10-28-2023

Estimating the extent of illegal fishing in the exclusive economic zone of Sierra Leone

Isha Jebbeh Kpaka

WORLD MARITIME UNIVERSITY

ESTIMATING THE EXTENT OF ILLEGAL FISHING IN THE EXCLUSIVE ECONOMIC ZONE OF SIERRA LEONE

ISHA JEBBEH KPAKA

A dissertation submitted to the World Maritime University in partial fulfillment of the requirements for the award of the degree of Master of Science in Maritime Affairs

2023

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)...**26/09/2023.....**

Supervised by: **Drs F. NEAT & K. AULD**

Supervisor's affiliation: **WMU**

ACKNOWLEDGEMENTS

I sincerely thank the Almighty God for His mercies, power, provision, and most of all, His faithfulness and love from the beginning of my academic career till this point. His kindness has enabled me to succeed academically in all of my endeavors.

I would like to extend my sincere gratitude to Professor Francis Neat and Dr. Kathleen Auld, my research supervisors, for their perseverance, direction, supportive encouragement, and constructive criticism of this dissertation. I really thank Aimee from Global Fishing Watch for her assistance with the analysis.

I want to express my gratitude to Dr. Sankoh and Mayor Fillie for their tireless support in the analysis of data.

I owe the International Maritime Organization (IMO) a debt of gratitude for providing me with the financing to pursue this master's degree and for enabling me to join this wonderful leader's network.

I want to express my gratitude to the following people for their assistance with this project: Representatives from the Ministry of Fisheries and Marine Resources, Joint Maritime Committee, Sierra Leone Navy, and Sierra Leone Maritime who took the time to share their knowledge through the interview process.

I would like to thank several persons for their contributions to this effort, starting with Mr & Mrs. Ruth William, Mrs. Christiana Serry, and Mrs. Alice for their important assistance.

I want to thank my parents, Mr & Mrs. Favor Kpaka, whose support and affection are always there for me. Sandra Kpaka and Precious Kpaka, my adorable sisters Without your help, there is no way I could have accomplished this.

ABSTRACTS

The loss of up to 26 million tonnes of fish annually a value of USD 23.5 billion, illegal, unreported, and unregulated (IUU) fishing is a solemn concern worldwide (Agnew et al., 2009). IUU fishing is especially problematic in developing countries and West Africa in particular. Concerning the regulations and strategies used to combat illicit fishing and the difficulties encountered, the study aims to estimate the quantity of potentially unlawful fishing in Sierra Leone and to explain patterns in the data.

This study employed a triangulation research methodology integrating qualitative and quantitative research techniques. The quantitative data was attained from both the Ministry of Fisheries and Marine Resources (MFMR) and the Global Fishing Watch (GFW) database. These data were used to analyze and quantify the extent of illegal fishing in the EEZ of Sierra Leone between the years 2018-2022.

The study findings indicate that there were vessels present in GFW and not in the MFMR database and these vessels were classified as low-risk and high-risk for illegal fishing based on factors such as port visits, broken AIS tracks, and whether they visited the waters of other countries in the region. The qualitative data was obtained from face-to-face interviews with various stakeholders in the fisheries sector and was studied using thematic analysis.

The results shown from both quantitative and qualitative data indicate that there appears to be a decline in illegal fishing activities in Sierra Leone within these years covered by the study and this could be attributed to stringent measures put in by MFMR, which came into effect in 2018. These include the Fisheries and Aquaculture Act of 2018, increases in license fees and fines, and the implementation of observer onboard vessels operating within Sierra Leone’s EEZ.

KEYWORDS: Sierra Leone, Exclusive Economic Zone, Illegal fishing, Industrial Fishing Vessels, Thematic analysis.

TABLE OF CONTENTS

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION

IUU Illegal Unreported Unregulated fishing

EEZ Exclusive Economic Zone

MSC Monitoring Surveillance Control

FAO Food Agriculture Organization

MFMR Ministry Fisheries Marine Resources

EU European Union

SL Sierra Leone

UNDP United Nations Development Programme

RFMO Regional Fisheries Management Organization

MRAG Marine Resource and Assessment Group

SLFA Sierra Leone Fisheries and Aquaculture Act

GFW Global Fishing Watch

IEZ Inshore Exclusion Zone

JMC Joint Maritime Committee

SLMA Sierra Leone Maritime Administration

SLN Sierra Leone Navy

ONS Office of National Security

SLPA Sierra Leone Port Authority

ATLAFCO Ministerial Conference on Fisheries Cooperation among African States

ICCAT International Commission for the Conservation of Atlantic Tuna

IMO International Maritime Organization

IPOA-IUU International Plan to Prevent, Illegal, Unreported, Unregulated Fishing

MPA	Marine Protected Area
MSC	Monitoring Control and Surveillance
NPOA-IUU	National Plan of Action to combat IUU fishing PSMA - Port State
UNFSA	United Nations Fish Stock Agreement
UNSDG	United Nations Sustainable Development Goals
AIS	Automatic Identification System
VMS	Vessel Monitoring System
SRFC	Sub-Regional Fisheries Commission
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
PSMA	Port State Measures Agreement
NGO	Non-Governmental Organizations
NEAFC	North-East Atlantic Fisheries Commission
NGO	Non-Governmental Organizations
IGO	Inter-Governmental Organizations
IMCS	International Monitoring Control and Surveillance
VGFSP	Voluntary Guidelines for Flag State Performance
VGCDS	Voluntary Guidelines for Catch Documentation Scheme

CHAPTER 1: INTRODUCTION

1.1 ILLEGAL, UNREPORTED, AND UNREGULATED (IUU) FISHING

Illegal, Unreported, and Unregulated (IUU) fishing, destabilizes efforts made by local, state, and federal levels to govern fisheries continually and preserve aquatic biological diversity. Worldwide losses from IUU fishing are projected to range from 11.06 million to 25.91 million tonnes of fish, or USD10 billion to USD 23 billion annually:

Illegal fishing can refer to a variety of offenses that violate national laws or RFMO conservation and management policies, particularly when a broad definition of fishing and associated activities is included. The ability to measure each of these tasks may require that they be enumerated and prioritized.

The word "unreported fishing" is being proposed to be rephrased as "non-reporting of all information relating to the fishing activity." This phrase would refer to actions that are not "fishing" in the strictest sense but rather a particular activity that is different yet related to fishing and can happen before, during, or after the act of fishing occurs. It comprises under-reporting, and reporting in violation of laws and RFMO conservation and management measures (illegal), as well as reporting that is not required by law or an RFMO conservation and management (unregulated), but is nevertheless prudent. It may be challenging to come to a consensus on what constitutes "unreported fishing" and how to measure it, however, as well as to provide realistic instances of what this might look like.

The term "unregulated fishing" refers mostly to actions of Stateless vessels, non-parties to RFMOs, and the lack of some States to regulate particular activities that are difficult to monitor and account for.

IUU fishing is the key contributing factor to this marine degradation and overfishing (FAO, 2006; EFTEC, 2008). Important areas of the marine environment are impacted because illegal fishing boats frequently employ harmful fishing techniques (FAO, 2007). Blast bombing has reportedly damaged more than 50% of the coral reefs in Southern Asia, according to Caldwell and Fox (2006). The issue of by-catch, or the unintentional capture of species that are not the intended target, has dramatically gotten worse as a result of the employment of prohibited equipment by illegal trawling remote fleets. For instance, inadvertent catch makes up approximately 40% of turtle deaths in some tuna fisheries (Mortimer et al., 2000), but shrimp trawlers experience by-catch at a rate of 35 to 85 tons of capture (Doughty and Carmichael, 2011). 100,000 seabirds, some of which are in grave danger, are killed by illegal longline fishing each year, according to Brothers (1991) (IUCN, 2011).

1.2. INTERNATIONAL CONVENTIONS AND GUIDELINES

1.2.1 UNITED NATIONS CONVENTION ON THE LAW OF THE SEA(UNCLOS)

The United Nations Convention on the Law of the Sea (UNCLOS) is the main treaty governing oceans. The Agreement serves as the legal authority for addressing the many challenges connected to the oceans, ensuring fair usage of marine resources, habitat, conservation, and protection by States (UNCLOS, 1982). The UNCLOS makes it possible for exclusive economic zones, the requirement of interstate cooperation in the management of living resources in territorial waters at sea, the implementation of flag State obligations, and the resolution of interstate disputes. Among the initial nations to approve the UNCLOS was Sierra Leone, which has continued to sign the treaty ever since.

1.2.2 UNITED NATIONS FISH STOCK AGREEMENT

On August 4, 1995, the United Nations Conference on Straddling and Highly Migratory Fish Stocks approved this treaty, and on November 11, 2001, it came into effect. Within the framework of the UNCLOS, UNFSA works to guarantee the continuing protection and continual benefit of straddling and very roaming species in coastal state EEZ and neighboring high-sea. The primary goals of the UN Fish Stock Treaty are to resolve transboundary fishery resource management issues to guarantee continuing conservation and viable use of straddling and extremely drifting fish stocks outside of the boundaries of state sovereignty. Through RFMOs, sub-regional and regional collaboration is required for the management of highly migratory species. The UNFSA urges collaboration among coastal States, ensuring security, and enhancing the ethical use of fisheries resources in EEZs and areas outside of national jurisdictions (ABNJ).

1.2.3 FAO PORT STATE MEASURE AGREEMENT TO PREVENT, DETER, AND ELIMINATE IUU FISHING

On November 22, 2009, the FAO Conference approved the Port State Measures Treaty (PSMA), which became effective in June 2016. By implementing an effective PSMA, the treaty aims to stop, discourage, and finally abolish unlawful behaviours by preventing seafood that has been illegally harvested from accessing international markets (FAO, 2009). The PSMA concession is the first legally obligatory universal treaty that precisely attempts to commerce the trade in IUU products by preventing the flow of illegal fish into global markets or the employment of illicit laborers in a variety of port facilities. By using PSMA, vessels can be observed, pursued, and inspected with less time, labour, and resources needed.

As an economical and safer alternative to conventional air and surface compliance enforcement techniques, ports offer inspections. The addition of data that is routinely collected during port inspections improves the national MCS. Fishing vessels attempting to enter an authorized port of another State while flying foreign flags

must comply with PSMA laws. Sierra Leone government is a member of PSMA. Government approval for the PSMA Treaty was given on June 1, 2017, and on September 17, 2018, the PSMA Ratification Instrument was sent to the Director of the FAO. In the Republic of Sierra Leone, the agreement was enforced on October 17, 2018.

1.2.4 INTERNATIONAL PLAN OF ACTION TO PREVENT, DETER AND ELIMINATE ILLEGAL, UNREPORTED AND UNREGULATED FISHING(IPOA-IUU)

Following its acceptance at the 20th meeting of the FAO Assembly on June 23, 2001, IPOA-IUU was proposed by the 24th Assembly of the FAO Group on Fisheries on March 2, 2001. The IPOA-IUU resolved to recommend a comprehensive outline for all necessary steps to stop IUU fishing in a variety of situations. In combatting illicit fishing, it emphasizes the roles of the flag, port, coast, and market. Additionally, it paves the way for joint initiatives involving NGOs, fishing communities, and the fishing industry to create a comprehensive strategy to resolve issues relating to illegal activities.

1.2.5 VOLUNTARY GUIDELINES FOR FLAG STATE PERFORMANCE(VGFSP)

The FAO Guidelines for Flag State Performance were adopted during the Commission of Fisheries' 31st session. It offers recommendations for improving and assessing how closely flag States adhere to their obligations under international law. VGFSP outlines a variety of actions that States should take to certify that ships flying flags are not involved in illicit activities. Fisheries management entails coordination between coastal and flag states as well as tracking, controlling, and monitoring of vessels. These regulations encourage information sharing, collaboration, and government teamwork to prevent the issuing of flags to vessels that are allegedly participating in illegal activity or vessels that propose to fly a "flag of convenience." VGFSP offers recommendations on how nations can encourage compliance, sanction

vessels that break the law, and help developing nations fulfill their obligations as flag States through intergovernmental cooperation.

1.2.6 VOLUNTARY GUIDELINE FOR CATCH DOCUMENTATION SCHEMES(VGCDS)

The Voluntary Guidelines for Catch Documentation Schemes (VGCDS) is a trade-related measure to stop, discourage, and eradicate illegal practices that complement the PSMA. The VGCDS was approved at the FAO Conference's 40th session in July 2017. VGCDS was designed to give aid to States, RFMOs, and other parties involved in fishing that are interested in creating and implementing a Catch Documentation Scheme. With the use of this scheme, fish and fishery products may be tracked along the whole supply chain, allowing authorities to determine whether the fish was obtained legally and in conformity with local, regional, and international conservation management policies, as well as any pertinent international regulations. A catch certificate program is being implemented in Sierra Leone relating to fish and fisheries products shipped to Korea. Before catches are imported into the nation or exported outside, it also confirms their place of origin.

