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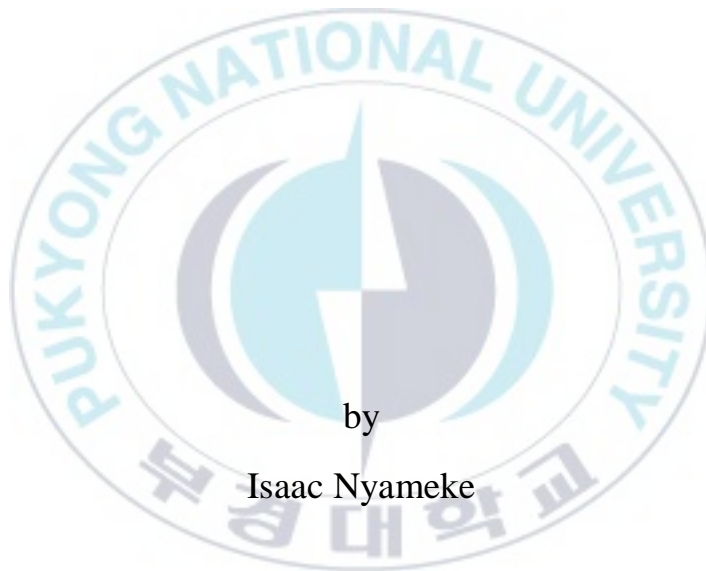
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Thesis for the Degree of Master of Fisheries Science

An assessment of the impact of foreign  
fishing in EEZ of African Countries



by

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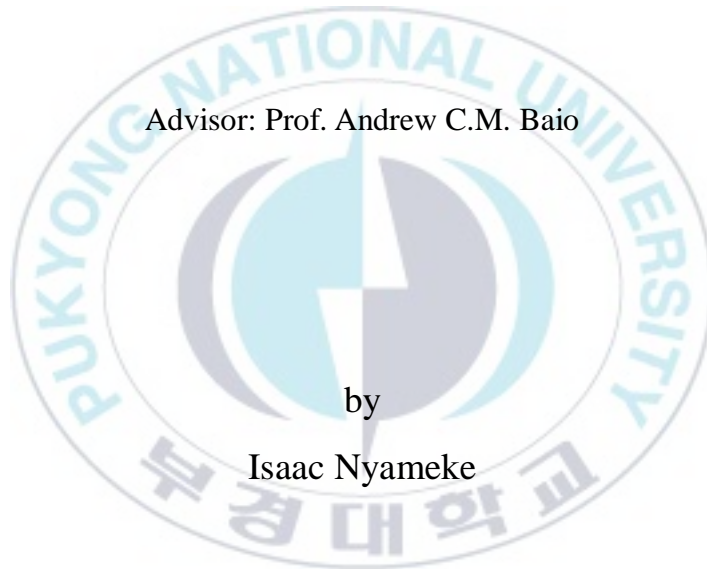
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August, 2021

An assessment of the impact of foreign fishing in  
EEZ of African Countries

아프리카 국가 배타적경제수역에서의  
외국어업의 영향평가

Advisor: Prof. Andrew C.M. Baio



by

Isaac Nyameke

A thesis submitted in partial fulfillment of the requirements

For the degree of

Master of Fisheries Science

Division of Fisheries Science, The Graduate School of World Fisheries University

Pukyong National University

August, 2021

# An assessment of the impact of foreign fishing in EEZ of African Countries

A thesis

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August 27, 2021

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# **An assessment of the impact of foreign fishing in EEZ of African Countries**

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## **Abstract**

This study assesses the impact of foreign fishing in the exclusive economic zone (EEZ) of African countries. The top 12 African marine fisheries producing countries, (3 countries per regional block) were studied using a 10-year (2006 to 2016) foreign catch data. We found 52 foreign countries fishing in African EEZ. Europe had the highest number of countries (24), followed by Africa (18), Asia (5) and North American (5). Foreign catch excluding reflagged vessel, constituted 39% of the African marine fisheries production of which 54% was caught by Europe, Asia (24.42%), Africa (10.93%) and North America (7.96%). The top 5 foreign catch countries by volume were China, Russia, Japan, Spain and Belize whereas, the top 4 commercial fishes caught by volume were perch-like species 15.50%, herring-like (13.26%), tuna (9.65%) and anchovies (9.47%). Bottom trawlers were the dominant gears used by Asian countries whereas, European and North American countries used pelagic trawlers. African countries used gillnet and encircling net. Foreign catch had quadrupled from 400,000 tons in 1996 to 1,600,000 tons in 2016. The fishing agreements between the foreign fishing countries and African marine countries have increased astronomically from 36 in 1960s to 307 in 2000. EU countries engaged in regional fishing agreement while Asian countries focused on government-to-government agreements. North Americans used private company partnerships agreement. Agreements with regional fisheries management organisations (RFMOs) have increased from 1.96% in 2008 to 4.04% in 2015. We noted that ex-vessel price paid by foreign fishing vessels were underestimated and differ from country to country for the same volume of species. Asian countries were found to exchange payment of ex-vessel value with project development such as building of port, football stadium, among others. The hypothesis that foreign fishing is a major contributing factor for the depletion of African countries marine fisheries resources has been accepted. The hypothesis is even strongly accepted if the 40% of the estimated total catch tagged as reflagged catch (foreign

catch renamed as national catch when foreign vessels enter joint venture arrangements and carry the host nation's flag) is correctly categorised as foreign catch. We recommend that RFMOs and other regional and sub-regional institutions support member states with technical and material resources in order to comply with the United Nations Convention of the sea (UNCLOS) regulations.



## **I. Introduction**

The world marine capture fisheries production has been part of human societal setting since the first century, to which Africa is no exception (see Marean et al. 2007). It has been reported (FAO 2018) that the African marine fisheries sector is an important source of animal protein in-take and employment for many rural communities along the coast. The fisheries sector is estimated to provide direct employment for about 60 million people globally of which 25.4 million are from Africa (FAO, 2001). de Graaf (2014) revealed that of the 25.4 million employed in African fisheries, 7.8 million (21%) are engaged in full-time and part time fishing whilst 17.6 million (42.4%) work in the post-harvest sectors. Murekezi (2020) assessment showed that African marine fisheries production has quadrupled from 2,000,000 tons in 1957 to 8,000,000 in 2018 - with an annual growth rate of 2.6% (Figure 1). As Belhabib et al. (2012b) suggested, the increase in African marine fisheries production is due to the use of modern technology in the African marine economic exclusive zone (EEZ) namely engine boats, fish finders, sonar coupled with overcapacity.

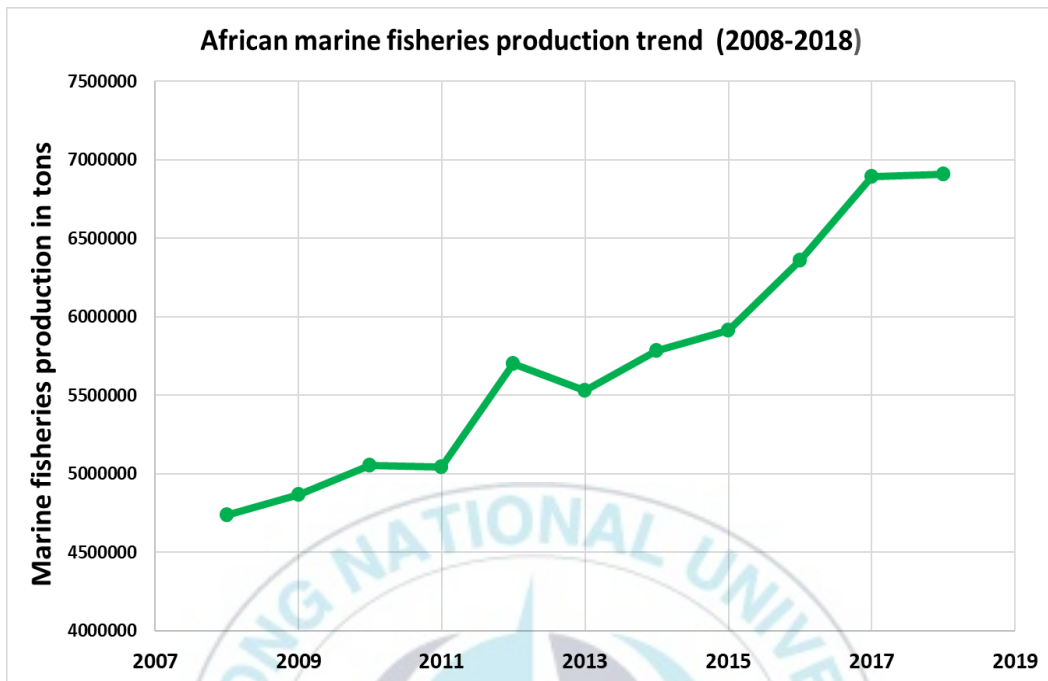


Figure 1: African marine fisheries production from 2008 to 2018

The African Union (2014) annual report estimated the value of African marine fisheries catch at US\$24 billion, contributing about 1.26 % of Africa’s GDP in 2015. But Cashion et al (2018) was concerned that there is no comprehensive data on licence fees paid by foreign fleets to African countries. FAO (2014) distant water fishing nations (DWFNs) report confirmed that about 25% of all marine catches around Africa are harvested by non-African countries valued at US\$0.4 billion. This is a far cry from Graaf’s (2014) ex-vessel value estimated at US\$ 3.3 billion.

Archaeologist (e.g. Erlandson 2001) have documented that the first human use of marine resource was in Africa around 125,000 years ago. The “Sea Around Us” project of the University of British Columbia (Zeller et al. 2020) submitted that, there are seven Large Marine Ecosystems (LMEs) in Africa (Figure 2). As Pauly (1995) maintained, these LME are among the most productive fisheries areas in the world because of their latitude, climate conditions, and wind speed that influences the upwelling systems.

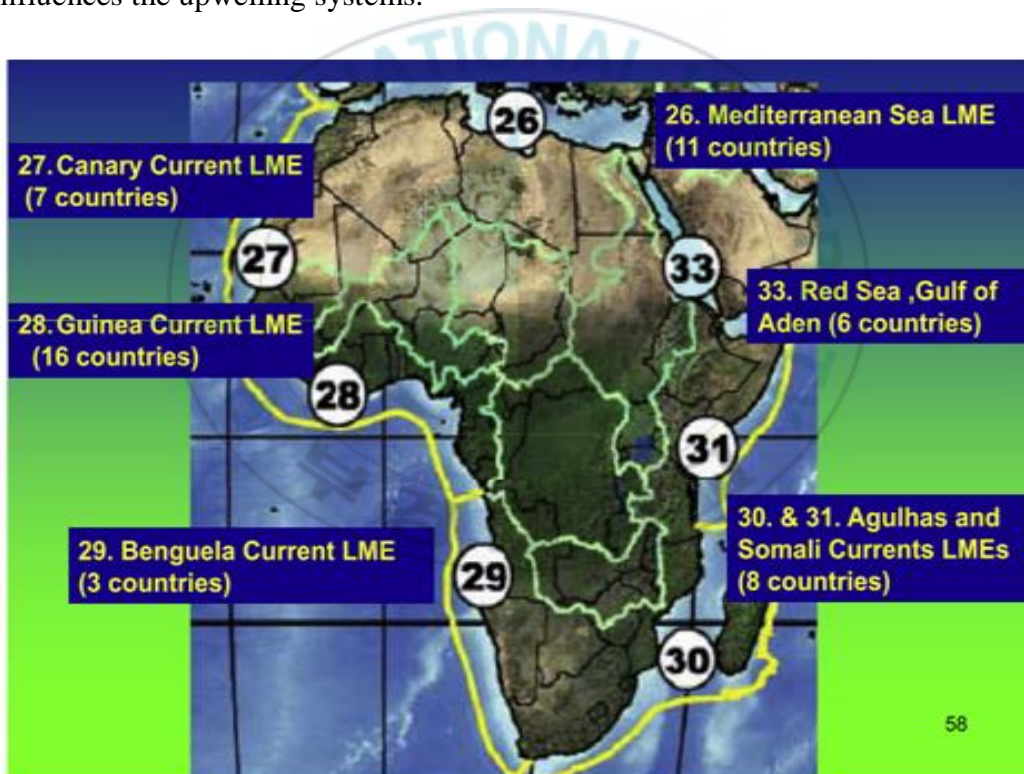


Figure 2: African Large Marine Ecology System Map adopted from Brown (2015)

## **1.1. Problem statement**

Notwithstanding the increasing trend of the African marine fisheries production (Figure 2), (de Graaf et al., 2014) showed that fish production per country varies considerably (Figure 3). Although, some indices such as Fisheries Performance Index (FPI) (Anderson et al. 2015) and Rapid Appraisal Performance Fish Index (RAPFish) (Alder et al. 2000) have been developed to analyse and evaluate the fisheries performance of various countries; no specific scientific research that explains the impact of the foreign fishing in EEZ of African countries has been undertaken. Thus, it is worthwhile to undertake this research to further investigate and explain the impact of foreign fishing in EEZ of African countries so as to ensure food security and resource sustainability in African countries in consonance with the Sustainable Development Goals (SDGs) 1,2,3, 7, 12, and 14 (Singh et al. 2018; GEF LME:LEARN 2017).

