



**FACULTY OF NATURAL RESOURCES AND ENVIRONMENTAL SCIENCES
DEPARTMENT OF FISHERIES AND WATER RESOURCES MANAGEMENT**

**ASSESSING THE EFFECTIVENESS OF GEAR RESTRICTION ON NILE TILAPIA
FISHERY AT KAZINGA CHANNEL, RUBIRIZI DISTRICT**

BY

ERISA ARINAITWE

BU/UG/2022/1226

**A RESEARCH REPORT SUBMITTED TO THE FACULTY OF NATURAL
RESOURCES AND ENVIRONMENTAL SCIENCES IN PARTIAL
FULFILLMENT FOR THE AWARD OF A BACHELOR'S DEGREE IN
FISHERIES AND WATER RESOURCE MANAGEMENT OF BUSITEMA
UNIVERSITY**

DECLARATION

I, ARINAITWE ERISA, declare that this study is original and has not been submitted for the award of a degree at any other university before.

Signed.. 

Date.....

APPROVALS

This dissertation has been submitted with the approval of my academic supervisors.

Dr. vianny Natugonza.

Maritime Institute

E-mail: Viannynatugonza@Yahoo.Com

Signed.....

Date 2

Ms. Mudondo Phelisiter

Faculty of Natural Resources and Environmental Sciences

E-mail: mpelisiter@gmail.com

Signed.....

Date 27/08/2025

DEDICATION

I dedicate this report to my beloved family of Mr. Kabahena Benon and Mrs. Grace Kemirere and my wife.

ACKNOWLEDGEMENT

I am so grateful to my research supervisor, Dr. Vianny Natugonza and Ms. Phelisiter Mudondo for the invaluable guidance, support and encouragement throughout this research journey. Their expertise and insights have been instrumental in shaping the direction of my work, and I am sincerely appreciative of their mentorship.

I would also love to extend my sincere thanks to the fisheries office of Rubirizi district local government and Katunguru Sub County especially the Fisheries Officer Katunguru sub county Ms. Nantongo Mary whose assistance and cooperation were crucial to the success of this study

I owe a special debt of gratitude to my family especially my parents, brothers and sisters especially my beloved mother Grace, my brothers Elias and Jonas and my sisters Fabis and Elidah without forgetting my beloved wife Ms Amondong Unice Fiona whose unwavering support, patience and love have been a constant source of strength. Your belief in me has been my greatest motivation.

Lastly, I want to acknowledge my friends and classmates most especially Joyce, Shakirah, Morris, Winnie, Abdul, Joel and Geoffrey whose encouragement and understanding have been invaluable. Thank you all for being there during both the challenging and rewarding moments of this journey.

TABLE OF CONTENTS

DECLARATION.....	1
APPROVALS.....	2
DEDICATION	3
ACKNOWLEDGEMENT.....	4
LIST OF ABBREVIATIONS	8
LIST OF FIGURES.....	9
ABSTRACT	10
CHAPTER ONE: INTRODUCTION	11
1.0 introduction.....	11
1.1: Background	12
1.2 Problem statement	14
1.3 Research Objectives:	15
1.3.1 Major objective.....	15
1.3.2 Specific objectives.....	15
1.4 Research question.....	15
1.5 Justification of the Study	15
1.6 Significance of the Study.....	16
1.7 Scope of the Study.....	17
1.7.1 Geographical Scope.....	17
1.7.2 Content Scope.....	17
1.7.3 Periodical Scope	17
CHAPTER TWO: LITERATURE REVIEW	18
2.0 Introduction	18
2.1 Theoretical Review.....	18
2.2 Overview of the Concepts of the Study.....	19
2.2.1 Nile Tilapia.....	19
2.2.2 Gear Restriction.....	19
2.2.3 Kazinga Channel.....	19
2.2.4 Fishery Management	20