1.2.7 THE AGREEMENT TO PROMOTE COMPLIANCE WITH INTERNATIONAL CONSERVATION AND MANAGEMENT MEASURES BY FISHING VESSELS ON THE HIGH SEAS

This treaty addresses problems with managing the world's fisheries brought on by vessels that flout existing fishing laws. On November 24, 1993, the FAO's 27th session approved this agreement, which went into force on April 24, 2003. To address the issue of fishing vessels changing flags, the agreement asks flag States to adopt legislation, tighten monitoring of their fleets, and assure acquiescence with worldwide protection and management standards on the high sea. A country cannot grant a flag to a ship used for high-seas fishing and prevent it from undermining established conservation measures if it cannot regulate the fishing actions of the vessels. Article III of this Agreement contains a description of this. The flag state is in charge of vessels that travel at great depths.

1.3 ILLEGAL,UNREPORTED, AND UNREGULATED(IUU) FISHING IN WEST AFRICA

In West African nations, fish is a significant source of protein and offers job opportunities for numerous individuals (Belhabib et al., 2015c). Fish stocks in this area have been decreasing as a result of overfishing and illicit fishing (Daniels et al., 2016). According to past studies, illegal fishing is responsible for up to 40% of all fish caught (Belhabib et al., 2012c, 2016; Belhabib and Pauly, 2015). Illicit practices are considered a contributing factor that causes the loss of 300,000 artisanal sector jobs in addition to harming the economies of weaker countries (Daniels et al., 2016). Because illegal fishing vessels are exceedingly moveable and use advanced sophisticated techniques to dodge investigation, evaluations of the number of unlawful practices conducted by industrial vessels are extremely hard to determine and are enclosed by a high degree of ambiguity.

Although several causes lead to illegal fishing, it is believed that financial gain is the main driver of industrial fishing (Le Gallic and Cox, 2006; Sumaila et al., 2006). Because of frail MCS schemes in West African countries such as Mauritania, Gambia, Sierra Leone, Guinea, Guinea-Bissau, and Senegal, IUU fishing is particularly troublesome in their national oceans or Exclusive Economic Zones. Standing (2006) asserts that MCS is frequently correlated with country measures like corruption and governance, both of which are highly deplorable in the region.

Ineffective administration, high levels of corruption, and high monitoring costs seriously call into doubt the viability of a nation's energies to mitigate illegal fishing. The presence of multinational sponsors improves transparency and increases surveillance efforts in the fishing sectors, as seen by examples from the region. Concerns have been raised relating to the effectiveness of these programs and the degree to which MCS (fines and penalties) make up for the harm that IUU fishing causes.

The adoption of "detection escape" strategies, which includes hacking electronic monitoring systems, using several vessel identities, fabricating registration documents, and using alternative flags to hide vessel identification and dodge routes, jeopardizes MCS efforts even more. Numerous cases that reveal extensive violations of fishing regulations in West Africa have brought major attention to the issue of price retrieval, enabling MCS exertions to become self-sustaining and self-governing of external capital (MRAG, 2005; Greenpeace, 2006).

1.4 THE CASE OF SIERRA LEONE

Sierra Leone is a nation in western Africa that borders the Republic of Guinea and Liberia. Low-lying mangrove swamps make up the majority of the nation's coastline, with a few large, sandy beaches and a few estuaries serving as occasional breaks. The exception to this rule is the mountainous area. Behind the coastal zone is a wooded plateau with an average height of 1,000 feet (300 meters). The highest point in Sierra Leone, Bintimani Mountain, is at 6,390 feet and is close to the Guinean border in the country's relatively hilly eastern region (Sierra Leone, n.d.).

1.4.1 EXCLUSIVE ECONOMIC ZONE(EEZ) OF SIERRA LEONE

According to Articles 55 and 57 of the United Nations Convention on the Law of the Ocean (UNCLOS,1982), EEZ is a region that encompasses 200 maritime miles after a country's seashore which is associated outside the regional sea and in which the coastal nations have both right and obligation to discover and exploit as well as the duty to protect and manage both living and non-living resources. Sierra Leone EEZ has an area which exceeds 160,000 km2. The interior ledge of Sierra Leone is around 100 km wide in the northern and tapers to about 13 km in the southern, which is where it shares a boundary with the Republic of Liberia. An exclusive environment that serves mutually as feeding and breeding areas for diverse organisms as well as an important habitat for assemblages of marine creatures has been formed on the

interior shelf, which has a total area of 30,000 km2. The shelf is endlessly supplemented by nutrients from stream systems.

The inner, middle, outer, and shelf edges comprise the central shelf. The relatively straightforward surfaces of the shelf, which have an average width of 62 kilometers and slope at angles, can be used to identify it. The outer shelf limit is situated, on average, at a depth of 160 meters. Each shelf zone runs at wide distances parallel to the shore and has a varied angle of bottom inclination. In the inner shelf zone, where there is significant wave activity, the depth ranges from 20 to 30 meters. Geomorphology in this area is thoroughly connected to that of the neighboring shoreline.

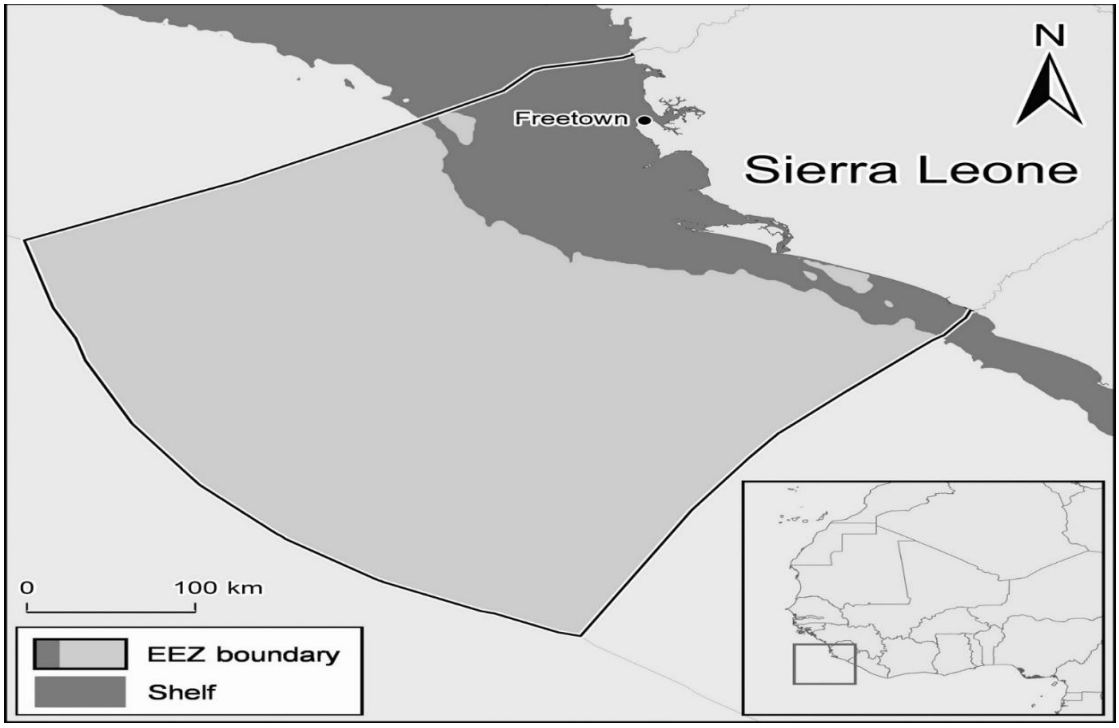

Figure 1: EEZ of Sierra Leone
Source: (Seto, Belhabib et al 2017)

In its marine, freshwater, and aquaculture ecosystems, the nation comprises substantial fish resources that can support food security, provide means of subsistence like employment and income, generate foreign exchange from the exportation of fishery products, and provide a variety of use and non-use living aquatic biodiversity values. The country has always fallen short of reaching the full potential influence of the fisheries industry on financial development despite its abundant natural resources. For instance, in 2014 the sector barely contributed $6 million in anticipation of $60 million in annual rent that could have accrued.

In Sierra Leone, illegal fishing is a significant problem (Seto, 2017). Fish stocks in the majority of shoreline ' EEZs are either overfished or exploited, and illegal fishing has emerged as a serious universal issue. In the past, the fisheries sector has helped the coastal villages in Sierra Leone to prosper. Among the unlawful fishing practices that are largely to blame for the loss of the nation's fish resource harvest include tampering with VMS, the use of improper fishing nets, trawling in forbidden regions, and numerous other unlawful fishing activities. To create effective MCS reserves and assess potential losses in coastal nations, it is difficult to quantify the type and scope of unlawful activities (Fillie, 2019).

Future expansion of these countries' fisheries has been constrained as a result. Due to its frail fisheries sector with limited ability to manage its own EEZ, Sierra Leone is extremely susceptible to unlawful fishing by foreign vessels. This results in both biological and economic overexploitation, endangering the nation's fisheries resources (Neiland, 2016).

1.5 NATIONAL LEGISLATION ON FISHERIES AND AQUACULTURE IN SIERRA LEONE

1.5.1 POLICY FOR FISHERIES AND AQUACULTURE IN SIERRA LEONE 2016

Despite its substantial natural resources, Sierra Leone has historically fallen short of realizing the dormant influence of the fisheries sector on financial growth. As mentioned in 2014, the industry barely provided $6 million out of an anticipated $60 million in potential accruable annual rent. Some of the poorest people in the world reside in Sierra Leone, and these so-called "Sunken Millions" are a significant source of development financing for them. There is evidence that some of the stocks' health has been put in jeopardy as well (The Sunken Billions Revisited: Progress and Challenges in Global Marine Fisheries, 2016). The lack of an all-encompassing, cogent, and sector-wide fisheries strategy as the cornerstone of resource management planning stands out among the various flaws and dangers. Additionally, the governance structure for fisheries before the start of reform programs in 2012 was centered on command and control-style decision-making processes, underperforming MCS systems, and the relatively enormous IUU fishing loss that resulted in roughly $30 million lost from Sierra Leone’s economy per year.

It also lacked qualified human resources in key fisheries areas. Unstable national and international fish trade and marketing mechanisms, overcapitalized and disorganized small-scale fisheries served by a weak extension system, and little to no government-responsible reinvestment in the sector, are some of the issues preventing Sierra Leone's fisheries sector from making its proper contribution to societal well-being. Sierra Leone’s Policy for Fisheries and Aquaculture was adopted in 2016 and directs government actions to improve fisheries management and combat IUU fishing. To combat challenges and realize the full potential of the sector, they must therefore implement the provisions of the policy. Especially in light of the widespread perception that some fish stocks are being underutilized, these fisheries, both industrial and artisanal, ought to have access to these stocks and be able to harvest

them sustainably (Policy for Fisheries and Aquaculture, 2016). The policy framework was a completely inclusive process that incorporated best practices as well as alignment with important international standards. It is narrowly focused on its primary policy areas while being pliable and dynamic enough to adapt to future changes. It provides a pathway to maximize the sector's potential for economic development.

1.5.2 FISHERIES AND AQUACULTURE ACT OF 2018

This Act establishes general rules for commercial fleets and small-scale fishing by inhabitants of Sierra Leone, Industrial fishing by foreign nationals within the nation's EEZ, and guidelines for fish farming (Section 2). The law is divided into 11 parts and 92 sections. The Department is accountable for fisheries and aquatic resources and has the official obligation for supervision (Subsection 2 of Section 3). Director of Fisheries nominations must come from the Public Service Commission. A Scientific, Economic, and Technical Commission will also provide advice to the Department. The minister elects Communal Fisheries Supervision Zones and transfers to local authorities the specific governance responsibilities for fisheries protection, management, and expansion in connection with such zones in discussion with the appropriate municipal council (Subsection 1 of Section 7).

The management objectives are outlined in Part III of the Act and must be directed by pertinent ecological and financial variables, such as trawling designs, stock mutuality, and important universal values. To preserve or restore stocks, management must use a conservative approach to harvesting and be founded on the most up-to-date technical information and scientific facts. When the fishing industry is developing, addressing domestic fisheries' demands should come first (Fisheries and Aquaculture Act,2018). The Director of Fisheries, in collaboration with the systematic, financial, and practical committees and interested parties, must study and implement yearly Fisheries Management Strategies. The Plan requires the Minister's approval. A Fisheries Management Strategy may comprise the allocation of

collective administration obligation to any municipal power (Subsection (1) of Section 52). Before importing, building, purchasing, or converting a vessel into fishing, carry out a thorough background investigation of the history of acquiescence to make sure that the concerned fishing vessels and their possible holder have at no time been intricate in illicit fishing practices. Without a valid certificate of registration, it is forbidden for anybody to operate a fishing vessel in the seas of the Sierra Fishery. No individual intends to be involved in fishing practices without a license or permit by the Director of Fisheries (Subsection (1) of Section 13). Operational fish processing enterprise or storing capacity, importing, exporting fishery products, and introducing any genetically modified fish into fisheries seas are a few examples of these operations. The term "related activities" also refers to utilizing a fishing vessel for fishing or related purposes, whether it be domestic or international, employing a fishing vessel from Sierra Leone for fishing or related purposes outside the fishery waters, and more (Subsection (1) of Section 15).

The Inshore Exclusion Zone (IEZ) will only be accessible to small-scale and leisure fishing. The Director of Fisheries must promote sustainable artisanal fishing and the creation of a minor fisherfolk coalition to develop market strategies for artisanal fisheries. Anyone who engages in aquaculture activities is not allowed to deny any public entrance to the customary fisheries zone under Subsection (1) of 18. The Act also includes provisions for, universal and provincial teamwork in fisheries management in combatting illicit practices which includes; MCS of fisheries and associated actions and implementation, contamination of fisheries waters, expansion and management of fish farming. (Subsection (1) Section 12).