### **1.1.1 Rationale for assessing the impact of foreign fishing in EEZ of African marine countries.**

Foreign fishing in the EEZ of African countries dominates fishing operations on the continent and accounts for about 40% of the African marine fisheries catch. It is therefore not surprising that, foreign distant water fishing catch volumes are comparable to the maximum sustainable yield (MSY) and total allowable catch (TAC) quota of the countries. Again, foreign catch is legal and underwritten by the UNCLOS regulations. The UNCLOS rules allows countries to make the surplus of its fisheries resources available to other countries (UN 1982). However, UNCLOS rules emphasis that before a country can give right of access to foreign catch countries, priority should be given to economic and regional development. Moreover, as Villasante et al. (2013) maintained, foreign catch fishing vessels have the capacity and modern technologies such as sonar, fish finders, fishing gears such as bottom trawlers with the inclination of overexploiting or even depleting the marine fisheries resources of the host countries.

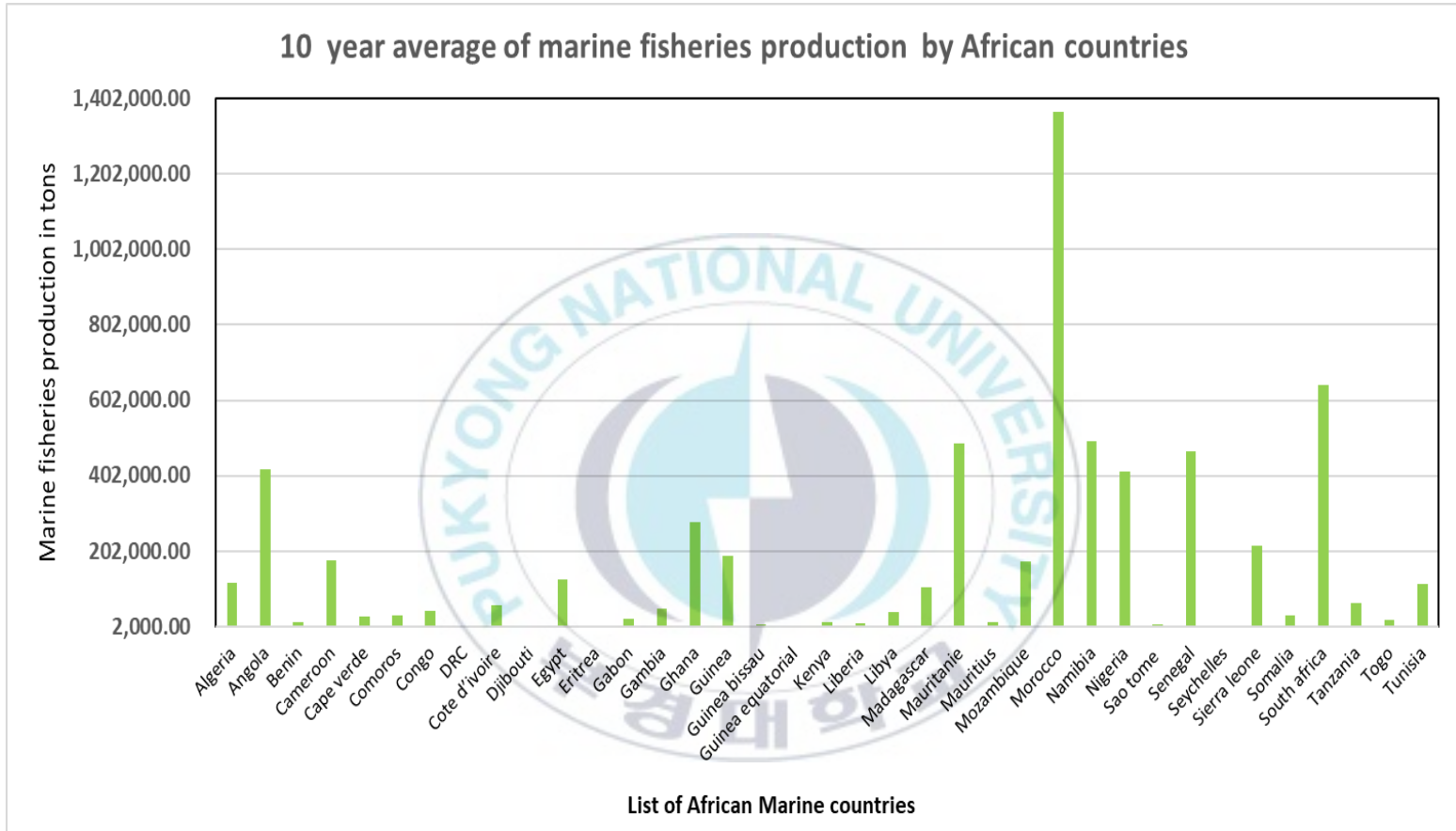


Figure 3: African countries marine fisheries production, 10-year average (from 2008 to 2018)



## **1.2. Research objective**

It is against the foregoing backdrop that the investigation focuses on:

1. Assessing the contribution and impact of foreign fishing in the exclusive economic zones (EEZ) of African marine countries.

### **1.2.1. Research question**

Consequently, the central question is:

1. What is the contribution and impact of foreign fishing to the total African marine fisheries production?

### **1.2.2. Research hypothesis**

We have thus hypothesised that:

Foreign fishing catch is the single most important catch contributing to the overexploitation and depletion of African marine fisheries resources.

## **1.3. Study Area**

### **1.3.1. Geographic location, economic and social environment**

Africa lies between 9.1021° N, 18.2812°E, bordered by the Mediterranean Sea to the north, the Red Sea to the northeast, the Indian Ocean to the southeast and the Atlantic Ocean to the west (AU 2012). The continent has been confirmed (IMF 2012) as the second-largest continent with a land size of 30.3 million km<sup>2</sup> with Algeria as the largest country by area. Africa is made up of 55 countries of which 37 are coastal. In 2018, World Population report (UNDP 2020) estimated African population at 1.4 billion with 60% of the population living on US\$ 2 per day and another 40% living within 50km of the coast (World Bank 2012).

African Union (AU) is the African geopolitical body based in Addis Ababa that governs the affairs of political and economic development of the countries similar in configuration to the European Union in Europe (AUC-NEPAD 2014). The continent is agrarian and endowed with abundant natural resources. The GDP of Africa was estimated at \$2.6 trillion in 2019 with an annual growth rate of 4%. The fisheries sector contributes about 1.2% to the African GDP (Odido, n.d.).

### **1.3.2. Climate condition**

Africa falls within the equator (Cropper 2014) with an average annual temperature of 28°C. As Allison et al. (2009) submitted, Africa is the most vulnerable continent to climate change because of the hot weather

### **1.3.3. African marine environment, EEZ and fisheries production**

Africa is acknowledged to be endowed with marine fisheries with a marine EEZ of about 12,216,296 km<sup>2</sup> (Figure 4) surrounded by seven LME (Pauly 1995; Brown 2016) and produces an average of about 6,700,000mt of fish per year (Figure 1). The UNCLOS of 1982 ratification records (Malone 1983) showed that most African countries have signed and ratified UNCLOS rules and regulations. Additionally, nearly all the African countries have developed national fisheries and aquaculture policies in line with FAO and AU fisheries and aquaculture Code of Responsible Fishing and compliance agreement (AU-IBAR 2016).

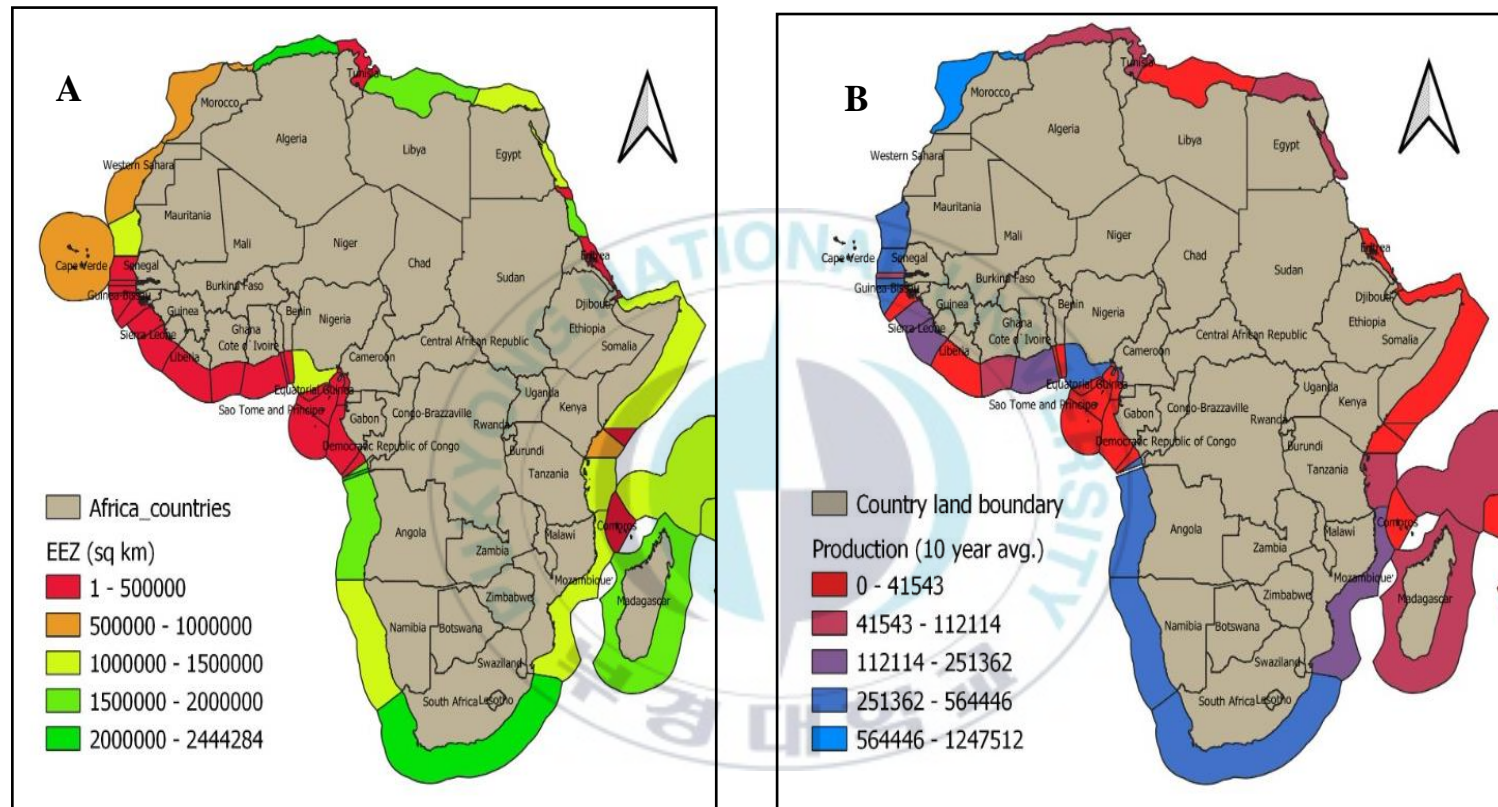


Figure 4: African marine fisheries EEZ and fish production maps.