2.3 Empirical literature review	20
2.3.1 Introduction to Fisheries Management and Gear Restrictions	20
2.3.2 Compliance and Perceptions of Fishers toward Gear Restrictions.....	21
2.3.3 Ecological Effects of Gear Restriction on Nile Tilapia Populations	22
2.3.4 Nile Tilapia Fisheries and Sustainability Challenges	23
2.3.5 Socio-Economic Implications of Gear Restrictions on Local Communities.....	24
2.4 Conclusion/Summary of the Literature	24
CHAPTER THREE: METHODOLOGY.....	25
3.1 introduction.....	25
3.1 Area of study	26
3.2 Research Design	27
3.3 Sample Size and sampling procedures	27
3.3.1 Study Population	27
Table 1: Targeted and Achieved Study Sample	28
3.3.2 Sampling Method	28
3.3.3 Sample Size	28
3.4 Data type and data collection.....	29
3.4.1 Compliance of fishers with gear restriction policies and explore their perceptions regarding these regulations at Kazinga channel.	29
3.4.2 Impact of gear restriction on Nile tilapia catches or stock abundance	30
3.4.3 Socio-economic implications of the gear restrictions on local fishing communities.....	30
3.5 Data analysis.....	30
3.5.1 Compliance of fishers with gear restriction policies and explore their perceptions regarding these regulations at Kazinga channel	30
3.5.2 Impact of gear restriction on Nile tilapia catches or stock abundance	31
3.5.3 Socio-economic implications of the gear restrictions on local fishing communities.....	31
3.6 Ethical Considerations.....	31
3.7 Quality Assurance and Control	31
3.8 Ethical Considerations.....	31
3.9 Study Limitations	32
CHAPTER FOUR: RESULTS AND DISCUSIONS.....	33
4.0 introduction.....	33

4.1 Response Rate	33
4.3 Compliance with Gear Restriction Policies.....	34
4.3.1 Compliance by Age Group.....	34
4.3.2 Compliance by Education Level.....	35
Challenges Faced While Complying	37
4.4 Existing Policies beyond Gear Restrictions.....	38
4.5 Effects of Gear Restrictions on Fish Catch and Socioeconomic Standards	38
4.5.1 Fish Catch Trends	39
4.5.2 Socioeconomic Impacts.....	39
4.6 Enforcement Mechanisms and Community Participation	40
4.6 Discussions	41
4.7 Implications of the Findings	43
4.8 Conclusion of the Discussion	43
CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS.....	43
5.1 Conclusion.....	43
5.2 Recommendations	45
REFERENCES	46
APPENDICES	51
Appendix 1: Questionnaire.....	51
Appendix 2: Interview Guide	54
Appendix 4: shows a catch ready for weighing at katunguru landing site.....	56
Appendix 5: shows a panel of gill nets with missed mesh sizes at kashaka landing site.....	57
Appendix 6: shows an interview with a fisherman at kazinga landing site.....	58
Appendix 7: shows a researcher weighing a catch at Katunguru landing site	59
Appendix 8: shows a panel of nets ready for deployment at kisenyi landing site.....	60

LIST OF ABBREVIATIONS

Abbreviation	Definition
FAO	Food and Agriculture Organization of the United Nations
NEMA	National Environment Management Authority
UBOS	Uganda Bureau of Statistics
LVFO	Lake Victoria Fisheries Organization
US	United States
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
NAFIRRI	National Fisheries Resources Research Institute
BMU	Beach Management Unit
FRP	Fisheries Reference Points
ICES	International Council for the Exploration of the Sea
GDP	Gross Domestic Product
SDG	Sustainable Development Goals
UN	United Nations
NPA	National Planning Authority
NBI	Nile Basin Initiative
DRC	Democratic Republic of Congo
FPU	Fisheries Protection Unit
FGD	Focus Group Discussion
NGO	Non-Governmental Organization
CABI	Centre for Agriculture and Biosciences International

LIST OF FIGURES

Figure 1: location of study area27

Figure 2: Compliance level by age groups3525

Figure 3: Compliance levels by education levels of respondents366

Figure 5: Shows impact of gear restrictions on household income**Error! Bookmark not defined.**7

ABSTRACT

This study assessed the effectiveness of gear restrictions in sustaining Nile Tilapia populations in Kazinga Channel Katunguru Sub-County, Rubirizi District. Its aimed to evaluate fishers' compliance with gear restriction policies, their perceptions of the regulations, the impact of these restrictions on fish catch and stock abundance, and the socio-economic consequences for local communities. Data collection involved field surveys, fisher interviews, and participatory focus group discussions. Emphasis was placed on examining the changes in fish stock size structure and abundance following the implementation of mesh size controls, as well as investigating the compliance levels and enforcement challenges faced by regulatory authorities.