The Act prohibits operating vessels from participating in fishing or related activities for an unauthorized motive in Sierra Leonean waters, as well as the taking, introducing, jetty, transhipping, purchasing, etc. of any fish or fish product trapped in infringement of the regulations of different nation (Section 2). The Director of

Fisheries must take the appropriate actions to protect the feasible management of fish and fisheries resources and to take action to mitigate IUU fishing operations (Subsection (1) of Section 10 of the Fisheries and Aquaculture Act of 2018).

1.5.3 FISHERIES AND AQUACULTURE REGULATION,2019

These rules offer additional assistance for fisheries governance and aquaculture. 2018 Fisheries and Aquaculture Act's provisions were partially implemented by them. The Regulations are divided into the following seven sections: The preliminary provisions cover fisheries conservation and management (I), licensing, authorization, and registration requirements and procedures (II), conditions and requirements for fishing, transshipments, the use of ports, and fish aggregation devices (III), information, records, returns, and an illegal, unreported, and unregulated register (IV), fish processing and marketing (V), offenses, fines, penalties, and liabilities (VI), and liability (VII). The Regulations are completed by 14 Schedules.
A development plan should be established for artisanal fisheries and the expansion of MPA. The director of Fisheries must encourage stakeholders, such as community groups, to do so, which is in agreement with section 11 of the Act. The 2019 Fisheries and Aquaculture Regulation states that this relates to the management and protection of fisheries (Fisheries and Aquaculture Regulation, 2019).

1.5.4 INSHORE EXCLUSIVE ZONE

The Inshore Exclusion Zone indicated in section 18 of the Act includes seawaters offshore of the abatement zone laterally shoreline of Sierra Leone linking latitude and longitude coordinates outlined in the First Schedule. Commercial fishing vessels are not permitted to enter this area (Fisheries and Aquaculture Regulation,2019).

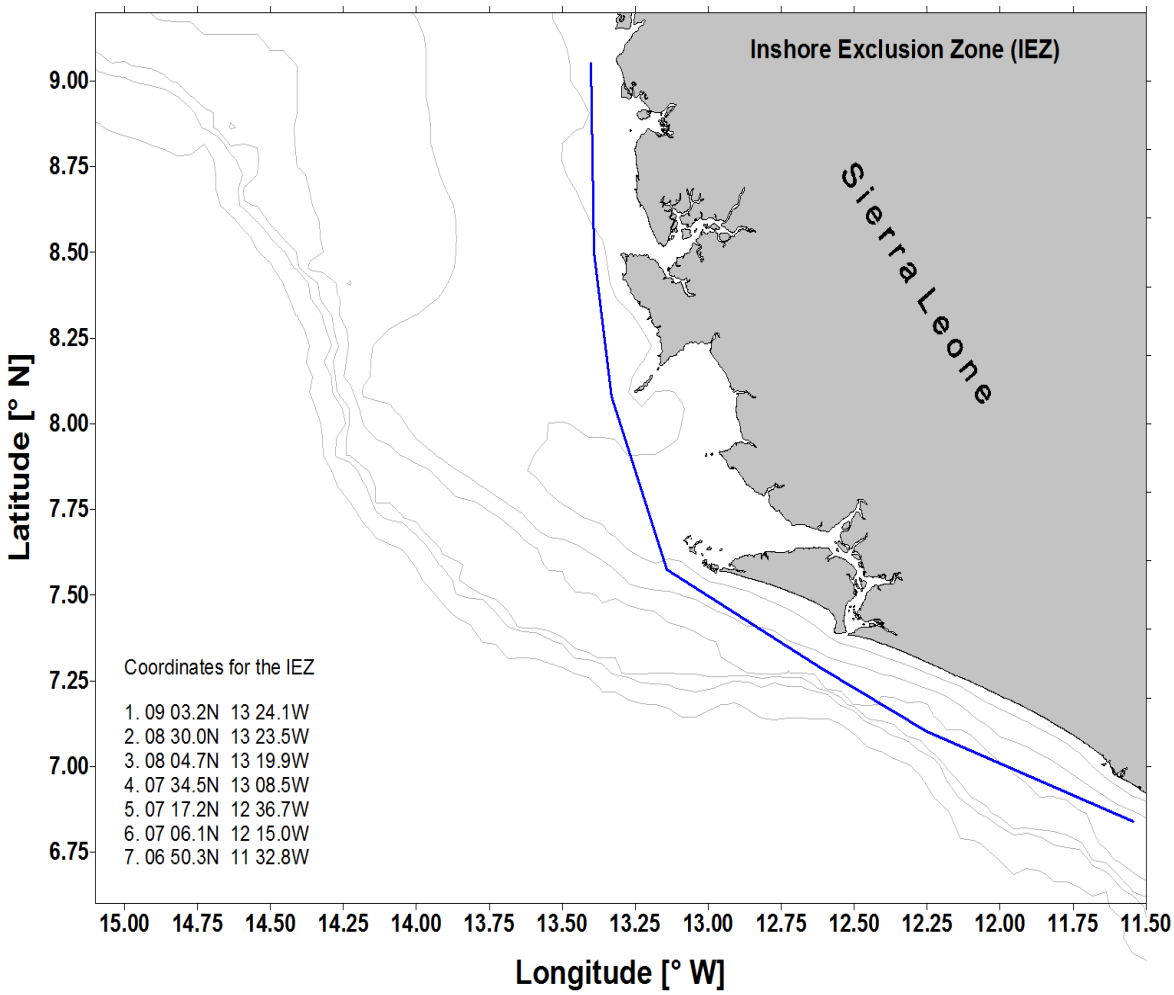

Figure 2: IEZ OF SIERRA LEONE
Source: Sei 2011

1.5.5 MARINE ENVIRONMENTAL PROTECTION

The Minister has the authority to designate MPA and to grant local area management bodies the power to enact bylaws that specify management strategies for the control of access rights and the implementation of conservation procedures. The Regulation included prohibited fishing methods and equipment as well as prohibitions on abandoning objects at sea. Fishing for sharks, rays, or turtles is not allowed. Fish species that have been deemed endangered by the Minister cannot be fished for.

The prerequisites that must be accomplished for the issue of licenses (particularly for industrial vessels) are detailed in the Regulations, along with the criteria and procedures for awarding licenses and authorizations. They specify conditions that must be met before a foreign fishing license can be issued. If a fisheries plan indicates that there is an excess of permissible catch, these may be given. The history of the fishing vessels and their beneficial holders about illicit practices must be investigated by the Minister. Additionally, the Director must ensure the distant fleet has the fish rights and operates outside of the flag State's exclusive fisheries.

The Protocols specify the circumstances in which a license may be refused. further specifies rules for the use of ports, the use of fish aggregation devices, the reporting of suspected IUU activity, the acquisition of licenses to operate fish processing facilities, the acquisition of permits to process fish aboard fishing vessels, the landing of sharks, and the transshipment of fish. Before being placed into the fishing waters, every fish that has been genetically modified, imported, or exotic must have a license.

1.5.6 TRANSSHIPMENT

An operator of a fishing vessel shall, by the terms and manner agreed in the eighth schedule, apply to the Director for a transshipment, loading, or local landing permit 72 hours preceding the transshipment. The time, place, and conditions that the Director may allow must be specified in the authorization for a transshipment, loading, or local landing. A foreign fishing vessel must obtain written permission from the Director and notify the port in advance to use a port in Sierra Leone. The Director shall not grant such authorization to the vessel if the Director is certain (a) the ship is involved in IUU fishing or associated activities or supports such activities; or (b) the vessel is an illegal, unreported, and unregulated listed vessel. It's possible that port facilities won't be given to an international fishing vessel. Every fishing boat from a foreign country must be inspected. (Fisheries and Aquaculture Regulation, 2019) Fish must be landed in the ports designated by the Minister.

1.6 DESCRIPTION OF THE FISHERIES SECTOR

It is estimated that the fish harvested in this sector has a marketing worth of about $200 million annually. Along the shorelines of the Western Area, 200,000 people are employed directly, and 600,000 people indirectly, which make up 10% of the population. The sector's yearly production is expected to reach 228,000 tons, and it contributes more than 10% to the nation's Gross Domestic Product. Compared to artisanal marine catch, which is expected to be over 150,000 tons, industrial catch production is 78,000 tons less. In essence, the marine artisanal subsector produces the majority of Sierra Leone's annual fish output (MFMR IDAS, 2019).

However, during the past 20 years, IUU fishing has become more prevalent in West Africa, mostly as a result of the Chinese distant water fleet. Senegal, Guinea, Sierra Leone, and Liberia are the nations that have been most severely impacted (Dobo, 2009). This has made it difficult for these nations' fisheries to survive. Due to a deficient system for managing its fisheries and its failure to efficiently patrol EEZ, the nation is extremely susceptible to distant fleets engaging in unlawful fishing. The nation's aquaculture resources are under threat which leads to both financial and biotic overutilisation (Neiland, 2016).

1.6.1 INDUSTRIAL FISHERY

The foreign national fishing fleet, which consists of fish trawlers, shrimpers, tuna purse seiners, support vessels, and carriers, is what distinguishes the industrial fishery from other types of fishing. Beyond the Inshore Exclusion Zone, which stretches 6 nautical miles from the baseline of Sierra Leone's Exclusive Economic Zone, industrial fishing primarily operates at an average depth of 30 meters. Purse seines, demersal fish trawlers, midwater trawlers, and shrimpers currently dominate the industrial fishery. While finfish trawlers frequently have a gross registered tonnage (GRT) of 150 to 600 tons, shrimpers normally have a GRT of 100 to 150 tons. In Sierra Leonean waters, carriers, supply ships, and purse seine boats are active, with GRTs ranging from 1000 to 3000 (MFMR, 2018).

1.6.2 ARTISANAL FISHERY

Artisanal fishing takes place in estuaries, creeks, bays, and littoral waters that extend from the coastline to a deepness of 15–45 meters. This fishery employs a diversity of dugout and planked canoes as well as a wide variety of fishing equipment, including cast nets, ring nets, driftnets, set nets, beach seines, pots & traps, fences, and hooks & lines. The artisanal fisheries significantly increase the nation's overall fish production. It serves as a social and economic engine for the development of the nation by enhancing food security, generating money, and generating jobs in fishing communities. According to a 2018 frame survey, there are around 12,000 fishing canoes in use in Sierra Leone. The total artisanal fleet has increased by 2,000 since the latest frame survey, which was conducted in 2011 and tallied 10,000 boats.

If restriction measures are not implemented, the artisanal fleet has a propensity to expand shortly since the artisanal fishery is not effectively controlled in terms of effort. Because of poor management and a lack of investment in new technologies, fishermen still use the same boats, motors, and equipment after 30 years. As a result, the artisanal sector has not made much progress (MFMR, 2018).

The small-scale fisheries segment contributes 10% of the nation's working populace. This has a substantial detrimental effect nation’s fisheries resource due to the predisposition for overfishing (Seto, Belhabib, Copeland et al., 2015). Small-scale fisheries contribute to the budget of coastal states more than the commercial sector does because of the growth of an intracommunity employment system that offers 500,000 jobs for its community members (Neiland, Cunningham, Arbuckle & Baio et al., 2017). This network has the power to reduce poverty rates and raise standards of living. According to COFREPECHE (2013), the fishing sector directly or indirectly employs 25% of the employed masculine populace in coastal areas. Small-scale fishermen fish for food (Okafor et al., 2019).

1.6.3 GOVERNANCE STRUCTURE OF THE FISHERIES SECTORS- THE MINISTRY OF FISHERIES AND MARINE RESOURCES

The Ministry of Fisheries and Marine Resources is the organization in custody of imposing the rules and protocols governing the nation's use of fisheries resources. It is also in charge of "the select management and control over fish, fisheries, and other marine resources within the fisheries waters." The political head of the ministry is the Minister. The Director is responsible for technical issues, and the head in charge of administrative issues is the Permanent Secretary. The five technical units in the Ministry are the Fish Quality Unit (charged with proper fish handling and processing), Monitoring Control and Surveillance Unit (charged with compliance change), Statistics Research Unit, Marine Artisanal Unit (charged with fisheries extension and governance of marine artisanal fishing in the coastal district of Sierra Leone), and Aquaculture and Inland Fisheries Unit (MFMR, 2018).

1.6.4 FISHERIES MONITORING, CONTROL, AND SURVEILLANCE

In agreement with Section 19 of the 2017 Fisheries and Aquaculture Act, an MCS Unit was formed and allocated to MFMR. The MCS unit is in charge of monitoring, managing, and observing all fishing and associated operations as well as enforcing the Act, rules, and laws about the legislation of fishing practices for the goal of sustainable management. The MCS Unit, which is in charge of making sure compliance, is supervised by the Joint Maritime Committee (JMC). The MCS Unit receives assistance from members of different pertinent Ministries, Departments, and Agencies (MDAs) in carrying out its responsibilities. The JMC was established through a Memorandum of Understanding with other MDAs to protect the socio-economic and environmental integrity of the country's maritime domain, including combating illegal fishing. The JMC is made up of nine (9) government stakeholder institutions. The Sierra Leonean Cabinet approved the establishment of these organizations, with the Ministry of Fisheries acting as the JMC's chairman.