#### **1.3.4. Marine Fisheries bodies in Africa**

African Union Inter-African Bureau for Animal Resource (AU-IBAR ) is the African political body in charge of fisheries and aquaculture development (AU-IBAR 2016). It is based in Nairobi, Kenya. Other important regional fisheries management organizations (RFMOs) or regional fisheries bodies (RFBs) that are operating in the marine environment include;

##### ***CECAF***

The Committee for the Eastern Central Atlantic Fisheries (CECAF) is an advisory body with membership of 33 coastal and non-coastal states, including the EU. It has a scientific sub-committee and three Working Groups on small pelagics, demersal species and for artisanal fisheries.

##### ***ATLAFCO/COMHAFAT***

The Ministerial Conference on Fisheries Cooperation between African States Bordering the Atlantic Ocean (ATLAFCO/COMHAFAT), with 22 member states. It is an advisory body made up of most of the coastal states of the western coast of Africa<sup>1</sup>

##### ***FCWC***

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<sup>1</sup> <http://www.fao.org/fishery/rfb/srhc/en>

The Fishery Committee for the West Central Gulf of Guinea (FCWC) is a sub-regional body of six coastal states including Liberia and Nigeria. Its main objective is to ensure, through appropriate management, ‘the conservation and optimum utilization of the living marine resources covered by the Convention and encouraging sustainable development of fisheries based on such resources’<sup>2</sup>

### ***ICCAT***

International Convention on the Conservation of Atlantic Tunas (ICCAT), is mandated to take conservation and management measures of Atlantic Tunas that are legally binding on its members.

### ***SRFC***

The Sub-Regional Fisheries Commission (SRFC)<sup>3</sup> was established in 1985 by a convention which underwent amendment in 1993. The inter-governmental fisheries cooperation organisation comprises of 7 member States: Cape Verde, The Gambia, Guinea, Guinea-Bissau, Mauritania, Senegal and Sierra Leone. Its mandate includes strengthening the regional cooperation to enhance the sustainable management of fisheries resources in maritime waters under the jurisdiction of member States. Article 2 of the SRFC Convention of 1985

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<sup>2</sup> <http://www.fao.org/fishery/rfb/fwc/en>

<sup>3</sup> <http://www.spcsrp.org/en/presentation#History>

emphasises harmonisation of national policies of Member States on the preservation, conservation and exploitation of fisheries resources and strengthen cooperation for the well-being of the populations. Specific objectives are:

1. Ensuring harmonization and consistency of national fisheries policies, with regards to the conservation and exploitation of fisheries resources.
2. Fostering sub-regional cooperation for monitoring, control and surveillance of fisheries zones, including providing institutional, legal and operational support to eliminate illegal, unreported and unregulated (IUU) fishing.
3. Strengthening human capacities to undertake fisheries research activities.
4. Reinforcing the scientific and technical information system.
5. Ensuring adoption of joint strategies by international bodies.

The commission is currently coordinating the West African Regional Fisheries Programme.

## *IOTC*

The Indian Ocean Tuna Commission (IOTC)<sup>4</sup> sets out to promote cooperation among the Members and cooperating non-members of the IOTC in order to ensure the conservation and optimum utilisation of stocks covered by the organisation's establishing Agreement and encouraging sustainable development of fisheries based on such stocks. The key functions are:

1. Stocks assessment to gather, analyse and disseminate scientific information, catch and effort statistics and other data relevant to the conservation and management of the stocks and to fisheries based on the stocks;
2. Research and development activities in respect of the stocks and fisheries covered by the IOTC, and other activities such as transfer of technology, training and enhancement whilst ensuring the equitable participation of Members
3. Conservation and Management Measures (CMM) to ensure the conservation of the stocks covered by the Agreement and to promote the objective of their optimum utilisation throughout the Area;
4. Economic and social aspects assessment of the fisheries based on the stocks covered by the Agreement bearing in mind, in particular, the interests of developing coastal States.

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<sup>4</sup> <http://www.iotc.org/about-iotc>



## ***COREP***

Regional Commission of Fisheries of Gulf of Guinea (COREP)<sup>5</sup> is a specialized intergovernmental institution of the Economic Community of Central African States. COREP's mission is to assist Member States in ensuring sustainable fishing and its protection, and as well as promoting development of aquaculture for the well-being of the greatest number of people. Created by the Convention on the Regional Development of Fisheries in the Gulf of Guinea, the document was signed 21 June 1984 in Libreville, Gabon. Members States are Cameroon, Congo (Dem Rep of), Congo (Rep of), Gabon, as well as Sao Tome e Principe. Angola and Equatorial Guinea have observer status. COREP and The Abidjan Convention signed a MoU for cooperation in the following areas:

1. Determining the status of fishery resources and aquatic ecosystems of the marine and continental environments of the area.
2. Conservation and protection of fishery resources and aquatic ecosystems in marine and inland waters.
3. Management and sustainable development of fisheries and aquaculture in marine and continental environments.

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<sup>5</sup>[http://www.abidjanconvention.org/media/documents/press\\_speech/Press%20Release%20on%20MoU%20with%20COREP.pdf](http://www.abidjanconvention.org/media/documents/press_speech/Press%20Release%20on%20MoU%20with%20COREP.pdf)

### *The Abidjan Convention*

The Convention<sup>6</sup> which came into effect in 1984 forges cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the West, Central and Southern Africa Region (also known as the Abidjan Convention). The designated area rich in fish and petroleum resources covers 22 states with a combined coastline of just over 14,000 kilometres on Africa Atlantic Ocean from Mauritania to South Africa. Countries in the Abidjan Convention area: are Angola, Benin, Cameroon, Cape Verde, Congo (Democratic Republic of), Congo (Republic of), Côte d'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mauritania, Namibia, Nigeria, Sao Tome e Principe, Senegal, Sierra Leone, South Africa and Togo. Of these, 17 are currently parties to the Convention. It aims to curbing dumping of undesirable matter from ships; pollution from land-based sources, exploration and exploitation of the sea-bed. The Convention provides for liability and compensation in case of pollution. It is the basis for cooperative efforts to address other issues such as overfishing, control of the fish stocks, coastal-based tourism, coastal erosion, specially protected areas, and environmental impact assessment in the region. Major achievements are:

1. Adoption of a Regional Contingency Plans and other Means of Preventing and Combatting Pollution Incidents (2011)

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<sup>6</sup> <http://www.abidjanconvention.org/>

2. Additional Protocol to the Abidjan Convention Concerning Cooperation in the Protection and Development of Marine and Coastal Environment from Land-based Sources and Activities in the Western, Central and Southern African Region (the LSBA Protocol - 2012)
3. The *Ad Hoc* Committee on Science and Technology (created 2014)
4. Regional Coordination Centre for Marine Pollution Emergency of the Abidjan Convention.

### **SWIOFC**

The Southwest Indian Ocean Fisheries Commission (SWIOFC)<sup>7</sup> promotes the sustainable utilization of the living marine resources of the Southwest Indian Ocean region, by the proper management and development of the living marine resources. It also addresses common problems of fisheries management and development faced by the Members of SWIOFC. The membership of SWIOFC includes Comoros, Madagascar, Somalia, South Africa, Mozambique, United Rep. of Tanzania, Kenya, Egypt, Seychelles, Mauritius, Morocco, Namibia and non-African countries, such as France, Maldives and Yemen. Key functions are:

1. Contribute to improved governance through institutional arrangements that encourage cooperation amongst members;

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<sup>7</sup> [http://d2ouvy59p0dg6k.cloudfront.net/downloads/swiofc\\_booklet\\_2015.pdf](http://d2ouvy59p0dg6k.cloudfront.net/downloads/swiofc_booklet_2015.pdf)

2. Help fishery managers in the development and implementation of fishery management systems that take due account of environmental, social and economic concerns;
3. Assess the state of the fishery resources in the area and the industries based on them;
4. Promote, encourage and coordinate research related to the living marine resources in the area and draw up programmes required for this purpose, and to organize such research as may be necessary;
5. Promote the collection, exchange, dissemination and analysis or study of statistical, biological, environmental and socio-economic data and other marine fishery information;
6. Provide scientific basis to assist Members in taking fisheries management decisions;
7. Provide advice on management measures to member governments and competent fisheries organizations;
8. Provide advice and promote co-operation on monitoring, control and surveillance, including joint activities, especially as regards issues of a regional or sub-regional nature;
9. Encourage, recommend and coordinate training in the areas of interest of the Commission;

10. Promote and encourage the utilization of the most appropriate fishing craft, gear, fishing techniques and post harvesting technologies.

### ***IGCC***

Interim Guinea Current Commission (IGCC) was established by the Abuja Ministerial Declaration in 2006 for leadership and coordination of the Guinea Current Large Marine Ecosystem (GCLME) Project. IGCC comprises of Angola, Benin, Cameroun, Congo, Cote D'Ivoire, DR Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea-Bissau, Liberia, Nigeria, Sao Tome Principe, Sierra Leone, and Togo. As a global resource, GCLME is among the most productive coastal and offshore waters in the world. The region is home to vast fishery resources, precious minerals, as well as oil and gas reserves. It also holds high potential for eco-tourism and is an important reservoir of globally significant marine biodiversity. However, the GCLME's habitats and living resources are threatened by human activity, including overexploitation, pollution from land- and sea-based sources, and ecosystem alterations resulting in the degradation of coastal habitats through erosion. The aim of the IGCC is to manage, develop and protect the coastal and marine environment from pollution and degradation; provide scientific evidence and information relating to degradation and changing state of coastal areas and marine ecosystem. The determination of the causes and sources of coastal and marine problems is another key activity. Target beneficiaries of the GCLME/ IGCC is the population of the Guinea Current

Countries, in particular the fishing communities with an emphasis on women. Government and Institutions will benefit from institution strengthening as a result of networking and training programs.

