components. One is the timely and complete transshipment declaration by both fishing and carrier vessel to relevant RFMO and states. This should include, and is not limited to, the details of vessels involved and the species and quantities of the catch transhipped. All tuna RFMOs have regulations in place to oblige both fishing and carrier vessel to report these data. The second, and perhaps the more crucial, component is data verification by the observer onboard carrier vessel by RFMO ROP. The observer is required to monitor implementation of the transshipment regulation provisions and confirm if the data reported in the transshipment declarations are consistent with the operation. For ROPs to be effective it needs to record complete data on catch, logbooks, vessel position data, and the intended port of landing, location of the transshipment and co-sign on the transshipment declaration (Wold & Cook,

2020). Currently not all tuna RFMO ROPs requires these details to be recorded or be reported to the involved states and the relevant RFMO secretariate.

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