The findings revealed that enforcement of minimum mesh size restrictions led to a reduction in the capture of juvenile Nile tilapia, allowing fish to mature and spawn at least once before harvest. This possibly contributed to improved recruitment rates and a positive shift in the size structure of the fish population, consistent with observations in other freshwater fisheries across East Africa. The catch composition shifted towards larger, more marketable fish, which indicated a move towards ecological sustainability and a potential increase in long-term fishery yields.

However, the study also documented short-term economic hardships experienced by fishers as a result of reduced catches of smaller fish, which historically contributed to household food security and income. These immediate livelihood impacts generated resistance to gear restrictions among some fishers, highlighting the social challenges inherent in fisheries management.

Enforcement of gear restrictions was found to be hampered by several factors including weak institutional capacity, limited resources for monitoring and surveillance, and widespread use of illegal fishing gears such as undersized monofilament nets. Beach Management Units (BMUs), intended to facilitate community-led resource governance, exhibited varying degrees of effectiveness, often impaired by a lack of legal support and inadequate community participation. The study underscored that enforcement alone was insufficient without concomitant efforts to address poverty and improve fisher livelihoods.

CHAPTER ONE: INTRODUCTION

1.0 introduction

Fisheries play a vital role in Uganda's economy and food security, contributing significantly to employment, income, and nutritional needs. The sector employs over 1.2 million people directly and indirectly, providing livelihoods to communities along major water bodies (FAO, 2021) Fish is also a crucial source of animal protein, accounting for approximately 50% of Uganda's dietary protein intake (NEMA, 2019).

However, the sustainability of fisheries resources is increasingly threatened by overfishing, habitat degradation, and illegal fishing practices (FAO, 2022). Overfishing occurs when fish are harvested faster than they can naturally replenish, leading to the depletion of Nile tilapia. This is especially evident in heavily exploited water bodies like Lake Victoria and the Kazinga Channel, where increased fishing effort driven by population growth and limited livelihood alternatives has led to declining catch sizes and reduced fish stock biomass (NEMA & UBOS, 2022). Habitat degradation further compounds this challenge, as wetlands, breeding grounds, and nursery areas are destroyed due to agricultural encroachment, deforestation, and urban runoff. These changes reduce water quality, cause eutrophication, and disrupt the ecological conditions necessary for fish survival and reproduction (LVFO, 2016). Illegal, unreported, and unregulated fishing practices, including the use of illegal gears such as undersized gillnets, fishing during closed seasons, and harvesting of juvenile fish, undermine fisheries regulations and contribute significantly to resource depletion (Bassa et al., 2020). These cumulative pressures threaten not only fish biodiversity but also the livelihoods and food security of millions of Ugandans who depend on fisheries resources.

The Nile tilapia (*Oreochromis niloticus*) (Linnaeus, 1758) is one of Uganda's most important commercial fish species. In 2018, for instance, Uganda's total fish production reached approximately 447,020 metric tons, with Nile tilapia contributing 49,768 metric tons. This accounted for approximately US\$153m from the export of 20,364 metric tons of fresh fillets of Nile tilapia making it a significant component of the nation's fishery. (Walakira, 2022)

However, its stocks have been under severe pressure due to high fishing effort and the use of illegal gear (Ogotu-Ohwayo, 2020). Studies indicate that fish sizes and catches have drastically declined in

major water bodies, including Lake Victoria and Lake Edward (Njiru et al, 2020). This decline poses significant challenges for biodiversity conservation and food security, necessitating effective management interventions to ensure the sustainability of these fisheries resources.

1.1: Background

Globally, fisheries contribute significantly to food security, livelihoods, and economic development. The Food and Agriculture Organization (FAO, 2022) reported that fish provided more than 3.3 billion people with at least 20 percent of their average per capita intake of animal protein, underscoring the role of fisheries in global nutrition. Nile tilapia (*Oreochromis niloticus*) is among the most widely farmed and exploited freshwater species, valued for its resilience, high growth rate, and market demand (Tibihika et al, 2024). However, overfishing, habitat degradation, and illegal fishing practices have created persistent challenges for sustainable management worldwide. Gear restrictions, including the enforcement of minimum mesh sizes and bans on destructive gears, have been widely applied as key management measures to safeguard fish stocks. In different countries, such interventions demonstrated varying levels of success depending on enforcement capacity and fisher compliance.