### ***BCC***

The Benguela Current Commission (BCC)<sup>8</sup> is a multi-sectoral inter-governmental, initiative involving Angola, Namibia and South Africa. It pursues the aims of the Benguela Current Large Marine Ecosystem (BCLME) - sustaining human and ecosystem well-being. The BCLME is richly endowed with both living and non-living resources – from large oil and gas reserves to abundant fisheries and unrivalled natural beauty. The BCC provides guidance for the countries of the region to introduce an “ecosystem approach to ocean governance”. This means that the three countries work together to manage the marine environment. The BCC was established in 2007 through the signing of an Interim Agreement. In 2013, the governments of Angola, Namibia and South Africa signed the Benguela Current Convention, a ground breaking environmental treaty that entrenched the Benguela Current Commission as a permanent inter-governmental organisation. It extends from east of the Cape of Good Hope, northwards to Cabinda Province in Angola and encompasses the full extent of Namibia’s marine environment. It is a major coastal upwelling

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<sup>8</sup> <http://www.benguelacc.org/index.php/en/about/what-is-the-bcc>

ecosystem and an important centre of marine biodiversity and marine food production. The Benguela is particularly productive in terms of fisheries resources, but top predators such as seabirds and marine mammals are also abundant. Commercial fisheries and the extraction of non-living natural resources such as oil, gas, diamonds and other minerals, are the focus of industrial activities in the region. It is estimated that coastal and marine resources contribute approximately US\$269 billion per year to the economies of Angola, Namibia and South Africa. Specifically, the aims of BCC are:

1. Preventing and eliminating pollution and taking steps to protect the marine ecosystem against any adverse impacts;
2. Undertaking environmental impact assessments for activities that might have negative impacts on the marine and coastal environment;
3. Collecting, sharing and exchanging data;
4. Where possible, reversing and preventing habitat alteration and destruction; protecting vulnerable species and biological integrity;
5. Improving human capacity and infrastructure.

### ***Canary Current Large Marine Ecosystem (CCLME)***

The Canary Current Large Marine Ecosystem (CCLME) project<sup>9</sup> combines fisheries and ecosystem governance frameworks and uses governance reforms, investments and management programs to empower the participating countries in order to address priority transboundary concerns on declining fisheries, associated biodiversity and water quality. The CCLME project is executed by the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Environment Programme (UNEP) in a combined effort to reverse the degradation of the Canary Current large marine ecosystem caused by over-fishing, habitat modification and changes in water quality by adoption of an ecosystem-based management approach. The project which operated between 2010-2015 was operational in seven participating countries Cape Verde, Guinea, Guinea Bissau, Mauritania, Morocco, Senegal and The Gambia. The project is funded by the Global Environment Facility (GEF) together with co-financing from participating countries and other partners. The project is open for co-funding and collaboration with parties interested in contributing to ecosystem management of the Canary Current region. Key project outcomes were:

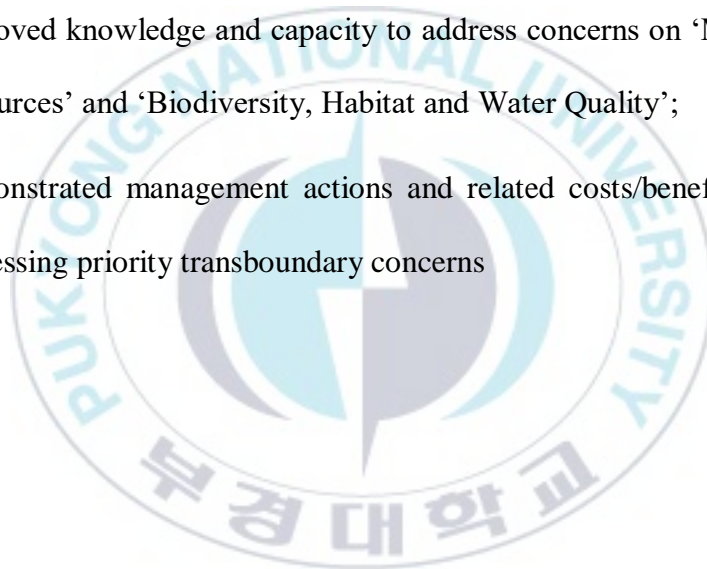
1. Multi-country agreement on priority transboundary issues, governance reforms and investments to address priority transboundary issues;

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<sup>9</sup> <http://www.fao.org/in-action/canary-current-lme/en/>



2. A sustainable legal/institutional framework for the CCLME;
3. Strengthened existing transboundary waters institutions and regional policies and instruments;
4. Stakeholders' involvement in transboundary waterbody priority setting and strategic planning, including 7 functioning National Inter-Ministry Committees;
5. Improved knowledge and capacity to address concerns on 'Marine Living Resources' and 'Biodiversity, Habitat and Water Quality';
6. Demonstrated management actions and related costs/benefits valuations addressing priority transboundary concerns



## II. Materials and Methods

### 2.1. Materials

#### 2.1.1. Flowchart

The flowchart illustrated in Figure 6 was developed as a road map to guide the study as explained in sections 2.12 to 2.7.0.

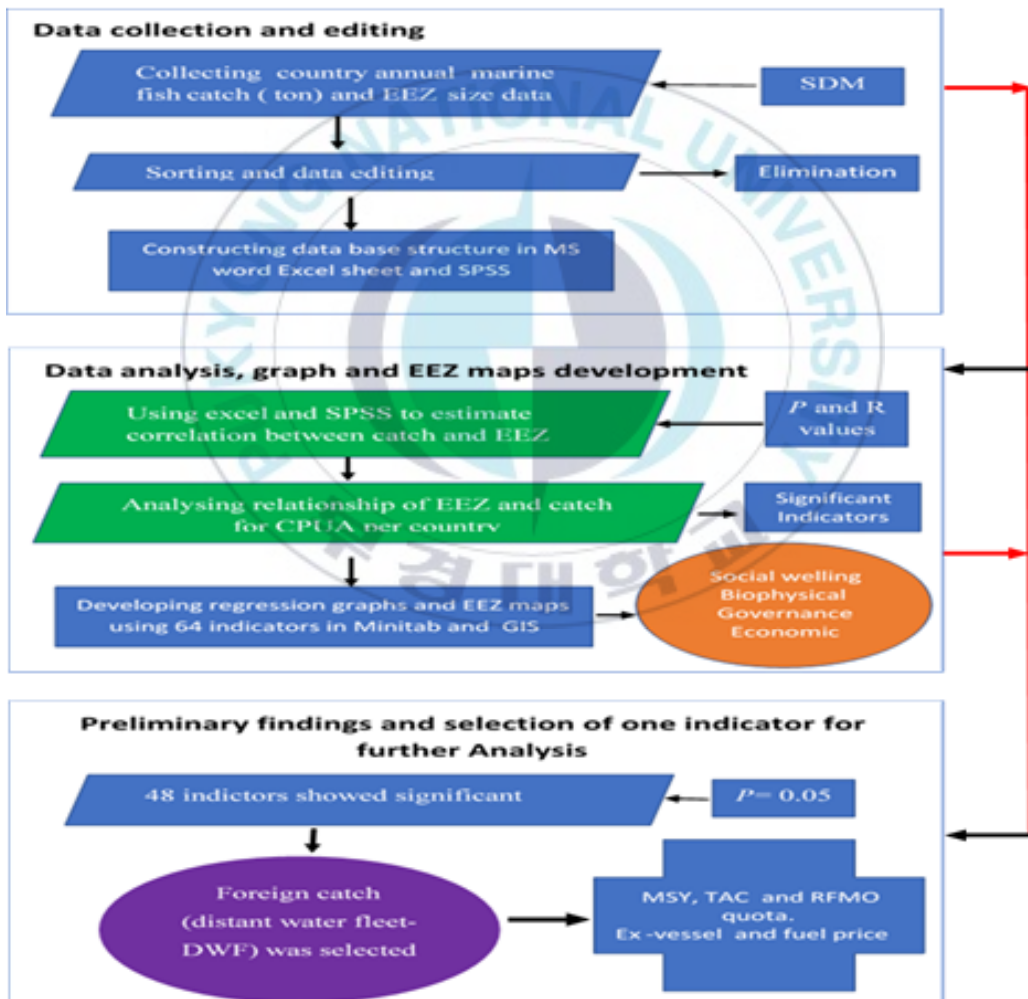


Figure 5:Flowchart illustrating how the research was conducted.

### **2.1.2. Catch per unit area (CPUA)**

Catch per unit area (CPUA) for each country was calculated using the country's average marine fisheries catch data from 1998 to 2018 (10 years) and dividing by the country's EEZ size as shown below.

$$\text{CPUA (Ton/ km}^2\text{)} = \frac{\text{Annual Marine Fisheries production (Metric Ton)}}{\text{Economic Exclusive Zone (km}^2\text{)}}$$

### **2.2.2 Data Entry into Excel and SPSS and elimination of outliers**

The data collected were entered into MS Excel and SPSS. It was then edited using 95% interval confidence to eliminate extreme outliers to ensure consistency.

### **2.2.3. Data analysis and representation of findings**

Regression Analysis was carried out in data analysis to determine any significant relationships ( $P = 0.05$ ) (Rosenblad 2017) as well as for the correlation (R-square values) between the CPUA and Foreign Catch.

## Foreign catch in Africa countries EEZ

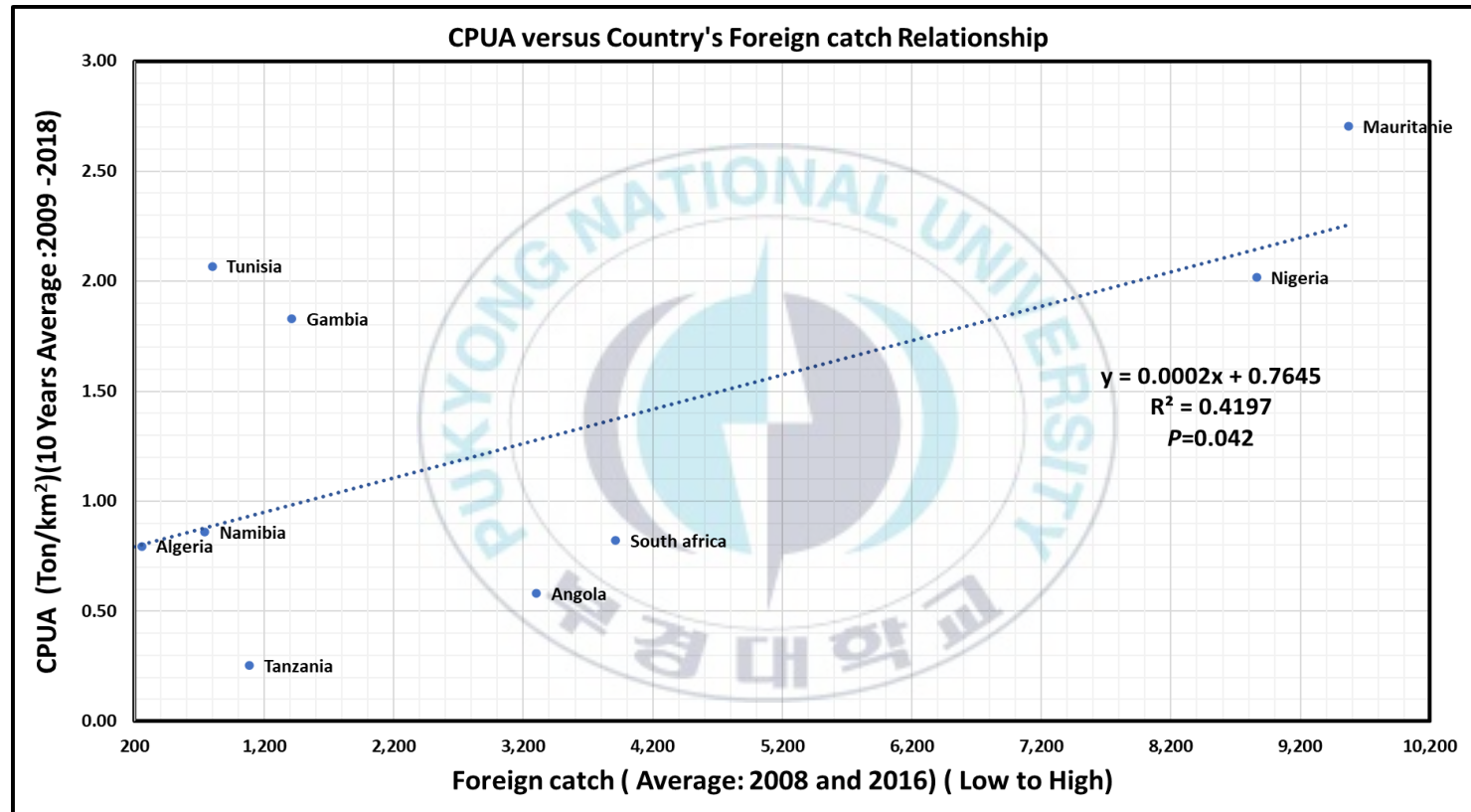


Figure 6: Foreign catch versus CPUA in selected African countries

#### 2.2.4. Ranking and selection of the top 3 CPAU for further analysis

The top 3 countries in each regional block (North, South, East and West) with the highest CPAU were selected making a total of 12 countries (Figure 7). The 12 countries selected were Morocco, Mauritania, Tunisia, South Africa, Angola, Namibia, Djibouti, Comoros, Tanzania, Nigeria, Gambia and Senegal as illustrated in Figure 7. The least CPAU were not used because of high variance between the highest CPAU (0.18 - 2.7) and the least CPAU (0.01-1.77).