The management of JMC includes representatives from the Office of National Security (ONS), Maritime Wing (Navy), Air Wing, Port Authority, National Revenue Authority, Marine Police, Immigration Department, and Maritime Administration. In April 2019, Sierra Leone declared a closed season for the first time (MFMR, 2019). Commercial fleets were prohibited from fishing due to fishery management strategy; it is believed that the nation's fisheries are being utilized in a biologically unfeasible way. IUU fishing is the main cause of this unsustainable exploitation, according to MFMR (2019).

1.7 PROBLEM STATEMENT

While illegal fishing in Sierra Leone is recognized as a national governance problem, the actual scope and extent of it is poorly documented and the true impact on the nation's economy is unidentified. Lack of data hurts fisheries governance and management in Sierra Leone and research is needed to fill this knowledge gap.

1.8 AIM OF STUDY

This study aims to use a variety of information sources to evaluate the extent of potential illegal fishing activities in Sierra Leone's Exclusive Economic Zone.

1.9 SPECIFIC OBJECTIVES

(1). To assess the extent of illegal fishing in the EEZ of Sierra Leone.
(2). To evaluate which fishing fleets are engaging in illegal fishing within Sierra Leone's EEZ.
(3). To assess measures put in place to mitigate illegal fishing in Sierra Leone.
(4). To assess the challenges in combatting illegal fishing in Sierra Leone.

1.10 RESEARCH QUESTIONS

(1). How much and what type of illegal fishing activities occur in the EEZ of Sierra Leone?

(2). Is illegal fishing being perpetrated by domestic or foreign vessels in Sierra Leone's EEZ?

(3). What are the measures put in place to tackle Illegal fishing in Sierra Leone?

(4). What are the challenges encountered in combatting illegal fishing in Sierra Leone?

1.11 SCOPE OF THE STUDY

Given the largely hidden nature of unreported and unregulated fishing and consequent difficulties in quantifying these activities, the study focuses solely on evaluating potentially illegal fishing in Sierra Leone (i.e., the infringement of nationwide fisheries rules and protocols), rather than IUU fishing as a whole. The study further confines its evaluation to activities of the industrial fleet in Sierra Leone's EEZ, as the artisanal fleet is largely unregulated.

CHAPTER 2: METHODOLOGY

2.1 RESEARCH DESIGN

This study utilizes a triangulation research strategy, drawing upon both qualitative and quantitative research methods. The term "triangulation methodology" describes the use of several methods or data sources to verify one another and answer the research questions.

2.1.1 QUALITATIVE RESEARCH

The qualitative research focused on open-ended and closed-ended questions. Field notes collection, document analysis, and in-depth interviews with stakeholders and other key informants were used to gather data. Face-to-face interviews were carried out with 15 respondents, including from the Ministry of Fisheries and Marine Resources, Joint Maritime Committee, Navy, Maritime Administration, and Marine Police. Using the deductive approach of thematic analysis, interview data were sorted into initial codes and themes using NVivo 14 transcription (Clarke et al.,2015; Terry et al.,2017; Elliot,2018;). The interview, which takes no more than 45 minutes per participant, was approved by the WMU ethics committee. The interview subjects are indicated in the remaining sections of the study by the following codes: A1, and A2. The study was conducted in complete anonymity.

Table 1 below contains a list of every respondent included in the research with an intended sample size of 15.

Table 1: List of interviewees, their designations, work experience, and codes

NO.	INSTITUTIONS	DESIGNATION	DURATION OF WORK	CODE
1.	Ministry of Fisheries and Marine Resources	Deputy Director	20	A1
2.	Ministry of Fisheries and Marine Resources	Assistant Deputy	15	A2
3.	Ministry of Fisheries and Marine Resources	Manager	10	A3
4.	Ministry of Fisheries and Marine Resources	Statistics Officer	8	A4
5.	Ministry of Fisheries and Marine Resources	Research Officer	6	A5
6.	Institute of Marine Biology and Oceanography	Consultant on Fisheries Aquaculture	20	A6
7.	Sierra Leone Navy	Head of Monitoring, Control, and Surveillance		A7
8.	Sierra Leone Navy	Head of Operation		A8
9.	Sierra Leone Navy	Inspection Officer	10	A9
10.	Joint Maritime Committee	Head of Technical Unit	7	A10
11.	Joint Maritime Committee	Inspection Officer	5	A11
12.	Joint Maritime Committee	Senior Officer Monitoring, Control and Surveillance	8	A12

13.	Sierra Leone Maritime Administration	Director of Shipping and Marine Environmental Protection	20	A13
14.	Sierra Leone Maritime Administration	Shipping Manager	12	A14
15.	Marine Police	Head of Marine Division	10	A15

2.1.2 QUANTITATIVE RESEARCH

Data from the MFMR was obtained on the number of registered vessels annually, the number of illegal fishing vessels detained over the previous five years, and the fisheries offenses for which they were detained.

Data was also obtained from the GFW (www.globalfishingwatch.org-) mapping tool, to evaluate fishing vessels operating within Sierra Leone's EEZ. GFW uses the Automatic Identification System (AIS) data to identify a vessel's name, call sign, IMO number, dimensions, Maritime Mobile Service Identifier (MMSI), as well as dynamic vessel positional data on location, speed, and course-specific information, including vessel draught and destination. From 2018 to 2022, AIS data were used to examine industrial fishing vessel activity patterns in Sierra Leone.

The researcher was first interested in determining any difference between those vessels licensed by MFMR, but not present in the GFW map. This was important to evaluate the limitations of the GFW data set. Second, the researcher sought to find any vessels present in GFW, but not licensed by MFMR. This was important for identifying possible illegal fishing operations. By looking in detail at the tracks of those vessels without a license, an evaluation was made of the risk of vessels being involved in illegal fishing. For example, if a vessel was fishing (showed spatial patterns associated with trawling or purse seiner setting) if the vessel came into a

Sierra Leonian port, or if it entered the waters of adjacent EEZs or the High Seas. Potential high-risk vessels would be those that were not registered in Sierra Leone, showed tracks consistent with fishing operations, and did not enter a Sierra Leonean port.

The researcher also considered if the AIS tracks of the vessels were broken, indicating that the vessels may have turned off their AIS tracker. Although there may be a variety of reasons for this, it is a potential indicator of illegal fishing.
An example is shown in Figure 3: Here there is clear fishing activity, but also clear signs of entering the port in Sierra Leone. Vessels entering a national port are less likely to be engaged in illegal fishing and so this particular vessel is deemed a low-risk vessel, even if it is not included on the list of licensed vessels.

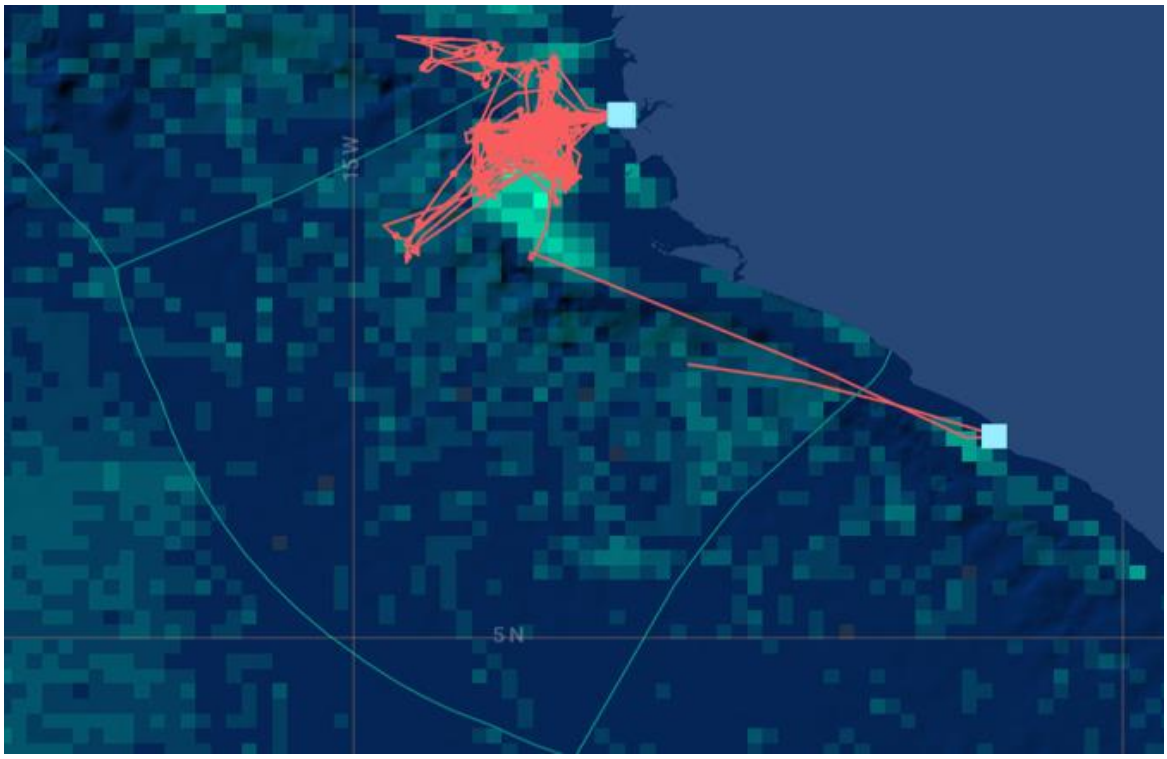

Figure 3: Screenshot from the GFW mapping tool showing the individual track of a trawler that made a port call in Freetown. This is considered a low-risk vessel. Source: GFW

Another example is shown in Figure 4: Here the unlicenced vessel is fishing using purse seine nets inside the Sierra Leone EEZ. It did not enter Sierra Leone's ports and appeared to engage in activity in the high seas and neighboring EEZs. Hence vessels are evaluated as being possible high-risk illegal vessels.

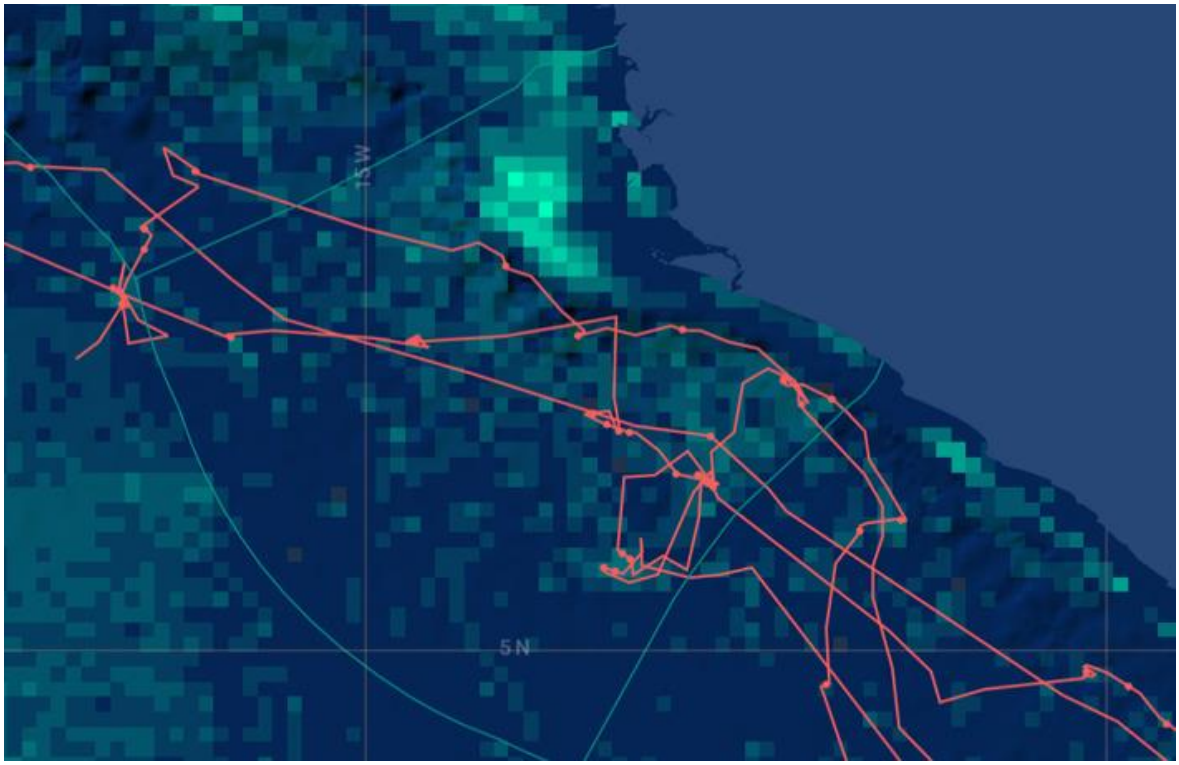

Figure 4: Screenshot from the GFW mapping tool showing the individual track of an unlicensed purse seiner that never made a port call in Sierra Leone. This is considered a high-risk vessel. Source: GFW

2.1.3 DOCUMENT ANALYSIS

Review of publications from peer-reviewed journals and reports on surveillance activities carried out by the Navy and MFMR were used to supplement the analysis and this information was collected through a desktop study.