Across Africa, freshwater and marine fisheries form a critical component of food production and employment. The continent's inland waters, including the Nile Basin, support millions of people who depend on fishing for subsistence and income. The increasing population pressure and limited access arrangements had placed enormous strain on African inland fisheries (Lake Victoria Fisheries Organisation, 2019). Gear restrictions were introduced in several African states to curb overexploitation and preserve spawning stocks. The enforcement of bans on illegal fishing gears in Lake Victoria contributed to recovery trends in fish stocks, particularly Nile tilapia and Nile perch. (Nyamweya et al, 2023).

Similarly, Mesh-size adjustments directly influenced the sustainability of tilapia fisheries in Lake Turkana, Kenya (Lomodei, 2022). However, while gear restrictions remain central to African fisheries policy, compliance challenges persisted due to poverty, limited livelihood alternatives, and weak institutional capacity. The shift from cooperative to coercive enforcement approaches in Africa brought gains in stock recovery but also losses in fisher cooperation and trust (Mpomwenda et al, 2023). Therefore, while gear restriction policies are well embedded within continental fisheries frameworks,

their ultimate success has been shaped by socio-economic realities and governance systems across different countries.

Within the East African region, fisheries are not only vital for nutrition and employment but also for regional trade and cross-border relations. The Nile tilapia fishery, in particular, is widely distributed across Lakes Victoria, Kyoga, Edward, and Albert. Regional studies revealed a persistent problem of illegal gears undermining stock recovery. The legislative and regulatory gaps in the Lake Victoria basin, emphasized inconsistent enforcement across states created loopholes exploited by fishers (Ssempijja et al, 2025). The coordinated enforcement actions across Kenya, Uganda, and Tanzania improved fish stock status, but gains remained fragile without continuous monitoring (Nyamweya et al, 2023) . The increasing fishing pressure, coupled with non-selective gears such as beach seines and undersized gillnets, diminished stock resilience (Lake Victoria Fisheries Organisation, 2019) .Institutional weaknesses, combined with resistance to gear restrictions, complicated the effectiveness of co-management frameworks in Kenya. These challenges reflected broader governance and compliance issues across East Africa. (Obiero, 2015)

In Uganda, the fisheries sector plays a pivotal role in national development, providing employment for more than 5.3 million people and contributing significantly to food and nutritional security (Republic of Uganda, 2023). The Kazinga Channel, linking Lakes Edward and George within Queen Elizabeth National Park, is one of the country's most productive fisheries ecosystems, supporting both biodiversity and livelihoods (State of knowledge, 2023). Over the years, destructive and illegal gears such as monofilament nets, beach seines, and cast nets were widely used, resulting in overfishing, declining tilapia size, and stock depletion (Nambi, 2023).

To address declining fish stocks, Uganda has implemented several fisheries management interventions, including closed seasons, designated fish breeding areas, licensing, and enforcement of gear restrictions (MAAIF, 2020). Among these, gear restrictions aim to limit the use of destructive and unsustainable fishing practices by regulating mesh sizes and prohibiting certain types of fishing gear. These interventions are designed to promote the recovery of fish stocks by reducing fishing pressure on juvenile and breeding populations.

Gear restriction has been widely recognized as a critical management tool in sustainable fisheries management. By regulating the size and type of fishing gear, it ensures that immature fish are not harvested, allowing them to grow and reproduce, thus contributing to the sustainability of the stock (García et al., 2018). In the context of Uganda, effective implementation of gear restrictions is particularly important due to the heavy reliance of local communities on fishery resources for their livelihoods and the pervasive use of illegal gears in many water bodies.