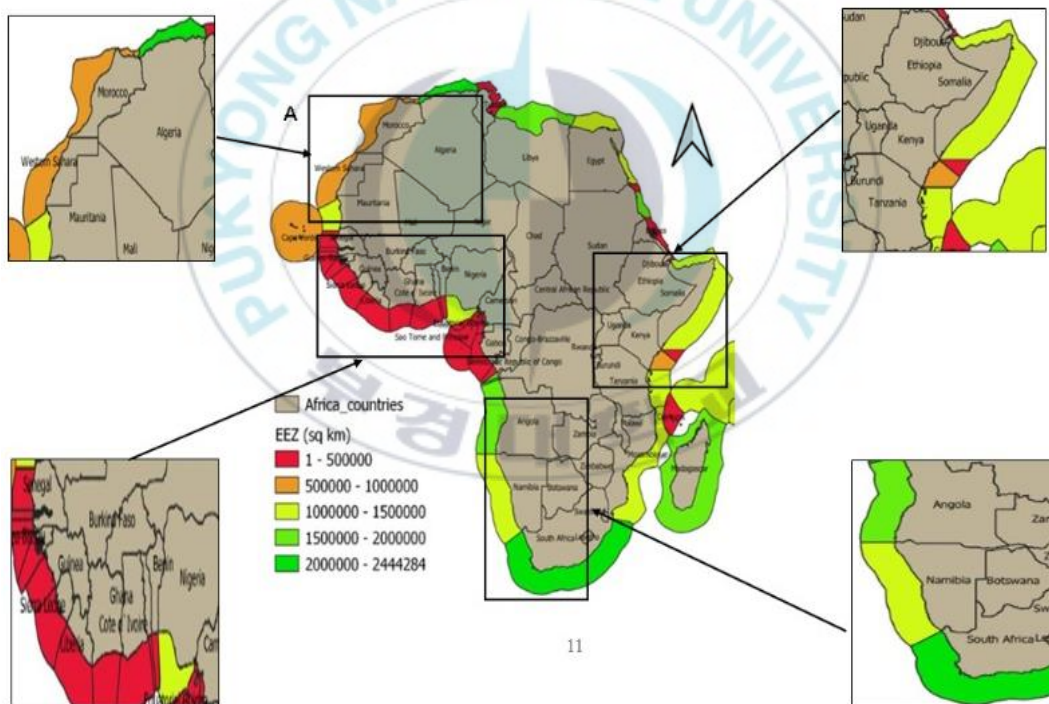


Figure 7: Regional Blocks where the 12 top countries were selected.

### III. Results

#### 3.1. Number of Foreign Catch Countries in African Marine EEZ

A total of 52 foreign catch fishing countries from 4 continents are fishing in African marine EEZ. Table 6 outlines the number of countries per continent fishing in African EEZ from 2006 to 2016. Europe has the highest number of foreign catch countries (24) in African EEZ followed by Africa (18) countries. Asia and North America each recorded (5) fishing countries.

**Table 1: Number of foreign fishing countries in African marine EEZ**

No	Continent	Number of countries	Average annual catch per ton
1	Asia	5 (9.62%)	855,129.23 (26.42%)
2	Africa	18 (34.62%)	353,817.27 (10.93%)
3	North America	5 (9.62)	257,757.02 (7.96%)
4	Europe	24 (46.15%)	1,769,637.24 (54.68%)
5	Australia	0 (0%)	0 (0%)
<b>Total</b>		<b>52 (100%)</b>	<b>3,236.340.76 (100%)</b>

Source: Compiled by authors from Sea Around Us database

### 3.2. Percentage of foreign catch in African marine EEZ

Foreign catch excluding reflagged vessel constituted 39% of African marine fisheries production from 2006 to 2016 (Figure 8). Fifty-four percent of foreign catch per volume was caught by Europe followed by Asia (24.42%), African (10.93%) with North America catching the least; (7.96%). Asia countries were found to have the highest foreign catch in the eastern and southern African countries while Europe dominated the northern and western African countries (Figure 9). North America do not have presence in the Eastern Africa block.

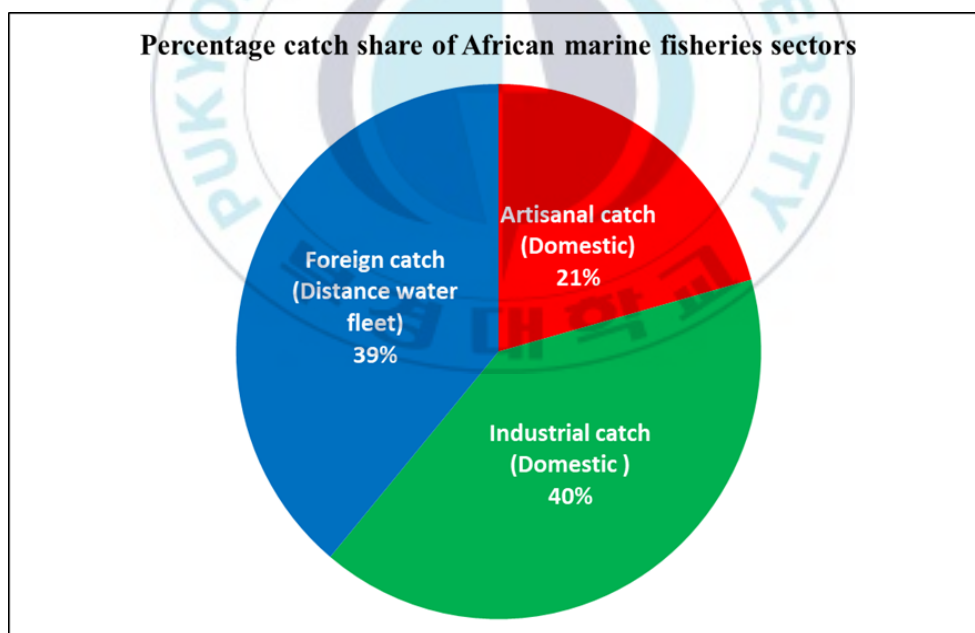


Figure 8:Percentage of catch by African marine fisheries sector.

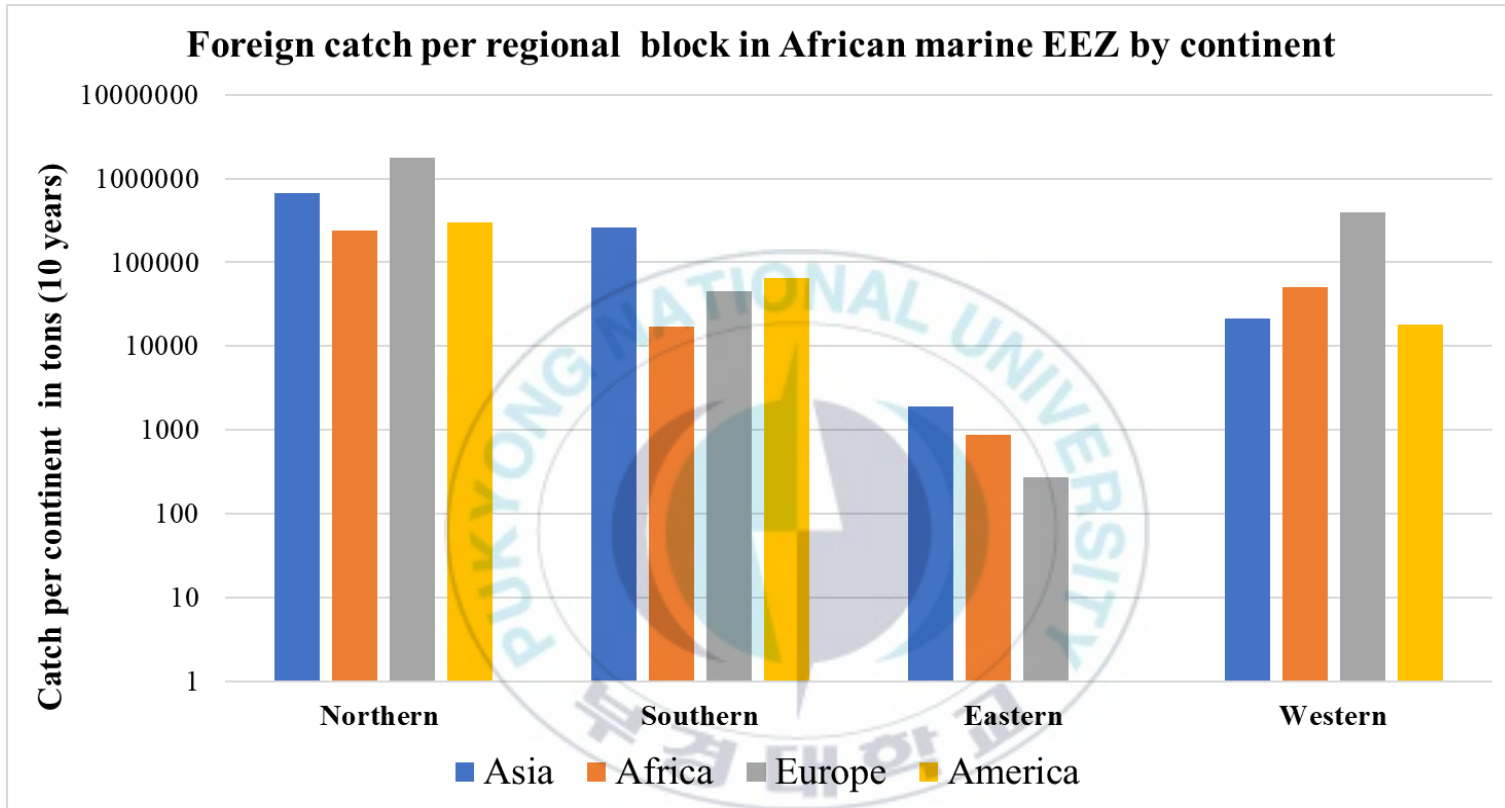


Figure 9: Foreign catch per regional block by continent.