CHAPTER 3: RESULTS

The number of licensed vessels from 2018 to 2022 by the MFMR of Sierra Leones is shown below in Table 2.

3.1 QUALITATIVE ANALYSIS OF DATA

Table 2: Total number of licensed vessels from 2018 -2022

Year	Amount
year 2018	136
year 2019	122
year 2020	125
year 2021	100
year 2022	89

(Source: MFMR)

The number of vessels that appear in Sierra Leone's EEZ based on the Global Fishing Watch database from 2018 to 2022 is shown below.

Table 3 Total number of vessels in GFW from 2018 – 2022

Year	Amount
year 2018	53
year 2019	43
year 2020	41
the year 2021	37
the year 2022	35

(Source: GFW)

Table 4 shows the vessels that appear in the GFW database and those vessels that are licensed by the MFMR register.

Table 4: Vessels in both GFW & MFMR license list

Year	Amount
year 2018	25
year 2019	27
the year 2020	30
the year 2021	32
year 2022	33

Source: MFMR& GFW

Table 5 shows details of the vessels that are in GFW but not in the MFMR register. It includes information about the flag states, fishing ports, gear types, gaps in AIS, and the level of risks, which is used to determine whether the vessels are likely to engage in illegal fishing or not.

Table 5: Risk of evaluation

NO.	Flag	Gear types	Fishing?	Port?	Other EEZ?	Broken AIS?	RISK
1.	Italy	Trawler	Yes	Yes	Yes	No	Low
2.	Italy	Trawler	Yes	Yes	Yes	No	Low
3.	Guinea-Bissau	Trawler	Yes	Yes	Yes	No	Low
4.	Sierra Leone	Trawler	Yes	Yes	Yes	No	Low
5.	Samoa	Trawler	Yes	Yes	Yes	No	Low
6.	Unknown	Fishing	Yes	Yes	Yes	No	Low
7.	France	Tuna Purse Seine	Yes	No	Yes	Yes	High

8.	France	Tuna Purse Seine	Yes	No	Yes	Yes	High
9.	France	Tuna Purse Seine	Yes	No	Yes	Yes	High
10.	France	Tuna Purse Seine	Yes	No	Yes	Yes	High
11.	France	Tuna Purse Seine	Yes	No	Yes	Yes	High
12.	France	Tuna Purse Seine	Yes	No	Yes	Yes	High
13.	Spain	Tuna Purse Seine	Yes	No	Yes	Yes	High
14.	Japan	Drifting Longliner	Yes	No	Yes	Yes	High
15.	Italy	Trawler	Yes	No	Yes	Yes	High
16.	China	Fishing	Yes	Yes	Yes	No	Low
17.	Guinea	Tuna Purse Seine	Yes	Yes	Yes	No	Low
18.	Namibia	Tuna Purse Seine	Yes	No	Yes	Yes	High
19.	Angola	Trawler	Yes	No	Yes	Yes	High
20.	China	Trawler	Yes	Yes	Yes	No	Low
21.	Angola	Trawler	Yes	No	Yes	Yes	High
22.	France	Tuna Purse Seine	Yes	No	Yes	Yes	High
23.	Italy	Trawler	Yes	Yes	Yes	No	Low
24.	Guinea-Bissau	Trawler	Yes	Yes	Yes	No	Low

25.	Guinea	Tuna Purse Seine	Yes	No	Yes	Yes	High
26.	China	Fishing	Yes	No	Yes	Yes	High
27.	Guinea-Bissau	Trawler	Yes	Yes	Yes	No	Low
28.	Belize	Trawler	Yes	No	Yes	Yes	High

Based on the evaluation in Table 5. Table 6 shows low-risk vessels that are present in the GFW but not licensed by MFMR. These vessels are referred to as low-risk vessels because stay in SL EEZ, have a clean AIS and they are engaging in fishing but they visit the port regularly.

Table 6: Vessels in GFW not MFMR license list

Year	Amount
year 2018	6
year 2019	2
year 2020	1
year 2021	1
year 2022	1

Source: GFW

Figure 6 below illustrates the number of high-risk vessels that are present in GFW but are not registered with MFMR. These vessels have been flagged as high-risk vessels because they are engaged in fishing activities without going to port in SierraLeone, the majority of these vessels do go into other EEZs in the region and some have broken AIS (whatever the case may be), further increasing the risk that they may be engaging in illegal fishing.

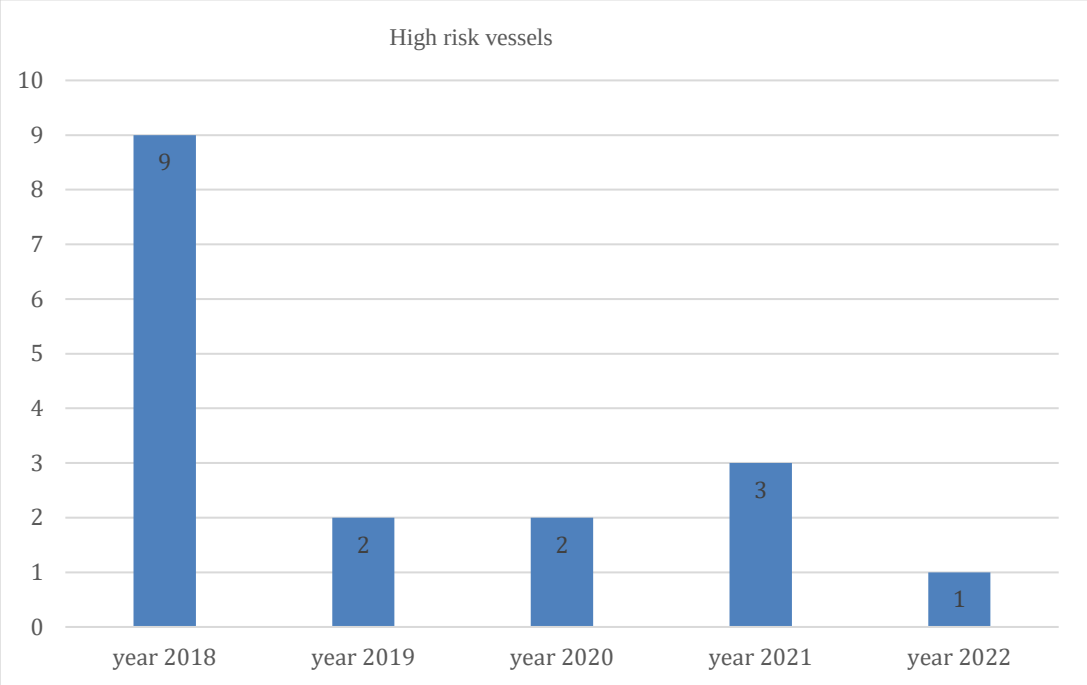

Figure 5: Vessels in GFW not MFMR License list

3.2 ARREST ON FISHING INFRACTIONS

Table 7: shows the total number of vessels detained between 2018 and 2022 based on information from MFMR.

Table:7 Arrest of vessels for fishing infractions

Year	Amount
year 2018	5
year 2019	3
year 2020	2
year 2021	1
year 2022	2

Table 8 shows the different types of fishing infractions committed from 2018 to 2022

Table 8: Types and numbers of offenses committed during the period 2018-2022

OFFENCES	AMOUNT
Fishing in IEZ	4
Failing to have the minimum percentage of crew on board	1
Fishing without observers onboard	1
Failing to have a logbook	1
Tampering with VMS	2
Obstruction of an authorized officer on duty	1

3.3 RESULT FOR QUALITATIVE ANALYSIS

The information in the table below was collected using NVivo transcription and includes the initial codes (themes and sub-themes identified in the transcripts), the number of interview participants, the assigned transcript excerpts (the number of interviews that mentioned a particular sub-theme), and a sample of interviewee statements. Four themes were classified and examined using a thematic method, including What constitutes illegal fishing in Sierra Leone's Exclusive Economic Zone (EEZ), who is engaging in illegal fishing, what steps have been taken to combat illegal fishing, and what challenges have been encountered. These themes are expanded upon in Sections 3.3.1 -3.3.4 below.

Table 9: Initial themes, sub-themes, and quotes with coded transcripts

Overarching Themes	Sub-themes: Initial codes	Number of participant(N=15)	Number of transcripts excerpts assigned	Sample of quotes
Theme 1: Illegal Fishing in Sierra Leone	Fishing in Inshore Exclusive Zone	15	5	"Reports of fractions of vessels fishing in the outer fringes of the IEZ that are of fish species that are mainly inshore water this occurs when they will drift in the Inshore areas." (A3)
	Undersized mesh	15	2	"In the past, there have been reports for the use of undersized fishing mesh". (A4)
	Uninstalled Vessel Monitoring System	15	2	"Yes, some vessels are tampering with the VMS and it is required that licensed vessels must have installed VMS" (A10)
Theme 2: Flag state involved in illegal activities	Vessels involved in fishing infringements	15	8	"Mainly foreign-flagged vessels, including Chinese,

				Greece, and Egypt vessels" (A11)
Theme 3: Measure to tackle illegal fishing	Monitoring, Control, Surveillance	15	14	"Navy deploys along the coast for early warning Tombo, Bailor, Gbandonpi, Bonthe, Suilma boundary to ensure effective MSC, if vessels fish in a prohibited area, they make screenshots for evidence and write a report". (A7)
	Fisheries Regulation	15	15	"Most IUU issues of industrial fishing have been addressed because of the review of the fisheries law from 1994 to 2018 fisheries and aquaculture act to 2019 fisheries and aquaculture regulation". (A1)
	Technologies	15	12	"JMC collect intelligence and information and share by using Vessel

				Monitoring System (VMS), AIS, Platform called YARIS" (A12).
	Fines and Penalties	15	14	"The problem of illegal fishing is not serious because of the increase in fines, from 30 thousand dollars to 1.5 million dollars fine for illegal activities". (A6).
	Enforcement	15	14	"12 inshore patrol craft deploy along the coast for patrols and surveillance to enforce the law" (A15).
	Compliance	15	15	"There has been a high level of compliance because of the measures put in place by MFMR, vessels compliance with no fishing in the IEZ, observers onboard the vessels, record on daily catch onboard" (A2)

	Collaborations	15	15	"The Sierra Leone Navy collaborates with US state navy, French, Liberia, and Guinea navy to conduct maritime operations, fisheries surveillance with US navy using the platform to conduct operation" (A9)
Theme 4: Challenges in mitigating illegal fishing	Fundings	15	12	"Lack of funding, motivation of officers doing the arrest of the vessels, insurance, at sea allowances and over-night allowances" (A8)
	Capacity building	15	10	"Insufficiently trained personnel for operating sophisticated technologies" (A5)
	Insufficient equipment	15	8	"Limited monitoring tools, drone, radars and satellite imaging to monitor EEZ". (A13)

3.3.1 ILLEGAL FISHING IN SIERRA LEONE

According to the interviews, there are several common themes around the types of illicit fishing present in Sierra Leones's EEZ. All the respondents listed undersized mesh, tampering with VMS, and fishing in the IEZ as instances of unlawful fishing methods. However, respondent A14 also mentioned another issue, namely "what is usually common, the captain not recording their catches in their log book in English, some of them will record their catches in a foreign language, which is prohibited."

3.3.2 FLAG STATE ENGAGES IN ILLEGAL ACTIVITIES

One of the primary perpetrators of illegal conduct, according to many of the participants who were interviewed, is foreign-flagged vessels. Participant A11 listed Chinese, Greek, and Egyptian-flagged fishing vessels as the main offenders.

3.3.3 MEASURES TO TACKLE ILLEGAL ACTIVITIES

As reported by many of the interviewees, the fisheries policy and legislative framework have also been reviewed to address the challenges of illicit fishing operations, and the result appears to be a decline in illegal fishing in Sierra Leone. For instance, "The MFMR has put stringent measures in place to combat illegal fishing by revising the 2018 Fisheries and Aquaculture Act, implementing 100% observer programs, registering vessels should have installed VMS, and enacting fines and penalties. The rise in licensing payments has led to a decrease in the problem of illegal fishing" (A1). All interviewees cited Monitoring, Control, and Surveillance as contributing factors in the recent drop in illicit fishing. "The intelligence lead patrol, which is part of the JMC where electronic and monitoring work is done, conducts routine patrol. To monitor our water, seagoing vessels as well as remote VMS and AIS systems are used" (A12). Collaboration was cited as a key strategy by several interviewees in combatting illegal fishing in Sierra Leone "Seven nations, including Mauritian, Gambia, Liberia, Guinea, Senegal, Guinea-Bissau, and Sierra Leone, participate in sub-regional fisheries and perform joint regional patrol". (A1)

As highlighted by many of the interviewees (14 out of 15 Respondents, as per Table 9), one of the steps implemented by MFMR to combat illegal fishing is increased fines and penalties. 10 out of 15 interviewees also brought up the subject of increased compliance as an indication that the new measures are working to reduce illegal fishing. For instance, "The rate of compliance has increased as a result of the strict measures implemented by MFMR," (A3)

3.3.4 CHALLENGES

Through the interviews, several problems regarding unauthorized fishing in Sierra Leonean waters were found. A common theme was that there is a lack of funding to tackle illegal fishing, with 12 out of 15 respondents highlighting this as a problem. The second key difficulty highlighted by the majority of interviewees was the lack of capacity building.