Finally, ecological factors such as seasonal variations, water quality, and habitat characteristics in the Kazinga Channel may influence the effectiveness of gear restrictions differently than in other fisheries worldwide (Akyoo et al, 2019). These factors justify the need for a localized study to assess the effectiveness of gear restrictions in this specific setting. This study seeks to address this knowledge gap by evaluating the effectiveness of gear restriction on the Nile tilapia fishery in the Kazinga Channel. Understanding the outcomes of this intervention will provide valuable insights for policymakers and stakeholders in improving fisheries management strategies and ensuring the sustainability of this vital resource.

1.2 Problem statement

The Nile Tilapia fishery in Kazinga Channel, Rubirizi District, is an essential source of food and income for local communities. However, overfishing and unsustainable fishing practices have led to a decline in Nile Tilapia populations, threatening both the ecological balance of the channel and the livelihoods of fishers (Musinguzi et al, 2024). In response, gear restriction policies have been implemented to promote sustainable fishing practices and protect fish stocks. Despite these efforts, the effectiveness of these restrictions remains uncertain, as compliance levels, enforcement challenges, and socio-economic impacts on local communities are not well understood. This lack of knowledge hampers the performance of the fisheries at the Kazinga channel fishery.

This study seeks to assess the effectiveness of gear restrictions in achieving sustainable Nile Tilapia populations by examining fishers' compliance, perceptions, and the socio-economic consequences of these regulations. By evaluating these factors, this research aims to provide insights that will support

policymakers in refining conservation strategies, enhancing fishery sustainability, and promoting the welfare of fishing communities in Rubirizi District.

1.3 Research Objectives:

1.3.1 Major objective

The overall objective of the study was to assess the effectiveness of gear restrictions in sustaining the Nile Tilapia fishery at Kazinga Channel Katunguru Sub County

1.3.2 Specific objectives

- i. To assess the compliance of fishers with gear restriction policies and explore their perceptions regarding these regulations at Kazinga channel.
- ii. To analyze the impact of gear restriction on Nile tilapia catch or stock abundance
- iii. To investigate the socio-economic implications of the gear restrictions on local fishing communities.

1.4 Research question

1. What is the compliance of fishers with gear restriction policies and their perceptions regarding these regulations at Kazinga channel?
2. What is the impact of gear restriction on Nile tilapia catch or stock abundance?
3. What are the socio-economic implications of the gear restrictions on local fishing?

1.5 Justification of the Study

The Nile tilapia fishery was essential for both local and global nutrition, with (FAO, 2022) noting that fish provided over 3.3 billion people with at least 20 percent of their animal protein intake. In Uganda, tilapia supported national food security and household income, while also contributing to employment for millions of people (Republic of Uganda, 2023). However, Destructive gears such as cast net and monofilaments in the Kazinga Channel threatened the sustainability of this critical ecosystem. Scientific studies further showed that such practices reduced tilapia genetic diversity, altered population structures, and heightened ecological vulnerability in the Edward–George–Kazinga system (Tibihika et al., 2020; Tibihika et al, 2023). This unique channel also held ecological and tourism value within Queen Elizabeth National Park, making effective management a national and regional priority (CEBioS, 2024).

The study was justified by the urgent need to generate evidence on the effectiveness of gear restrictions within Uganda's inland fisheries, while also contributing to broader regional debates on sustainable management. Regional studies demonstrated that enforcement of gear restrictions in Lake Victoria produced positive but fragile recovery trends, underscoring the need for context-specific evaluations (Nyamweya et al., 2023; Mpomwenda et al, 2023). Findings from the Kazinga Channel were therefore relevant not only to national policy makers and enforcement agencies but also to fishing communities and conservation stakeholders. Through addressing ecological, policy, and socio-economic outcomes in an integrated way, the study advanced both academic knowledge and practical decision-making for balancing stock recovery with community livelihoods.

1.6 Significance of the Study

The study was significant because it provided empirical evidence on the role of gear restrictions in sustaining Nile tilapia stocks within the Kazinga Channel. Nile tilapia was central to Uganda's fisheries economy and food security, however its populations had been negatively affected by destructive fishing gears and overexploitation. Through examining ecological outcomes such as changes in stock structure and recruitment potential, the study contributed to understanding how gear restrictions influenced species recovery in one of Uganda's most sensitive ecosystems.