### 3.3. Foreign catch trend in African marine EEZ (2006 to 2016)

Figure 10 shows the foreign catch time series data from 2006 to 2016 depicting a rapid increase from 2006 to 2007. We observed a stagnant catch between 2007 and 2008 with undulating growth between 2008 and 2010. There was a decline in foreign catch from 2010 to 2016 when catches declined consistently by about 2% annually. The sharp increase from 2006 to 2007 may be attributed to the increase in the number of fishing countries from 37 countries in 2006 to 41 countries in 2007. Belhabib et al. (2015) suggested that the consistent decline in the foreign catch from 2010 to 2016 may be associated with a new foreign catch fishing policy introduced by Mauritania. Mauritania did not issue octopus fishing rights to foreign catch countries since 2010 as a measure to conserve its marine fishing resources. This resulted in an annual catch decrease of about 200,000 tons from Mauritania EEZ (See Figure 10).

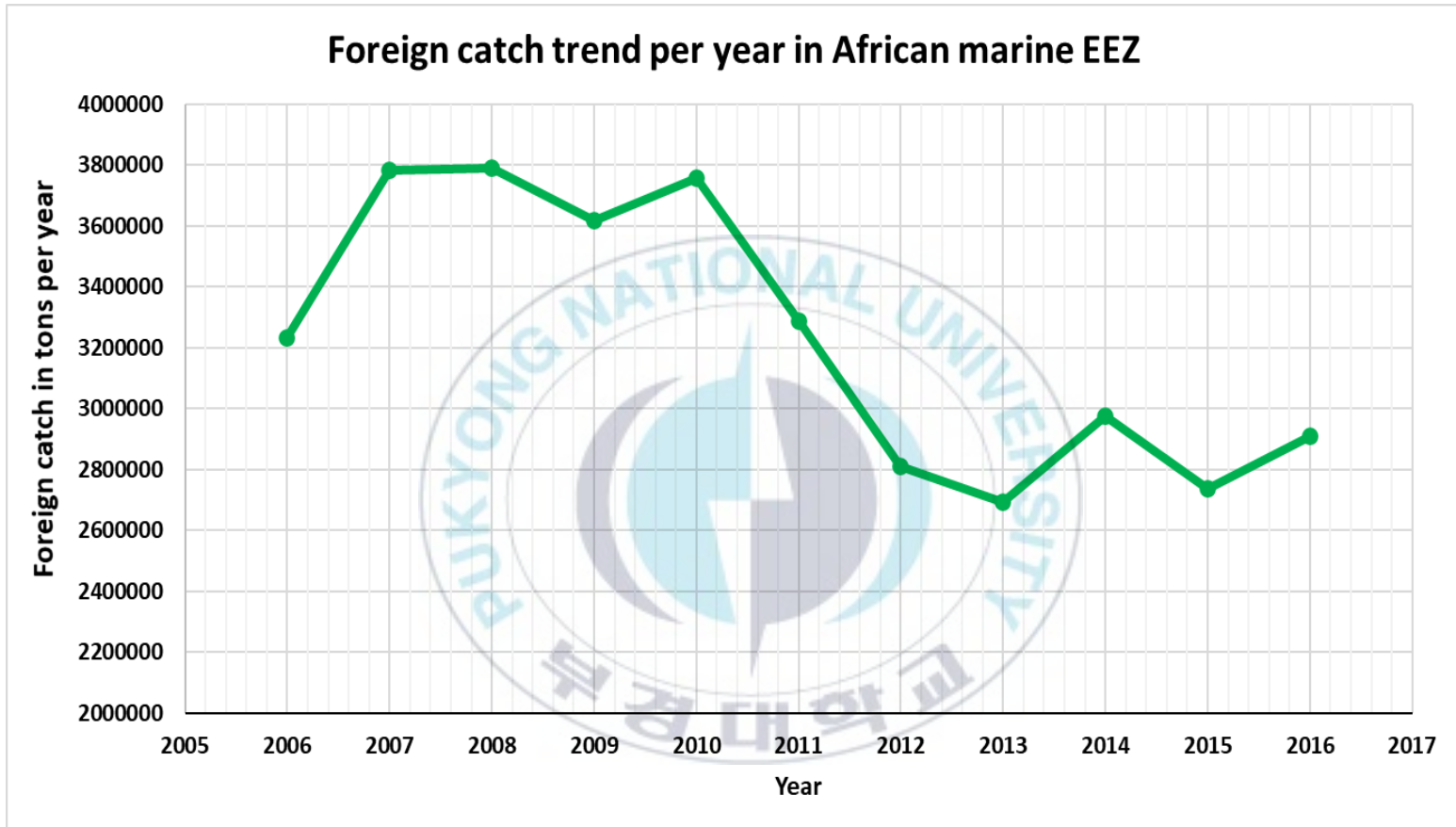


Figure 10: Annual foreign catch trend in African marine EEZ (2006 to 2016).

### 3.4. Foreign catch trend by continent of origin

A sharp increase in the Asian foreign catch in African marine EEZ was observed whereas, a declining trend was seen in the European foreign catch (Figure 11) as submitted by Kroodsma et al. (2018). Gutiérrez et al. (2020) noted that a realistic explanation for European foreign catch reduction in African EEZ could be attributed to reflagging of EU vessels in joint venture vessels arrangements to African national flag vessels. Such a misleading strategy which was exposed a long time ago (cf. Kaczynski and Fluharty 2002), is used by the foreign catch countries to avoid paying the legal and fair license fees in African EEZ. The reduction in European catch could be also associated with the introduction of automatic identification system (AIS) by the EU for all the European fishing vessels in African marine EEZ (Op. Cit.). As depicted in Figure 10, EU dominates the foreign catch in Mauritania EEZ, therefore, as Belhabib et al. (2012b) noticed. the new foreign catch fishing policy introduced by Mauritania may have been another factor for the reduction in EU foreign catch in African marine EEZ.

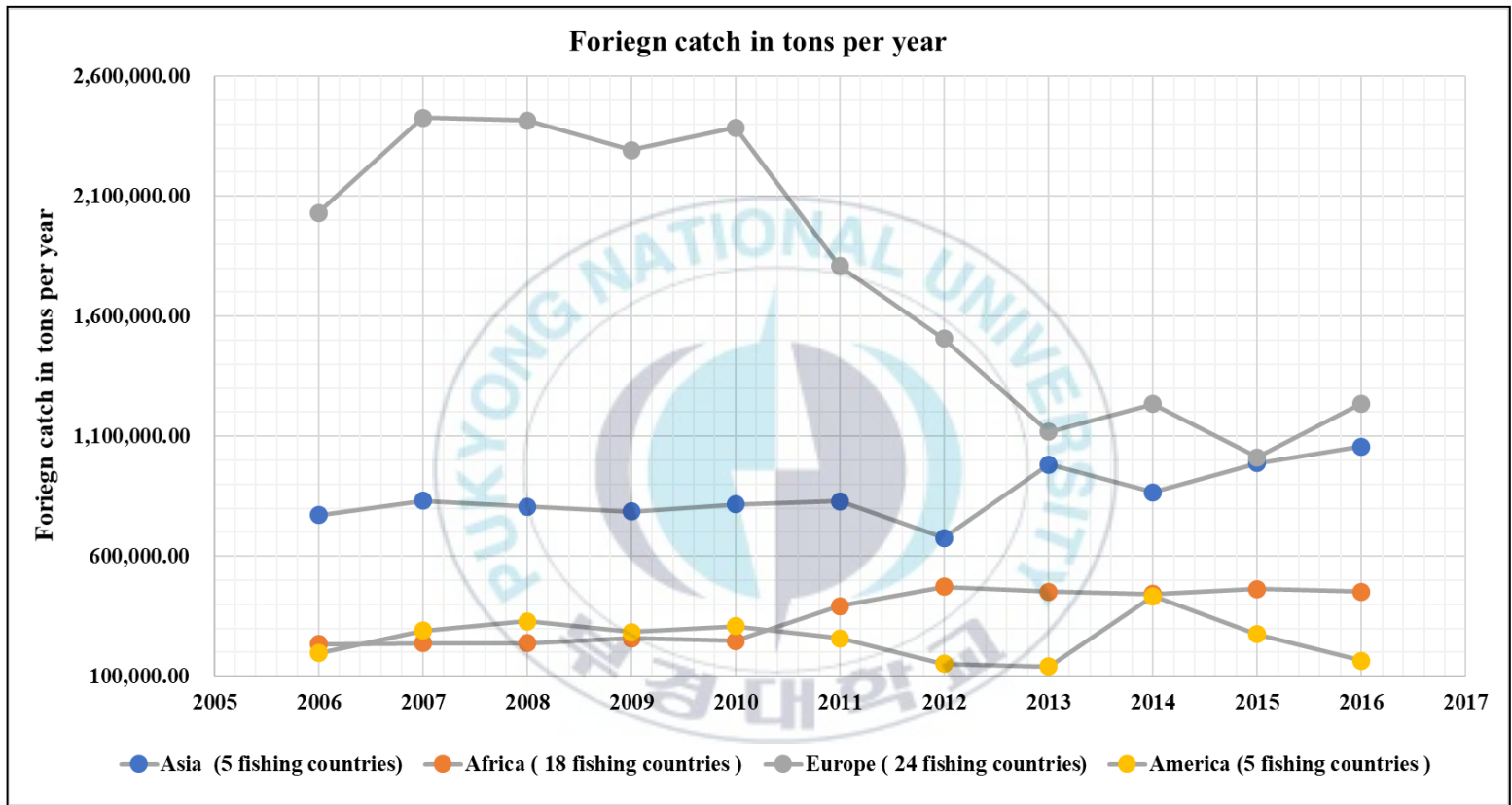


Figure 11:: Annual foreign catch (tons) trend from the African marine EEZ by continent of origin

### 3.5. Commercial fish species caught by foreign catch

Some 278 commercial fish species were targeted and harvested by foreign fishing fleets in African marine EEZ<sup>10</sup> (Pauly et al,2014). We grouped the 278 species into 10 major important commercial fisheries (Figure 12) including Perch-like species 15.50% of the total foreign catch by volume, followed by herring-like (13.26%), tuna (9.65%), anchovies (9.47%). Sharks, cod-like, crustaceans, flatfishes, scorpionfishes and molluscs were the least caught at 9% each which is in conformity with Alder and Sumaila (2004) findings. It was revealing to find that each continent had different target of species of interest in African marine EEZ. The Asian countries focused on perch-like, herring-like and sharks accounting for 86% of their catch in African EEZ consistent with what was reported by Sea Around Us (2016). Anchovies, tuna, herring-like and perch-like comprising 89% of European from African EEZ. Africans were found to catch more of herring-like and tuna consisting of 94%. Sharks, perch-like and herring-like were found to be harvested in the western Africa block countries. Anchovies and tuna were caught mostly in the northern block countries whereas southern block catches were dominated by crustaceans.