According to one of the experts consulted (A4), issues associated with insufficient monitoring tools to prevent illegal fishing were a problem, a concern that was also raised by Respondents A2, A11, A15, and A13 as examples. Difficulties in collaborating were cited as a further factor in driving the illicit activity, and this was reported by 5 out of 15 Respondents.

CHAPTER 4: DISCUSSION

The triangulation method, which uses data from both qualitative and quantitative data sources, was found to be a useful way of validating results through the convergence of data from many sources. By analyzing data from the MFMR and GFW, an evaluation was made on the amount of licensed and unlicensed vessels operating in Sierra Leone's EEZ. Furthermore, of those found to not have licenses, an evaluation was made of the risk of being involved in illegal fishing. Further insight into the extent of illegal fishing was provided from the qualitative research by speaking with decision-makers and experts in the management of the fisheries in Sierra Leone.

Respondents were questioned about who is engaging in illegal fishing, and the findings of the study were utilized to map out how much and what kind of illicit fishing operations occur in Sierra Leone's EEZ. The findings are also pertinent to the strategies involved in combatting illegal fishing in Sierra Leone and the difficulties encountered. The overfishing of fish stocks, as well as the rising levels of misery and malnutrition in West African seaside villages that depend on fishing, are caused by industrial vessels (Belhabib et al.,2016, Finch 2016; Joaque,2017, Okeke-Ogbuafor et al.,2020b).

Those in charge of making decisions from Ministries, Departments, and Agencies who were surveyed had positive opinions about the potential for fishing resources to contribute to economic development in Sierra Leone. This aligns with estimations from the FAO (2010) and Neiland et al. (2016), which place the involvement of fisheries in the nation's GDP at 10.2% in 2013 and 9.1% in 2010. In West Africa, the fishing sector employs close to a million people and generates between 2% and 10% of the Gross Domestic Profit of the area (Belhabib et al., 2015). However, it was assessed that up to 40% of the fish caught in the region are estimated to be caught through illegal fishing (Belhabib et al.,2012c,2016, Belhabib and Pauly,2015). Given

these figures, it is encouraging that this study has revealed an apparent decrease in illegal fishing over the period 2018-2022 in Sierra Leone.

4.1 HOW MUCH AND WHAT TYPES OF ILLEGAL FISHING ACTIVITIES OCCUR IN THE EEZ OF SIERRA LEONE?

Data from MFMR of Sierra Leone's license vessels from 2018-2022 suggests that there was a significant increase in license registration in 2018. It is a positive sign that more vessels are licensed, but at the same time, the interviewees suggest that illegal fishing remains a problem within this licensed fleet, highlighting infringements such as fishing in the IEZ, tampering with VMS, using undersized mesh, fishing without observers onboard, and failing to comply with regulations. From 2018 through 2022, fishing in the Inshore Exclusion Zone (IEZ)was the most common infraction. Industrial fishing is prohibited in the IEZ, a region near the beach, which is set aside for artisanal and recreational fishing.

The second-highest fishing infraction over the previous five years is indicated as being VMS tampering. Using the Global Positioning System (GPS), the vessel monitoring system displays the exact geographic location of these vessels. Each Contracting Party's Fisheries Monitoring Centres (FMCs) receives data from the vessel(s) via a satellite monitoring system. To avoid being detected while operating illegally, industrial fishing vessels may tamper with VMS.

The use of inadequate mesh was also cited as a common violation leading to the unintentional capture of non-target species and smaller fish. This is a very common form of illegal fishing found throughout African countries. Another common form of fishing offense was the absence of observers on board commercial vessels. These observers are in charge of providing MFMR with daily catch data reports.

The qualitative information gleaned from the interviews also showed that fishing in the IEZ and tampering with the VMS significantly increased in 2018 which could be attributed to the absence of operative Monitoring, Control, and Surveillance of the Sierra Leone EEZ. This may have been associated with the general election that took place in 2018. The election caused much disruption within the government and may have resulted in overexploitation and depletion of fish stocks.

4.2 WHO IS DOING THE ILLEGAL FISHING?

Consistent with other studies (Neiland,2016) in the region, the interviewees indicated, that foreign-flagged vessels were expected to be involved in illicit fishing than domestic vessels in the waters of Sierra Leone. According to data from GFW and the reports from the interviewees, the study's findings show that the flags of the vessels engaging in illegal fishing often vary. While the interviewees believed that Chinese, Greek, and Egyptian-flagged vessels were the primary offenders, the data from GFW showed a wider spread of flag States, with many vessels from (France, Italy, and China) being classified as high-risk vessels. This discrepancy may partly be explained by flag hopping, which is typically seen in illegal fishing vessels as a means of evading detection and capture.

It should be noted that GFW makes use of AIS data, a safety technology that was first created to stop ship collisions at sea. There are limitations to AIS. For example, to receive signals, satellites must be overhead as terrestrial receivers only pick up signals close to shore. As a result, ships operating in certain regions of the world acquire fewer AIS positions, which limits the capacity of the system to identify apparent fishing efforts (GFW,2019). Furthermore, GFW's estimate of fishing activity is modeled rather than observed, it is referred to as "apparent" rather than certain. From inspection of the vessel track in the GFW mapping tool, it was evident that there were some instances where an AIS gap existed. This may be the vessel deliberately turning off the AIS ("going dark") and there is evidence that this can be related to criminal activities. This may explain some of the disparity between the

data from the MFMR and GFW including vessels that are present in the MFMR list but absent in GFW as well as vessels that are present in the GFW but absent in the MFMR list within the specified period.

The study's findings show that there are vessels in the MFMR registry that use AIS but were not picked up by the GFW. Additionally, there were instances where vessels with the same Maritime Mobile Service Identify (MMSI)were mistakenly identified as different vessels rather than the same vessels, which can highlight weakness in a system like the GFW.

Low-risk vessels are those that visit ports in Sierra Leone and are involved in fishing activities that exhibit spatial patterns using either trawling or purse seine. Although these vessels were thought to be carrying out legal fishing operations, they were not listed in the MFMR registry, which may have been due to an outdated list of licensed vessels. However, if these vessels do not visit a Sierra Leone Port, they are regarded as potential high-risk vessels.

4.3 WHAT ARE THE MEASURES PUT IN PLACE TO TACKLE ILLEGAL FISHING IN SIERRA LEONE?

The study suggested that the majority of vessels identified can be regarded as engaging in legal fishing activities because they are registered fishing vessels authorized by the MFMR and also present in the GFW database. The data obtained from the MFMR and GFW indicates that there has been an increase in authorized fishing as a result of the high rates of registered vessels. The Fisheries and Aquaculture Act of 2018's enforcement, as well as the rise in registration fees and taxes for vessels, may explain the decrease in the registration of vessels between 2019 and 2022. Many fishing companies stopped fishing during this period and instead invested in processing as a result of the high license fees and tax increases. After stopping their fishing operations, some industrial fishing corporations turned to buying their catch from artisanal fishermen and processing it for export.

It is worth noting also that the Ministry of Fisheries and Marine Resources imposed a closed season in April 2019.

According to the qualitative data gleaned from interviews, the review and amendment of the Fisheries and Aquaculture Act of 2014(which then became the Fisheries and Aquaculture Act of 2018) has led to a decrease in illegal fishing. This is similar to situations in other regions (Okeke-Ogbuafor et al.,2020a, Lee,2019, Schiffman,2018). For instance, the Senegalese government decided to fine the Russian fishing vessel more than $41400 US for engaging in illegal fishing within Senegalese waters as a result of the fisheries legislation. This decision was preceded by a historic decision to dramatically increase fines against illegal fishing.

The active Monitoring, Control, and Surveillance program in Sierra Leone from 2018-2022 accounted for the high number of detentions, according to data from MFMR and reports from interviews that indicated there had been an increase in the detention of fishing vessels for breaking the law. The findings of a recent study that produced the first provincial record for crimes and sanctions led to the introduction of the first marking scheme that positions MCS by observing the sums, the number of detected lawbreakers, the offense types that are efficiently charged, the illicit catch worth, and the clarity of the evidence. According to the study's final finding, Sierra Leone and Gambia have the MCS schemes with the highest marks and are the republics where most criminals are captured and given the heftiest fines (Doumbouya et al., 2017).

The responders suggested regional and worldwide cooperation as a measure to address the subject of illegal actions. Sharing information is essential for this, notably information on beneficial ownership of domesticated vessels, the owners' enterprises, their operations, and previous offenses. require mutual capacity building to effectively create and put into implementation important regulations, such as the PSMA, and to improve the efficacy of enforcement through synchronized patrols and

other MCS mechanisms. To ensure consistency and regularity, the SRFC which covers the area from Mauritania to Sierra Leone, supports information sharing, capacity building, and coordinated patrol between states.

4.4 WHAT ARE THE CHALLENGES ENCOUNTERED IN COMBATTING ILLEGAL FISHING IN SIERRA LEONE?

The study suggests lack of technical capacity expertise is a barrier to tackling illegal fishing. Kannan (1999) emphasized the significance of training, learning, and knowledge for advancing human progress and eradicating scarcity in the fishing industry. Illegal fishing can only be tackled with knowledge of the nature of the problem and the existence of the rules. Technical competence is thus a necessity for MSC employees (Daliri et al.,2016). In addition, the study suggests that the main challenges faced by Sierra Leone's fight against illegal fishing are a lack of financing, resources, properly qualified employees, and data gathering.

CHAPTER 5: CONCLUSION & RECOMMENDATIONS

This study aimed to evaluate the extent of potential illegal fishing activity in Sierra Leone's Exclusive Economic Zone, to contribute to enhanced fisheries governance in the region. This research utilized both qualitative and quantitative data, and a triangulation research methodology was employed to assess validity through the convergence of data from many sources. The large number of registered vessels in Sierra Leone in 2018, led to a high rate of fishing infractions, such as fishing in the IEZ, tampering with VMS, using undersized mesh, and failing to have an observer onboard.

According to the study's qualitative data from the interviews, the high number of fishing violations in 2018, could be attributed to the absence of effective MCS, but in 2019, there seems to be a decline in illegal fishing which could be attributed to the stringent measures put in place by MFMR, including a review of the Fisheries and Aquaculture Acts, an increase in fines, effective MCS, and partnerships with both regional and international organizations. This study represented the key stakeholders from the fisheries authorities but lacked perspectives from the fishing industry itself. Future work should consider how best to engage with the fishing industry.

A follow-up study on the perception of illegal fishing in Sierra Leone's EEZ, including industrial fishing companies and fishing communities, should be conducted. This would help to improve knowledge and understanding of the extent of illegal fishing in Sierra Leone's EEZ and the challenges in addressing this problem because the interview sample size was small and a larger and more varied sample of people involved in fishing would have shown heterogeneous perceptions.

A further limitation was the trustworthiness of the GFW data. For example, to acquire a full picture of illegal fishing in Sierra Leone, it would have been helpful to search for vessels that were on the registration list but not present on the GFW map

in or near Sierra Leone, to see if they might have been fishing outside of Sierra Leone's water (i.e., they have a license for Sierra Leone but haven't used it and are instead fishing elsewhere where they may also have a license). Similarly, it would have been helpful to verify whether the names of vessels in GFW were up to date. It is possible that vessels registered with MFMR were showing up in GFW, or vice versa, but under a different name. This type of analysis may have produced a clearer picture but the researcher was unable to do this due to time restrictions.

5.1 RECOMMENDATIONS

In the interest of addressing the issue of data discrepancies, it is recommended that there be an increase in coordination between the Ministry of Fisheries and Marine Resources and Global Fishing Watch, in terms of data sharing as well as for MFMR to consider making their VMS data available to GFW.

The MFMR may also consider establishing a website where all licensed fishing-related vessels, as well as those associated with illegal activity, would be made publicly available.

All licensed vessels in the Ministry of Fisheries and Marine Resources' registry should also be current and updated regularly.

Regarding improved governance of illegal fishing in Sierra Leone, Monitoring, Control, and Surveillance could be made more efficient, through increasing personnel capacity in particular, teaching them how to handle cutting-edge technologies like drones, radars, and satellites, as well as tools such as GFW.