The findings were also valuable for guiding fisheries management and enforcement. The Fisheries and Aquaculture Act of 2023 provided a strong legal framework for regulating gears, but gaps persisted in assessing whether implementation was effective on the ground. Through analyzing enforcement realities and compliance levels, the study informed both national policy makers and the Fisheries Protection Unit on the strengths and weaknesses of current strategies. At the community level, insights into the socio-economic impacts of gear restriction were significant for balancing conservation needs with household livelihoods. Regionally, the results aligned with broader lessons from East Africa, where gear enforcement had shown both ecological gains and social challenges. Overall, the study was significant for advancing knowledge, supporting policy, and improving the sustainable management of Nile tilapia fisheries in Uganda.

1.7 Scope of the Study

1.7.1 Geographical Scope

The study was carried out in the Kazinga Channel, situated in Rubirizi District within Queen Elizabeth National Park in western Uganda. The channel lies at approximately 0°12'30"S latitude and 29°53'00"E longitude, stretching for nearly 32 kilometers between Lakes Edward and George. This location was selected because it is a critical habitat for Nile tilapia, supports large fishing communities, and is also a biodiversity hotspot that attracts tourism. Concentrating on this area enabled a clear understanding of how gear restrictions influenced both fish stock dynamics and community livelihoods in an ecologically sensitive ecosystem.

1.7.2 Content Scope

The study focused on assessing the effectiveness of gear restrictions in relation to the Nile tilapia fishery. It covered four landing sites found in Katunguru Sub County, Rubirizi district that included Kashaka landing site, Katunguru landing site, Kazinga landing site and Kisenyi landing site because they were the main areas for: ecological outcomes, enforcement measures, and socio-economic impacts. Ecological outcomes were considered in terms of changes in fish stock structure, size distribution, and recruitment potential. Enforcement measures were examined to determine how regulatory actions shaped compliance among fishers. The socio-economic dimension was analyzed to capture how fishing households and communities were affected by restricted access to previously used gears. Concentrating on these aspects ensured that the study provided a balanced view of conservation outcomes alongside community welfare.

1.7.3 Periodical Scope

The study covered the period from 2017 to 2025. This timeframe was selected because it represented the years when gear restrictions were increasingly enforced and new policy frameworks were introduced, notably the introduction of the Fisheries Protection Unit at the Kazinga Channel. Through focusing on this period, the study was able to capture changes in fish stock trends, enforcement practices, and community responses under the most recent management efforts.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

Fisheries remained vital for food security and livelihoods worldwide, with Nile tilapia (*Oreochromis niloticus*) being one of the most important species in Uganda and across Africa. Overexploitation and destructive gears reduced stock sustainability, leading to the adoption of gear restrictions as a key management tool (Tibihika et al, 2023). Globally, the Food and Agriculture Organization (2022) highlighted such measures as central to sustainable fisheries, while East African studies showed that enforcement of gear bans produced ecological gains but faced compliance challenges (Nyamweya et al., 2023; Mpomwenda et al, 2023). In Uganda, the Fisheries and Aquaculture Act of 2023 reinforced gear control, though uncertainty persisted about its effectiveness in ecosystems such as the Kazinga Channel (Republic of Uganda, 2023). This chapter reviewed theories, concepts, and empirical studies to contextualize the assessment.

2.1 Theoretical Review

Fisheries management has long been guided by theories that explain the challenges of resource use and the necessity of regulation. One of the most relevant is the Tragedy of the Commons, which argues that when natural resources are freely accessible, users tend to exploit them unsustainably, leading to depletion. This perspective explains why unrestricted use of destructive gears in the Kazinga Channel resulted in reduced tilapia size and stock decline, since each fisher sought short-term gain at the expense of long-term sustainability (Nambi et al., 2023). Closely related is the Common-Pool Resource Theory, which emphasizes the need for collective action and institutional arrangements to manage fisheries effectively. Regional studies have shown that gear restrictions only succeeded where enforcement and cooperative management structures were in place, while weak governance often reversed recovery gains (Nyamweya et al., 2023; Mpomwenda et al, 2023). Furthermore, the Sustainable Livelihoods Approach provided a framework for understanding the socio-economic dimension of fisheries management, linking gear restrictions to household welfare and community resilience. In Uganda, the Fisheries and Aquaculture Act of 2023 reflected these theoretical underpinnings by reinforcing institutional control over gear use and emphasizing sustainable exploitation for both ecological and livelihood outcomes (Republic of Uganda, 2023).