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<sup>10</sup> <http://www.seaaroundus.org/>

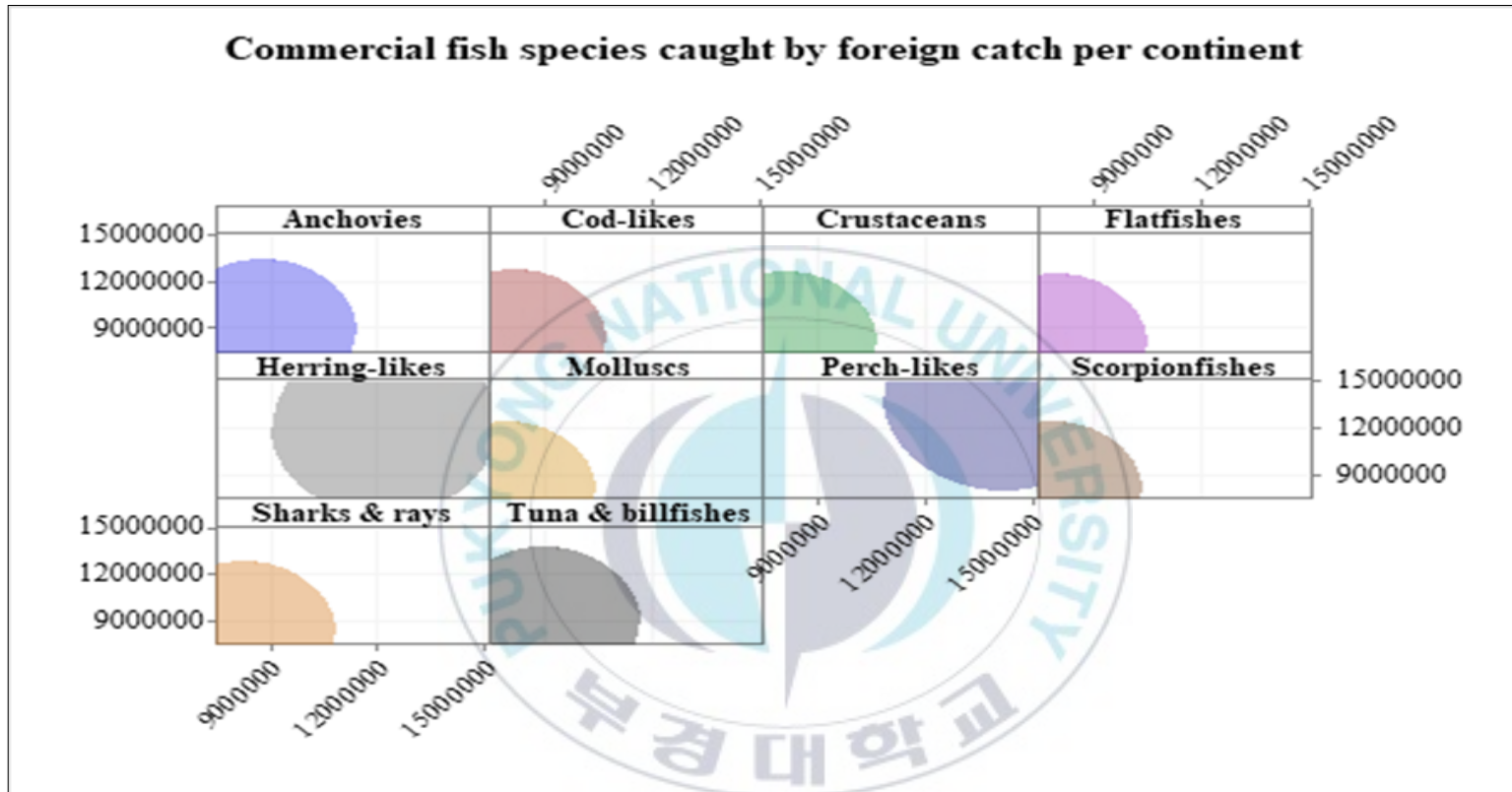


Figure 12: Top Commercial fish species caught by foreign catch in African marine EEZ.

### 3.6. Gears used by foreign fleet in African marine EEZ

Twenty-four fishing gear types are used by foreign fleets in the African marine EEZ which is in conformity with Zeller et al (2016) submission (Figure 13). The dominant 10 fishing gears are pelagic trawl accounting for 24% of the total catch, followed by bottom trawl (21%), purse seine (10%). The remaining gears were pole and line pots nets, gillnet, hand, lines longline, traps and shrimp trawlers contributing less than 9% each of the fish catch volume in African marine EEZ (Figure 13). Bottom trawlers were the dominant gears used by Asia countries in African marine EEZ while European countries used pelagic trawlers (See Figure 14). African countries were found to use gillnet, longline and encircling net. American countries were engaged in pelagic trawling.

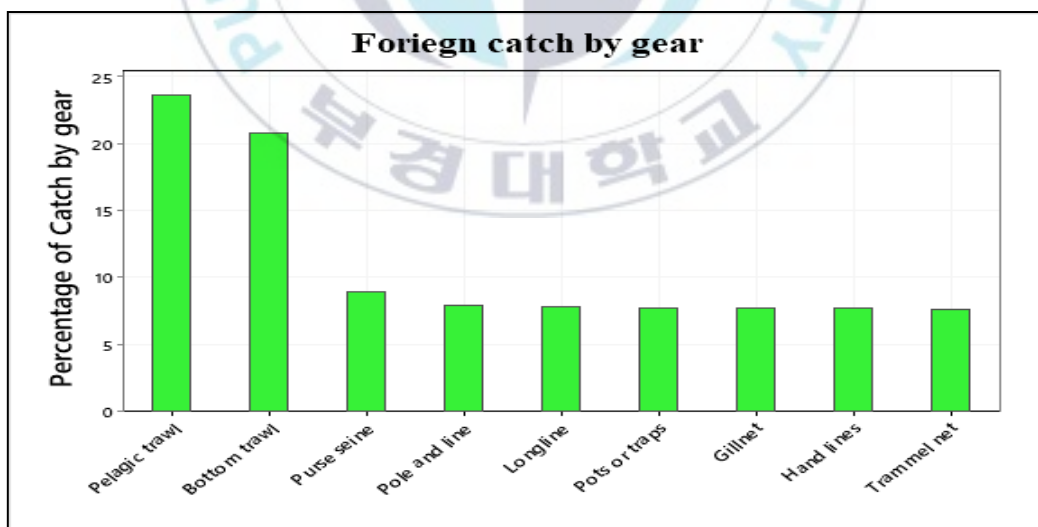


Figure 13: Percentage of catch by gear used in foreign catch in African marine EEZ.

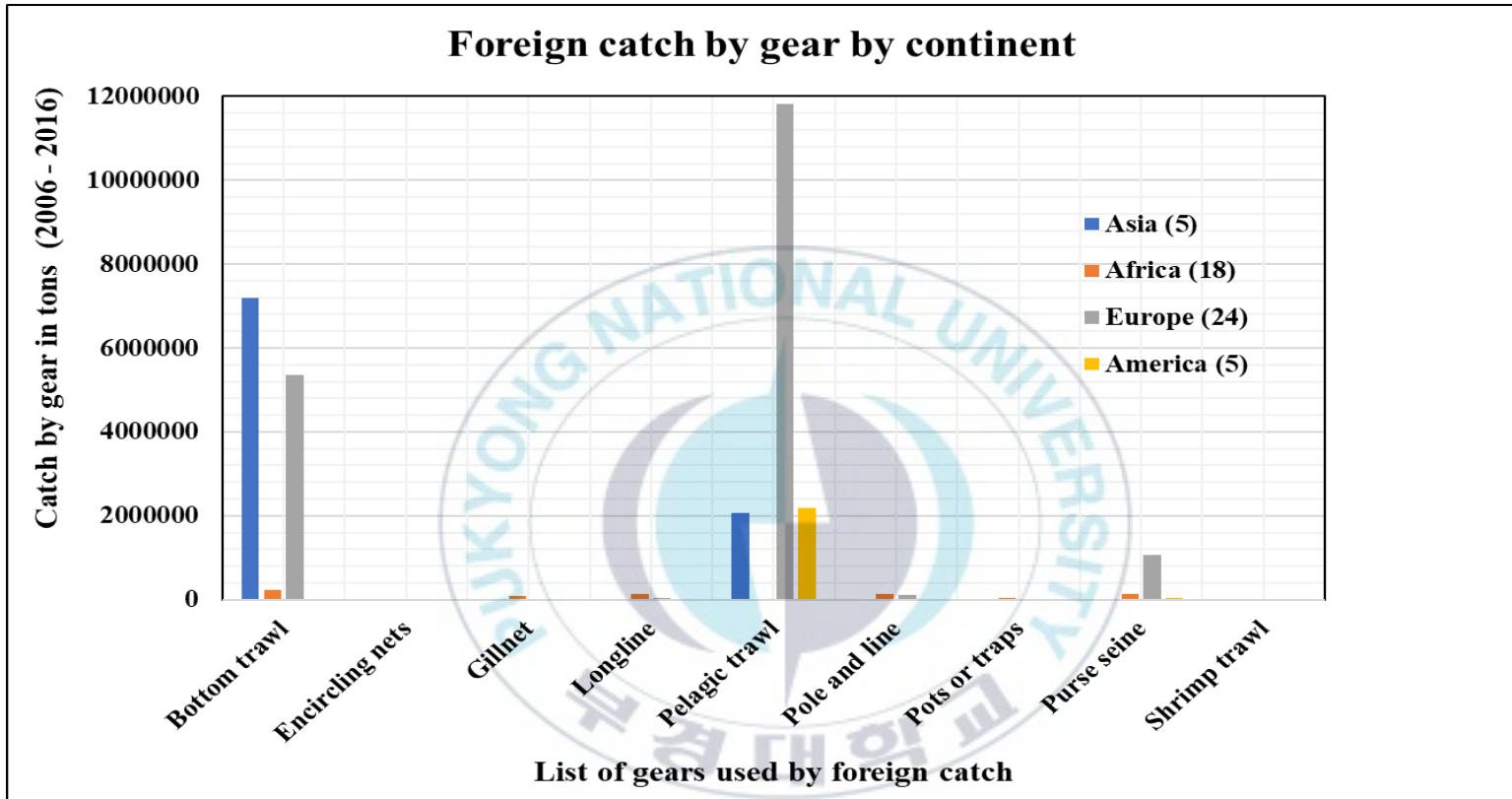


Figure 14: Gear used in foreign catch per continent in African marine EEZ.



### 3.7. Number of foreign fishing vessel in African marine EEZ

As shown in Table 2 an increasing trend in the number of foreign catch vessels in African marine EEZ has been observed (e.g. Kroodsma et al. 2018). The number of foreign vessels in African marine EEZ have quadrupled over the past 20 years between 1996 to 2016 from 400,000 tons per annum in 1996 to 1,600,000 tons in 2016. Gutiérrez et al. (2020) attributed the increasing trend to Asian countries particularly China. The increase in Chinese vessels is associated with the economic development partnership agreements with African countries for fishing access right in African countries marine EEZ (Belhabib et al. 2015). Table 2 shows the galloping trend in China's foreign fishing vessels that are fishing in African EEZ from 1958 to 2016.

**Table 2: Number of Chinese vessels fishing in Africa EEZ**

No	Year	Number of China's vessels fishing in Africa EEZ
1	1958	13
2	2000	372
3	2013	462
4	2016	518

Source: Adopted from Greenpeace and ODI report annual fishing reports

### **3.8. Fishing access agreement in African marine countries**

Different typology of access partnership agreement between the African marine countries and foreign fishing countries have been observed (e.g. Manach et al. 2011). These agreements were made up of country-to-country partnership, joint venture agreement, reflagged, private, and chartered vessels agreement. There were limited regional body agreements. Standing (2016) noted that the fishing vessels from EU countries in African marine EEZ are declining whilst their fishing access partnership agreements are increasing. The foreign fishing agreement in Western Africa block has increased astronomically over time from 36 in 1960s to 242 in 1980s then to 307 in 2000 which generated unease in Senegalese small-scale fishermen in 2015 (as Senegalese fishermen and women have been campaigning strongly against the granting of fishing access to foreign catch vessels). A comprehensive data on individual country's fisheries access partnership agreement was not available. This is because most of the fishing agreement are confidential and not published at the country's Ministry of Fisheries website. Other agreements involved support of developmental projects for access to fisheries resources (See Table 3 and 4).

### 3.9. RFMO fishing agreement between foreign catch countries

As presented in Table 3, we found EU countries engage in regional fishing agreement with African countries more than Asia and North America. The Asia countries tend to focus on government-to-government agreement while the North Americans used private company partnerships agreement. We observed an increasing trend in RFMO fisheries agreement in all the regional blocks from 2006 to 2016 (Table 4). We categorised the agreement into inferred and RFMO and calculated their relative % catches. Inferred is defined as country-to-country agreement, joint venture and charter agreements which accounted for more than 90% of the catch while the RFMO agreements covers only tuna.