REFERENCES

Agnew, D. J., Pearce, J., Pramod, G., Peatman, T., Watson, R., Beddington, J. R., & Pitcher, T. J. (2009). Estimating the Worldwide Extent of Illegal Fishing. *PLoS ONE*, *4*(2), e4570. https://doi.org/10.1371/journal.pone.0004570

Belhabib, D., Mendy, A., Subah, Y., Broh, N. T., Jueseah, A. S., Nipey, N., Boeh, W. W., Willemse, N., Zeller, D., & Pauly, D. (2016). Fisheries catch under-reporting in The Gambia, Liberia, and Namibia and the three large marine ecosystems which they represent. *Environmental Development*, *17*, 157–174. https://doi.org/10.1016/j.envdev.2015.08.004

Belhabib, D., Sumaila, U. R., Lam, V. W. Y., Zeller, D., Le Billon, P., Abou Kane, E., & Pauly, D. (2015). Euros vs. Yuan: Comparing European and Chinese Fishing Access in West Africa. *PLOS ONE*, *10*(3), e0118351. https://doi.org/10.1371/journal.pone.0118351

Belhabib, D., Sumaila, U. R., & Le Billon, P. (2019). The fisheries of Africa: Exploitation, policy, and maritime security trends. *Marine Policy*, *101*, 80–92. https://doi.org/10.1016/j.marpol.2018.12.021

Belhabib, D., Sumaila, U. R., & Pauly, D. (2015). Feeding the poor: Contribution of West African fisheries to employment and food security. *Ocean & Coastal Management*, *111*, 72–81. https://doi.org/10.1016/j.ocecoaman.2015.04.010

Bennett, N. J., Le Billon, P., Belhabib, D., & Satizábal, P. (2022). Local marine stewardship and ocean defenders. *Npj Ocean Sustainability*, *1*(1). https://doi.org/10.1038/s44183-022-00002-6

Burgess, M. G., Polasky, S., & Tilman, D. (2013). Predicting overfishing and extinction threats in multispecies fisheries. *Proceedings of the National Academy of Sciences*, *110*(40), 15943–15948. https://doi.org/10.1073/pnas.1314472110

Chen, X., Xu, Q., & Li, L. (2023). Illegal, Unreported, and Unregulated Fishing Governance in Disputed Maritime Areas: Reflections on the International Legal Obligations of States. *Fishes*, *8*(1), 36. https://doi.org/10.3390/fishes8010036

Clarke, V., & Braun, V. (2021). *Thematic analysis*. Auckland.ac.nz. https://researchspace.auckland.ac.nz/bitstream/handle/2292/43968/Thematic%20analysis_Journal%20Positive%20Psychology_ACCEPTED..pdf?sequence=4&isAllowed=y

Conteh, M. P. (2021). Law enforcement about illegal unreported and unregulated (IUU) fishing in Sierra Leone. *World Maritime University Dissertations*. https://commons.wmu.se/all_dissertations/1689?utm_source=commons.wmu.se%2Fall_dissertations%2F1689&utm_medium=PDF&utm_campaign=PDFCoverPages

CUNNINGHAM, S., NEYLAND, A. E., ARBUCKLE, M., & BOSTOCK, T. (2009). Wealth-based Fisheries Management: Using Fisheries Wealth to Orchestrate Sound Fisheries Policy in Practice. *Marine Resource Economics*, *24*(3), 271–287. https://doi.org/10.1086/mre.24.3.42629655

Daliri, M., Kamrani, E., Jentoft, S., & Paighambari, S. Y. (2016). Why is illegal fishing occurring in the Persian Gulf? A case study from the Hormozgan province of Iran. *Ocean & Coastal Management*, *120*, 127–134. https://doi.org/10.1016/j.ocecoaman.2015.11.020

Daniels, A., Gutiérrez, M., Fanjul, G., Guereña, A., Matheson, I., & Watkins, K. (2016). *Western Africa's missing fish The impacts of illegal, unreported, and unregulated fishing and under-reporting catches by foreign fleets*. https://digitalcommons.fiu.edu/cgi/viewcontent.cgi?article=2006&context=srhreports

Djiga Thiao, Mbaye, A., M Dème, & Hamet Diaw Diadhiou. (2017). *Focusing on monofilament nets while overlooking the priorities of artisanal fisheries governance in Senegal*. African Journal of Marine Science *39*(3), 339–348. https://doi.org/10.2989/1814232x.2017.1377634

Doumbouya, A., Camara, O. T., Mamie, J., Intchama, J. F., Jarra, A., Ceesay, S., Guèye, A., Ndiaye, D., Beibou, E., Padilla, A., & Belhabib, D. (2017). Assessing the Effectiveness of Monitoring Control and Surveillance of Illegal Fishing: The Case of West Africa. *Frontiers in Marine Science*, *4*. https://doi.org/10.3389/fmars.2017.00050

Dyhia Belhabib, & Philippe Le Billon. (2022). Adjacency and vessel domestication as enablers of fish crimes. *Frontiers in Marine Science*, *9*. https://doi.org/10.3389/fmars.2022.936174

Elliott, V. (2018). Thinking about the Coding Process in Qualitative Data Analysis. *The Qualitative Report*, *23*(11). https://doi.org/10.46743/2160-3715/2018.3560

Erceg, D. (2006). Deterring IUU fishing through state control over nationals. *Marine Policy*, *30*(2), 173–179. https://doi.org/10.1016/j.marpol.2004.11.004

Everett, G. V. (2002). *FAO, Fishery Monitoring, Control and Surveillance (MCS), and the Control of Illegal Fishing*. Aquadocs.org. http://hdl.handle.net/1834/817

Fajardo, T. (2022). To criminalize or not to criminalize IUU fishing: The EU's choice. *Marine Policy*, *144*, 105212. https://doi.org/10.1016/j.marpol.2022.105212

Fillie, M. (2019). Socioeconomic impacts of illegal unreported and unregulated (IUU) fishing on Sierra Leone. *World Maritime University Dissertations*. https://commons.wmu.se/all_dissertations/1198

Gallic, B. L., & Cox, A. (2006). An economic analysis of illegal, unreported and unregulated (IUU) fishing: Key drivers and possible solutions. *Marine Policy*, *30*(6), 689–695. https://doi.org/10.1016/j.marpol.2005.09.008

Global Fishing Watch. (2019). *Sustainability through Transparency | Global Fishing Watch*. Global Fishing Watch. https://globalfishingwatch.org/

Hilborn, R., Amoroso, R. O., Anderson, C. M., Baum, J. K., Branch, T. A., Costello, C., de Moor, C. L., Faraj, A., Hively, D., Jensen, O. P., Kurota, H., Little, L. R., Mace, P., McClanahan, T., Melnychuk, M. C., Minto, C., Osio, G. C., Parma, A. M., Pons, M., & Segurado, S. (2020). Effective fisheries

management is instrumental in improving fish stock status. *Proceedings of the National Academy of Sciences of the United States of America*, *117*(4), 2218–2224. https://doi.org/10.1073/pnas.1909726116

Jesperson, S., & Henriksen, R. (2022). Piracy as a result of IUU fishing: Challenging the causal link. *African Security Review*, *31*(3), 245–260. https://doi.org/10.1080/10246029.2022.2049329

Juned, M., Samhudi, G. R., & Lasim, R. A. (2019). The Impact of Indonesia's Sinking of Illegal Fishing Ships on Major Southeast Asia Countries. *International Journal of Multicultural and Multireligious Understanding*, *6*(2), 62. https://doi.org/10.18415/ijmmu.v6i2.673

Kannan, K. P. (1999). Poverty alleviation as advancing basic human capabilities: Kerala's achievements compared. *Opendocs.ids.ac.uk*. https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/3007

Katikiro, R. E., & Mahenge, J. J. (2016). Fishers' Perceptions of the Recurrence of Dynamite-Fishing Practices on the Coast of Tanzania. *Frontiers in Marine Science*, *3*. https://doi.org/10.3389/fmars.2016.00233

Le Gallic, B. (2008). The use of trade measures against illicit fishing: Economic and legal considerations. *Ecological Economics*, *64*(4), 858–866. https://doi.org/10.1016/j.ecolecon.2007.05.010

Leroy, A., Galletti, F., & Chaboud, C. (2016). The EU restrictive trade measures against IUU fishing. *Marine Policy*, *64*, 82–90. https://doi.org/10.1016/j.marpol.2015.10.013

Liddick, D. (2014). The dimensions of a transnational crime problem: the case of our fishing. *Trends in Organized Crime*, *17*(4), 290–312. https://doi.org/10.1007/s12117-014-9228-6

Mackay, M., Hardesty, B. D., & Wilcox, C. (2020). The Intersection Between Illegal Fishing, Crimes at Sea, and Social Well-Being. *Frontiers in Marine Science*, *7*. https://doi.org/10.3389/fmars.2020.589000

Neiland, A. E., Cunningham, S., Arbuckle, M., Baio, A., Bostock, T., Coulibaly, D., Gitonga, N. K., Long, R., & Sei, S. (2016). Assessing the Potential Contribution of Fisheries to Economic Development —The Case of Post-Ebola Sierra Leone. *Natural Resources*, *07*(06), 356–376. https://doi.org/10.4236/nr.2016.76031

Okafor-Yarwood, I. (2019). Illegal, unreported, and unregulated fishing, and the complexities of the sustainable development goals (SDGs) for countries in the Gulf of Guinea. *Marine Policy*, *99*, 414–422. https://doi.org/10.1016/j.marpol.2017.09.016

Okeke-Ogbuafor, N., & Gray, T. (2021). Is community-based management of small-scale fisheries in Sierra Leone the answer to their problems? *World Development Perspectives*, *21*, 100292. https://doi.org/10.1016/j.wdp.2021.100292

Okeke-Ogbuafor, N., Gray, T., & Stead, S. M. (2019). Is there a "wicked problem" of small-scale coastal fisheries in Sierra Leone? *Marine Policy*, 103471. https://doi.org/10.1016/j.marpol.2019.02.043

Okeke-Ogbuafor, N., Gray, T., & Stead, S. M. (2020). The controversial role of foreign fisheries consultants in Sierra Leone's coastal waters. *Marine Policy*, *118*, 103399. https://doi.org/10.1016/j.marpol.2018.12.018

Pauly, D., & Zeller, D. (2017). Comments on FAO State of World Fisheries and Aquaculture (SOFIA 2016). *Marine Policy*, *77*, 176–181. https://doi.org/10.1016/j.marpol.2017.01.006

Petrossian, G. A. (2012). *The decision to engage in illegal fishing: an examination of situational factors in 54 countries*. Rucore.libraries.rutgers.edu. https://rucore.libraries.rutgers.edu/rutgers-lib/38695/

Petrossian, G. A. (2015). Preventing illegal, unreported and unregulated (IUU) fishing: A situational approach. *Biological Conservation*, *189*, 39–48. https://doi.org/10.1016/j.biocon.2014.09.005

Petrossian, G. A. (2018). A micro-spatial analysis of opportunities for IUU fishing in 23 Western African countries. *Biological Conservation*, *225*, 31–41. https://doi.org/10.1016/j.biocon.2018.06.011

Seto, K., Belhabib, D., Mamie, J., Copeland, D., Vakily, J. M., Seilert, H., Baio, A., Harper, S., Zeller, D., Zylich, K., & Pauly, D. (2017). War, fish, and foreign fleets: The marine fisheries catches of Sierra Leone 1950–2015. *Marine Policy*, *83*, 153–163. https://doi.org/10.1016/j.marpol.2017.05.036

Short, R., Gurung, R., Rowcliffe, M., Hill, N., & Milner-Gulland, E. J. (2018). The use of mosquito nets in fisheries: A global perspective. *PLOS ONE*, *13*(1), e0191519. https://doi.org/10.1371/journal.pone.0191519

Soyer, B., Leloudas, G., & Miller, D. (2017). Tackling IUU Fishing: Developing a Holistic Legal Response. *Transnational Environmental Law*, *7*(1), 139–163. https://doi.org/10.1017/s2047102517000267

Sumaila, U. R., Marsden, A. D., Watson, R., & Pauly, D. (2007). A Global Ex-vessel Fish Price Database: Construction and Applications. *Journal of Bioeconomics*, *9*(1), 39–51. https://doi.org/10.1007/s10818-007-9015-4

Temple, A. J., Skerritt, D. J., Howarth, P. E. C., Pearce, J., & Mangi, S. C. (2022). Illegal, unregulated and unreported fishing impacts: A systematic review of evidence and proposed future agenda. *Marine Policy*, *139*, 105033. https://doi.org/10.1016/j.marpol.2022.105033

Thorpe, A., Whitmarsh, D., Ndomahina, E., Baio, A., Kemokai, M., & Lebbie, T. (2009). Fisheries and failing states: The case of Sierra Leone. *Marine Policy*, *33*(2), 393–400. https://doi.org/10.1016/j.marpol.2008.09.002

United Nations. (2015). *The 17 sustainable development goals*. United Nations. https://sdgs.un.org/goals

Wekke, I. S., & Cahaya, A. (2015). Fishermen Poverty and Survival Strategy: Research on Poor Households in Bone Indonesia. *Procedia Economics and Finance*, *26*, 7–11. https://doi.org/10.1016/s2212-5671(15)00962-4

White, A. T., Vogt, H. P., & Arin, T. (2000). Philippine Coral Reefs Under Threat: The Economic Losses Caused by Reef Destruction. *Marine Pollution Bulletin*, *40*(7), 598–605. https://doi.org/10.1016/s0025-326x(00)00022-9

Willis, S., Bygvraa, D. A., Hoque, Md. S., Klein, E. S., Kucukyildiz, C., Westwood-Booth, J., & Holliday, E. (2023). The human cost of global fishing. *Marine Policy*, *148*, 105440. https://doi.org/10.1016/j.marpol.2022.105440

APPENDICES

APPENDIX 1: VESSELS PRESENT IN GFW DATABASE

YEAR	FLAG	TOTAL
2018	Spain	9
	Italy	8
	France	8
	Senegal	3
	Guinea Bissau	3
	Others	22
2019	France	10
	Spain	7
	Senegal	6
	Italy	5
	El-Salvador	2
	Others	13
2020	France	8
	Senegal	6
	Spain	6
	Italy	5
	Ghana	3
	Others	13
2021	France	8
	Senegal	6
	Spain	6
	El-Salvador	3
	China	3
	Others	11
2022	Senegal	9

	France	9
	China	3
	Spain	2
	Guatemala	2
	Other	10

APPENDIX 2: DIFFERENT TYPES OF FISHING GEAR FROM GFW DATABASE

YEAR	TYPE OF GEAR	AMOUNT
2018	Tuna purse seine	31
	Fishing net	16
	Fishing	4
	Drift away	1
	Boat	1
2019	Tuna purse seine	31
	Fishing net	10
	Fishing	1
	Boat	1
2020	Tuna purse seine	30
	Fishing net	15
2021	Tuna purse seine	25
	Fishing net	6
	Fishing	4
	Drift away	1
	Boat	1
2022	Tuna purse seine	22
	Fishing net	8
	Boat	1
	Fishing	2

APPENDIX 3: SURVEY QUESTIONNAIRE

SIERRA LEONE NAVY

DISSERTATION TOPIC: Estimating the extent of legal and illegal fishing in the EEZ of Sierra Leone.