2.2 Overview of the Concepts of the Study

2.2.1 Nile Tilapia

Nile tilapia (*Oreochromis niloticus*) is one of the most commercially important freshwater fish species in Uganda and across Africa. It has been highly valued because of its adaptability, fast growth, and role in household nutrition and income generation. In Uganda, tilapia populations have formed the backbone of capture fisheries, however stock declines have been attributed to overfishing and destructive gears that reduce size structure and recruitment capacity (Nambi et al., 2023). Genetic studies have further demonstrated that Nile tilapia populations in the Edward–George–Kazinga system were under ecological pressure, with evidence of differentiation linked to fishing intensity (Tibihika et al., 2020; Tibihika et al, 2023). For this study, Nile tilapia was considered the primary species through which the effectiveness of gear restrictions was assessed.

2.2.2 Gear Restriction

Gear restriction refers to the regulation of fishing tools and methods to reduce overfishing and protect fish stocks. These restrictions include banning destructive gears such as beach seines and monofilaments, as well as setting minimum mesh sizes to ensure the protection of juvenile fish. Globally, such measures have been recognized as critical for rebuilding stocks and enhancing ecological balance (FAO, 2022). Regional experiences around Lake Victoria revealed that strict enforcement of gear bans supported partial recovery of Nile tilapia, though challenges of compliance and institutional weaknesses persisted (Nyamweya et al., 2023; Mpomwenda et al, 2023). Within Uganda, the Fisheries and Aquaculture Act of 2023 emphasized gear restrictions as a central management tool, making them the key intervention assessed in the Kazinga Channel (Republic of Uganda, 2023)

2.2.3 Kazinga Channel

The Kazinga Channel is a 32-kilometer waterway located in Rubirizi District within Queen Elizabeth National Park. It connects Lakes Edward and George and supports a rich ecosystem that provides livelihoods for fishing communities while also contributing to tourism and biodiversity conservation. The channel has, however, faced significant fishing pressure, with illegal gears leading to reduced tilapia stocks and increased ecological stress (CEBioS, 2024). As a unique ecosystem, it represents a hotspot where the interaction between conservation objectives and fishing livelihoods is most visible.

For this reason, the Kazinga Channel served as the focal geographical site for assessing the impact of gear restrictions on Nile tilapia fishery.

2.2.4 Fishery Management

Fishery management refers to the laws, policies, and enforcement mechanisms aimed at ensuring sustainable utilization of aquatic resources. Effective management incorporates ecological, economic, and social considerations to balance conservation with livelihoods. Globally, management measures such as licensing, gear regulation, and community involvement have been promoted to address the challenges of overfishing (FAO, 2022). In East Africa, coordinated enforcement across shared water bodies demonstrated that management efforts contributed to stock improvements, though governance weaknesses limited long-term gains (Nyamweya et al, 2023). In Uganda, the Fisheries and Aquaculture Act of 2023 provided an updated framework that placed emphasis on sustainable practices and strict control of gears to ensure ecological recovery and community benefits (Republic of Uganda, 2023).

2.3 Empirical literature review

2.3.1 Introduction to Fisheries Management and Gear Restrictions

Fisheries management policies aim to achieve sustainable fish populations, protect marine biodiversity, and support the livelihoods of fishing communities. Among the widely adopted strategies, gear restrictions such as limiting net sizes, types of fishing equipment, and allowable fishing techniques are implemented to regulate fish capture, reduce bycatch, and prevent overfishing (FAO, 2020) Research suggests that gear restrictions, when effectively enforced, can reduce pressure on fish stocks and promote ecosystem recovery. However, their success often hinges on local compliance and enforcement capacity, as well as the adaptability of fishing communities to new regulations (Pomeroy, 2006)

Inland fisheries face significant challenges due to a lack of reliable data on stock status, which limits effective management (Cookie et al, 2016). This is particularly true in regions like Sub-Saharan Africa, where fisheries contribute significantly to livelihoods but are often poorly managed (Garibaldi et al, 2014), Stock assessments provide fisheries reference points (FRP), benchmarks that measure the status of fish stocks, yet these are rarely utilized due to data deficiencies (ICES 2017;Lorenzen, 2016). Improving available data is vital for sustaining inland fisheries and ensuring they are considered in major policy processes (Cooke et al, 2016).