**Table 3:Regional assigned tuna quota and inferred foreign catch per year.**

<b>Year</b>	<b>RFMO</b>	<b>%</b>	<b>Inferred foreign catch</b>	<b>%</b>
2006	71,770.41	2.22	3,160,202.29	97.78
2007	63,530.21	1.97	3,721,198.42	98.32
2008	63,306.09	1.96	3,725,736.05	98.33
2009	79,583.30	2.46	3,538,625.94	97.80
2010	77,729.99	2.41	3,679,612.97	97.93
2011	95,185.80	2.95	3,194,415.91	97.11
2012	110,876.48	3.43	2,698,138.98	96.05
2013	128,097.36	3.96	2,565,700.08	95.24
2014	104,844.84	3.24	2,872,635.09	96.48
2015	100,286.30	3.10	2,636,956.66	96.34
2016	130,336.24	4.03	2,780,977.66	95.52
<b>Total</b>	<b>1,025,547.02</b>	<b>2.88</b>	<b>34,574,200.05</b>	<b>97.12</b>

### **3.10. Ex-vessel price payment by foreign catch in the African EEZ**

Ex-vessel price paid by foreign catch vessels for fishing in African marine EEZ differ from country to country for the same species, volume and season of catch – as also observed by Swartz et al (2013). Belhabib et al. (2015) also reported that hakes caught from Morocco was valued at US\$ 4,000 per ton compare to US\$ 118 per ton caught from Mauritania. Again, Belhabib et al. (2012) exposed the fact that ex-vessel price paid for foreign catch in African EEZ were underestimated as compare to global market price - a practice echoed by Swartz et al (2013) when the reported that Asia countries were notorious for paying less ex-vessel price for fishes caught in African EEZ as compare to the EU countries. As Belhabib et al. (2015) pointed out, the reasons why Asia countries pay less ex-vessel price in African EEZ was associated to compensate for project supports such as building of port, construction of football stadium, among others. These projects for fishing access rights arrangements, indicated neither the volume of fish taken, nor the type of species harvested in compensation for the cost of the development project. Table 9 presents the list of examples of project China have implemented in the African countries for the past 10 years.

**Table 4: Payment of ex-vessel value of Foreign catch from the African marine EEZ the form of developmental project**

<b>Country</b>	<b>Project</b>	<b>Years</b>	<b>Payment Agreement</b>	<b>TAC (catch Quota)</b>
Cape Verde	Construction of dam and football stadium	7	Fishing access for years 7	No catch quota found.
Cape Verde	Modernization of telecommunication network	3	Fishing access for years 3	No catch quota found.
Cape Verde	Debt relief	4	Fishing access for years 4	No catch quota found.
Ivory Coast	Interest free loan	4	Fishing access for years 4	No catch quota found.
Gambia	Hospital construction	4	Fishing access for years 4	No catch quota found.
Gabon	Hospital and parliament construction	4	Fishing access for years 4	No catch quota found.
Ghana	Construction of fishing harbour	4	Fishing access for years 4	No catch quota found.
Ghana	Provision of fishing ropes and net	2	Fishing access for years 2	No catch quota found.
Gabon	Construction of national, senate assembly and office builds	4	Fishing access for years 4	. No catch quota found.
Mauritania	Construction of Port infrastructure	4	Fishing access for years	No catch quota found.
Guinea Bissau	Modernization of telecommunication network	4	Fishing access for years 4	No catch quota found.
Mauritania	Provision of military jets	3	Fishing access for years 3	No catch quota found.
Libera	Supply of canoe engines	3	Fishing access for years 3	No catch quota found.

## IV. Discussion

Foreign catch arrangements between countries is a legally binding agreements supported by UNCLOS rules and regulations (UNCLOS 1982). Although UNCLOS permits countries to have fishing access agreement, the rules state that the host countries should conduct stock assessment to determine the stock volume and available surplus as total allowable catch (TAC) to ensure exploitation at or below the maximum sustainable yield (Iheduru 2019). The UNCLOS (1982) fishing agreement surplus clause also states that before a fishing access right can be granted, national, regional and continent priorities should be considered.

Belhabib and Divovich (2014) pointed out that, due to inadequate technical knowhow, lack of capital resources as well as political pressures from the developed countries, most of the developing countries including African countries do not carry out stock assessment in line with the UNCLOS regulations before granting foreign fishing access right.

Increasing trend in the Asian and European foreign catch vessels in African marine EEZ has been observed despite declining catch volume from EU vessels with a real concern of stock depletion. This gives credence to Villasante et al. (2013) submission that the use of bottom trawlers in African marine EEZ by the top five foreign catch countries by volume namely China, Russia, Japan, Spain and Belize; could have a negative impact on African marine fisheries environment. Again, as Daniels et al. (2016) argued, this could result in fisheries

depletion especially in the northern and western block of Africa similar to fisheries depletion currently experienced in Asia and Europe.

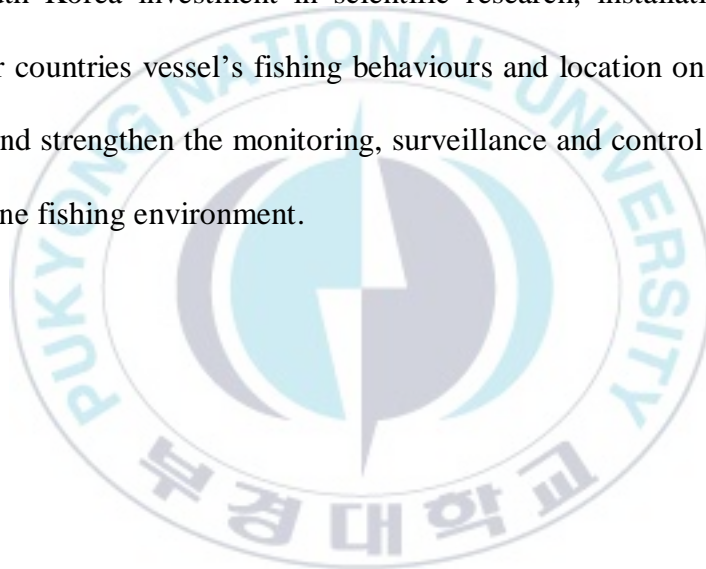
The new fisheries policies introduced by Mauritian to reduce foreign catch quota is recommended as a step in a right direction. The policy refused granting octopus catching right to foreign fishing countries as a measure for conserving its fisheries. As Belhabib et al. (2015) counselled, such policies should be encouraged and emulated by other African marine countries.

It was encouraging to see an increase in African RFMO fishing access agreement with the foreign catch countries. This could help to improve the marine conservation in Africa. Inferred catch such as reflagged and flag of convenience catch has been declining as seen in Table 9 due to the increasing in RFMO foreign fishing agreement. The RFMOs are supporting with technical services for member countries to establish total allowable catch quotas (Riddle 2006).

The use of developmental projects as currency in fishing access right in African marine EEZ by the foreign catch countries is gaining momentum. However, this mode of fishing agreements should be reconsidered. As Jacqueline et al (2004) suggested, these projects agreement should indicate fish catch quota, target species and harvest season as well as the duration of the access right. This will help to reduce overexploitation of African marine EEZ fisheries resources. Moreover, Standing's (2008) suggestion that it will prevent undermining of the

national livelihood, food security, regional economic development as well as corruption control in the African marine fisheries sectors is valid.

It is an alarming revelation (cf. Daniels et al. 2016) that the high value Africa marine EEZ fisheries namely perch-like, tuna and herring-like species have been over-exploited and likely to be depleted if ecosystem management measures are not taken by the host countries. However, as Österblom et al. (2010) noted, the EU and South Korea investment in scientific research, installation of AIS to monitor their countries vessel's fishing behaviours and location on sea, will help to improve and strengthen the monitoring, surveillance and control of IUU in the African marine fishing environment.





## V. Conclusion and Recommendations

Based on our findings and discussions, accept the hypothesis that the foreign catch proportion including reflagged vessels in African marine EEZ is the major contributing factor for the depletion of fisheries resource in African EEZ. The other variables such as, number of national owned fishing fleet, fisheries management capacity, latitude and employment also contributed to the difference. As an example, lack of national owned fishing fleets in Djibouti, Tanzanian and Somalia accounted for their low domestic catch despite their rich marine environment. Morocco and Ghana with national fleets, have higher domestic fisheries catch. Again, Mauritian's capacity to manage its fisheries resource have helped to improve its domestic catch and reduced foreign catch over the past 30 years (1980 to 2016).

The new fisheries policies introduced by Mauritian to reduce foreign catch quota is recommended as a step in a right direction and such management policies should be encouraged and emulated by other African marine countries. The African RFMOs and other regional and sub-regional institutions should assist member countries with technical and material in order to to comply with UNCLOS regulations especially stock assessment, monitoring, surveillance and control of foreign catch countries in African. African marine countries should establish registry of reflagged vessels and ex-vessel price scheme to ensure

collective negotiation to enhance fairness. It is crucial that African countries fully implement the port state measures agreement.



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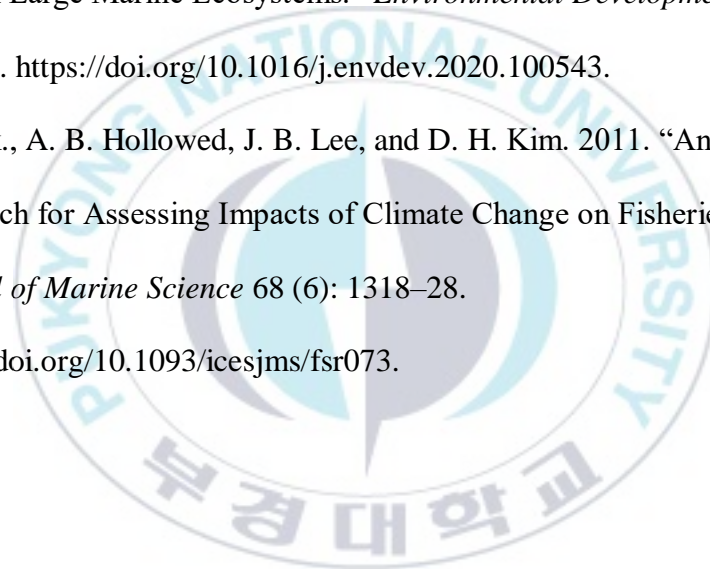
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The idea for this study came from the WFU- Fisheries Stock Assessment course given by Emeritus Prof. Chang IK Zhang. I noted all the countries report presented by my colleagues' students had different fisheries production. I then started to ask why? I contacted Prof. Zhang for some taught why production differ. He tasked me to find out. Prof. Zhang recommended the subject is a PhD topic, however, I should do what I can and continue later for a PhD. I started to research on the subject. I really appreciate Prof. Dr. Andrew Baio (lead supervisor) and Prof. Chang IK Zhang (Co-supervisor) for accepting and encouraging me to conduct this research as part of my thesis work under the social science and fisheries management departments.

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## **Dedication**

I dedicate this thesis research to AU-IBAR department of fisheries and aquaculture team especially Dr. Mohammed Seisay. Also, to Emeritus Prof. Diane Kellogg of Bentley University. Finally, to my family, my lovely wife Josephine and my children Juliet, Joseph, Samuella and Jonathan. I know it has not been easy for you, me being away for so long and not there to play with you especially in difficult times like this that you are not going to school because of the Covid – 19 pandemic. I will be home soon. I love you all.