INFORMED CONSENT STATEMENT

My name is Isha Jebbeh Kpaka, a postgraduate student at the World Maritime University (WMU) specializing in Ocean Sustainability, Governance, and Management (OSGM). I am understanding a research project entitled "Estimating the extent of legal and illegal fishing in the EEZ of Sierra Leone". This survey questionnaire is designed to obtain your observations, views, analyses, and concepts on the research issue.

SUMMARY OF THE DISSERTATION TOPIC

This research aims to assess the extent of legal and illegal fishing in the EEZ of Sierra Leone, by evaluating the fishing fleets operating within Sierra Leone's EEZ and estimating the statistics of vessels licensed to fish and the attributes including flag state, length, fishing gear, and target species. This survey also intends to assess the extent of Stakeholders' involvement in the management of the fisheries resources in Sierra Leone. To achieve the research objectives and its aim it is required that all information requested in the questionnaire should be provided as completely and accurately as possible. The survey should take 30 minutes, participation is voluntary. All your responses will be treated with strict confidentiality and will be used for research purposes only. Your responses will be anonymous. Thank you in advance for your participation.

SURVEY QUESTIONNAIRE

(1). How serious is the problem of illegal fishing by industrial vessels in Sierra Leone's EEZ? Where is this occurring? What types of vessels are involved?

_____
_____
_____

(2). What role does the Sierra Leone Navy play in preventing illegal fishing activities in the EEZ?

_____
_____
_____

(3). How does the Sierra Leone Navy currently monitor and enforce compliance with fishing regulations in the EEZ of Sierra Leone? What technologies do you use? Is your capacity to detect illegal fishing adequate?

_____
_____
_____

(4). In your experience, what are the most common types of illegal fishing activities that occur in the EEZ of Sierra Leone?

_____
_____
_____

(5). What challenges does the Navy face when trying to prevent and deter illegal fishing activities in the EEZ of Sierra Leone?

_____
_____
_____

(6). How do you coordinate with other navies and international organizations to combat illegal fishing activities?

_____
_____
_____

(7). What data and information do you use to assess the extent of illegal fishing activities in your country's waters?

_____
_____
_____

(8). How frequently are industrial vessels sanctioned for illegal fishing? Would you say this has increased, decreased, or stayed the same in the last five years?

_____
_____
_____

(9). Do you think the penalties for individuals and companies caught engaging in illegal fishing activities in your country's waters are strong enough?

_____
_____
_____

(10). In your experience, what are the most effective ways to deter illegal fishing activities in Sierra Leone?

_____
_____
_____

APPENDIX 4: SURVEY QUESTIONNAIRE

ENVIRONMENTAL JUSTICE FOUNDATION

DISSERTATION TOPIC: Estimating the extent of legal and illegal fishing in the EEZ of Sierra Leone.

INFORMED CONSENT STATEMENT

My name is Isha Jebbeh Kpaka, a postgraduate student at the World Maritime University (WMU) specializing in Ocean Sustainability, Governance, and Management (OSGM). I am understanding a research project entitled "Estimating the extent of legal and illegal fishing in the EEZ of Sierra Leone". This survey questionnaire is designed to obtain your observations, views, analyses, and concepts on the research issue.

SUMMARY OF THE DISSERTATION TOPIC

This research aims to assess the extent of legal and illegal fishing in the EEZ of Sierra Leone, by evaluating the fishing fleets operating within Sierra Leone's EEZ and estimating the statistics of vessels licensed to fish and the attributes including flag state, length, fishing gear, and target species. This survey also intends to assess the extent of Stakeholders' involvement in the management of the fisheries resources in Sierra Leone. To achieve the research objectives and its aim it is required that all information requested in the questionnaire should be provided as completely and accurately as possible. The survey should take 30 minutes, participation is voluntary. All your responses will be treated with strict confidentiality and will be used for research purposes only. Your responses will be anonymous. Thank you in advance for your participation.

SURVEY QUESTIONNAIRE

(1). How serious is the problem of illegal fishing by industrial vessels in Sierra Leone's EEZ? Where is this occurring? What types of vessels are involved?

_____

_____

_____

(2). What are some of the most pressing issues associated with illegal fishing your organization is currently working on?

_____

_____

_____

(3). In your opinion, what are the main drivers of illegal fishing activities, and how can they be addressed?

_____

_____

_____

(4). What are your sources of data information relating to illegal fishing in the region and how is the information shared?

_____

_____

_____

(5). What is the nature and level of MCS measures designed to address illegal fishing and the level of expenditure associated with these?

_____

_____

_____

(6). Should there be stronger penalties for individuals and companies caught engaging in illegal fishing activities? If so, what kind of penalties?

_____

_____

_____

(7). How do you collaborate with national governments, international organizations, and other stakeholders to combat illegal fishing?

_____

_____

_____

(8). What more can be done to improve the monitoring and enforcement of fishing regulations in the EEZ of Sierra Leone, to prevent illegal fishing activities?

_____

_____

_____

(9). What are the challenges encountered when trying to prevent and deter illegal fishing activities in Sierra Leone EEZ?

_____

_____

_____

(10). In your opinion, what are the most effective ways to deter illegal fishing activities in Sierra Leone waters?

_____

_____

_____

APPENDIX 5: QUESTIONNAIRE

JOINT MARITIIME COMMITTE

DISSERTATION TOPIC: Estimating the extent of legal and illegal fishing in the EEZ of Sierra Leone.

INFORMED CONSENT STATEMENT

My name is Isha Jebbeh Kpaka, a postgraduate student at the World Maritime University (WMU) specializing in Ocean Sustainability, Governance, and Management (OSGM). I am understanding a research project entitled “Estimating the extent of legal and illegal fishing in the EEZ of Sierra Leone”. This survey questionnaire is designed to obtain your observations, views, analyses, and concepts on the research issue.

SUMMARY OF THE DISSERTATION TOPIC

This research aims to assess the extent of legal and illegal fishing in the EEZ of Sierra Leone, by evaluating the fishing fleets operating within Sierra Leone’s EEZ and estimating the statistics of vessels licensed to fish and the attributes including flag state, length, fishing gear, and target species. This survey also intends to assess the extent of Stakeholders’ involvement in the management of the fisheries resources in Sierra Leone. To achieve the research objectives and its aim it is required that all information requested in the questionnaire should be provided as completely and accurately as possible. The survey should take 30 minutes. participation is voluntary. All your responses will be treated with strict confidentiality and will be used for research purposes only. Your responses will be anonymous. Thank you in advance for your participation.

SURVEY QUESTIONNAIRE

(1). How serious is the problem of illegal fishing by industrial vessels in Sierra Leone's EEZ? Where is this occurring? What types of vessels are involved?

_____

_____

_____

(2). What role does the Joint Maritime Committee play in preventing and deterring illegal fishing activities in the EEZ of Sierra Leone?

_____

_____

_____

(3). How does the JMC currently monitor and enforce compliance with fishing regulations in the EEZ of Sierra Leone, and what are some of the challenges faced?

_____

_____

_____

(4). Is illegal fishing mainly done by foreign-flagged vessels? Can you indicate how many foreign flags are involved in illegal fishing vessels per year? Has this improved or gotten worse over the past 5 years?

_____

_____

_____

(5). How do you coordinate with navies, international organizations, and other stakeholders to combat illegal fishing activities?

_____

_____

_____

(6). What data and information do you use to assess the extent of illegal fishing activities in your country's waters? Are these technologies you find especially effective?

_____

_____

_____

(7). Should there be stronger penalties for individuals and companies caught engaging in illegal fishing activities in your country's waters? If so, what kind of penalties?

---

(8). What more can be done to improve the monitoring and enforcement of fishing regulations in Sierra Leone EEZ to prevent IUU fishing activities?

_____

_____

_____

(9). What are the challenges faced by the JMC when trying to prevent and deter illegal fishing activities in your EEZ?

_____

_____

_____

(10). In your opinion, what are the most effective ways to deter illegal fishing activities in Sierra Leone waters?

_____

_____

APPENDIX 6: SURVEY QUESTIONNAIRE

MINISTRY OF FISHERIES AND MARINE RESOURCES

DISSERTATION TOPIC: Estimating the extent of legal and illegal fishing in the EEZ of Sierra Leone.

INFORMED CONSENT STATEMENT

My name is Isha Jebbeh Kpaka, a postgraduate student at the World Maritime University (WMU) specializing in Ocean Sustainability, Governance, and Management (OSGM). I am understanding a research project entitled "Estimating the extent of legal and illegal fishing in the EEZ of Sierra Leone". This survey questionnaire is designed to obtain your observations, views, analyses, and concepts on the research issue.

SUMMARY OF THE DISSERTATION TOPIC

This research aims to assess the extent of legal and illegal fishing in the EEZ of Sierra Leone, by evaluating the fishing fleets operating within Sierra Leone's EEZ and estimating the statistics of vessels licensed to fish and the attributes including flag state, length, fishing gear, and target species. This survey also intends to assess the extent of Stakeholders' involvement in the management of the fisheries resources in Sierra Leone. To achieve the research objectives and its aim it is required that all information requested in the questionnaire should be provided as completely and accurately as possible. The survey should take 30 minutes. participation is voluntary. All your responses will be treated with strict confidentiality and will be used for research purposes only. Your responses will be anonymous. Thank you in advance for your participation.

SURVEY QUESTIONNAIRE

(1). How serious is the problem of illegal fishing by industrial vessels in Sierra Leone's EEZ? Where is this occurring? What types of vessels are involved?

_____

_____

_____

(2). Can you estimate the proportion of licensed fishing vessels in the industrial fleet for the last five years? Approximately what proportion of the licensed fleet is foreign-flagged or owned?

_____

_____

_____

(3). How would you rate the compliance of the industrial fisheries with Sierra Leone's fisheries regulations? On a scale of 1-10 with 1 being non-compliant and 10 being fully compliant. Please motivate your answer

_____

_____

_____

(4). Are there any particular locations where illegal fishing is more likely to be happening? For example, are you aware of industrial fishing activities occurring in prohibited areas such as Inshore Exclusion Zone (IEZ) and Marine Protected Areas (MPAs)? If so, how is this acted upon? Have there been any arrests?

_____

_____

_____

(5). Are you aware of the use of prohibited fishing gear in Sierra Leone's EEZ? If so, what types and how is this acted upon? Any arrests?

_____

_____

_____

(6). Are you aware of industrial vessels that are operating without VMS, or AIS? If so, how is this acted upon? Any arrests?

_____

_____

_____

(7). Are you aware of any other illegal fishing practices, e.g., fishing vessels that are not operating within their allocated quotas? If so, how is this acted upon? Any arrests?

_____

_____

_____

(8). Overall, how many arrests were made in the last five years for fisheries infractions? Have you noticed an increase or decrease in recent years? Are these domestic or foreign vessels?

_____

_____

_____

(9). How does the MFMR coordinate with other national agencies, navies, international organizations, and other stakeholders to combat illegal fishing activities?

_____

_____

_____

(10). In your opinion, what are the most effective ways to deter illegal fishing activities in Sierra Leone waters?

_____

_____

_____

APPENDIX 7: CONSENT FORM

Dear Participant,

Thank you for agreeing to participate in this research survey, which is carried out in connection with a Dissertation that will be written by the interviewer, in partial fulfillment of the requirements for the degree of Master of Science in Maritime at the World Maritime University in Malmo, Sweden.

The topic of the Dissertation is …Estimating the extent of Legal and Illegal Fishing in EEZ of Sierra Leone……...

The information provided by you in this interview will be used for research purposes and the results will form part of a dissertation, which will later be published online in WMU's digital repository (maritime commons) subject to final approval of the University and made available to the public. Your personal information will not be published. You may withdraw from the research at any time, and your data will be immediately deleted.

Anonymized research data will be archived on a secure virtual drive linked to a World Maritime University email address. All the data will be deleted as soon as the degree is awarded.

Your participation in the interview is highly appreciated.

Student's name ……ISHA JEBBEH KPAKA…….

Specialization ……OCEAN SUSTAINABILITY GOVERNANCE AND MANAGEMENT…

Email address ……w1012931@wmu.se……

* * *

I consent to my data, as outlined above, being used for this study. I understand that all personal data relating to participants is held and processed in the strictest confidence, and will be deleted at the end of the researcher's enrolment. Name: ……

Signature: ……

Date: ……