In Africa, inland fisheries employ approximately 5 million people and contribute significantly to GDP, underscoring their importance for food security and economic stability (Garibaldi et al, 2014). However, effective management approaches are urgently needed, especially in light of the Sustainable Development Goals (SDGs), which aim to address issues like pollution and overfishing that directly impact inland fisheries (UN, 2017)

Despite their significance, inland fisheries often suffer from inadequate monitoring, which hinders effective management and undermines progress toward the SDGs (Cooke et al, 2016). The lack of reliable data on fish stocks, including aspects such as trophic interactions and the magnitude of threats, often results in these fisheries being overlooked in governance processes (Cooke et al, 2016). This situation highlights the need for comprehensive assessments and improved management measures based on solid data to ensure the sustainability of these vital resources.

While extensive research has been conducted on the success of gear restrictions in different fisheries (Njiru et al, 2014), its effectiveness in Uganda, and specifically in the Kazinga Channel, remains underexplored. Given the unique socio-ecological context of the Kazinga Channel, this research seeks to fill this knowledge gap by evaluating the compliance

2.3.2 Compliance and Perceptions of Fishers toward Gear Restrictions

The success of gear restriction policies often depends on fisher compliance and community perceptions. Research shows that fishers' perceptions of regulations are influenced by their understanding of resource sustainability, economic incentives, and enforcement transparency (Pollnac et al, 2010). Studies in Uganda and Kenya have found that fishers are more likely to comply with regulations when they perceive direct benefits, such as improved fish stocks and income stability, or when enforcement mechanisms are clear and equitable (Kolding et al, 2012;McClanahan et al, 2004). Additionally, attitudes toward gear restrictions may vary based on socio-economic conditions, as communities with fewer livelihood alternatives may view these regulations as economic burdens rather than conservation tools.

Socio-demographic factors such as age, education, and income levels also influence compliance. Younger fishers, who may be more adaptable to change, often show higher compliance rates compared to older generations (Njiru et al, 2008).

The perceived fairness of regulations can also significantly impact compliance. Fishers are more likely to comply with rules they believe are equitable and just (Kolding et al, 2014).

Cultural beliefs and practices also shape compliance behavior. In some communities, traditional fishing methods are deeply rooted in culture, leading to resistance against modern regulations (Ogutu-Ohwayo, 1990). Understanding these cultural dimensions is crucial for developing regulations that are acceptable and effective.

Despite these efforts, illegal fishing practices remain prevalent, undermining compliance with gear restrictions (Bassa et al, 2013). The lack of reliable data on fish stocks complicates the enforcement of regulations, as fishers may not perceive the benefits of compliance when they lack information on stock recovery (Musinguzi et al, 2024)

The effectiveness of gear restrictions at Kazinga Channel is often undermined by enforcement challenges. (Akyoo et al, 2019) Highlighted those inadequate resources and personnel for monitoring fishing activities hinder the implementation of regulations. Corruption among enforcement officials further complicates the situation, as it can lead to non-compliance and illegal fishing practices.

Recent assessments in the Lake Edward system indicate that many exploited fish stocks are overfished or recruitment impaired, highlighting the importance of compliance with sustainable management practices (Musinguzi et al, 2023). The implementation of effective management measures based on comprehensive data could significantly enhance compliance among local fishers.

2.3.3 Ecological Effects of Gear Restriction on Nile Tilapia Populations

Ecological studies have consistently shown that destructive gears reduce stock resilience by targeting immature fish and disrupting recruitment processes. In Uganda, evidence from the Edward–George–Kazinga system demonstrated that uncontrolled fishing practices eroded the genetic diversity of Nile tilapia, creating distinct population structures that reflected ecological stress (Tibihika et al, 2020). Morphological analyses further revealed that anthropogenic pressures, including the use of small-mesh nets, reduced average body size and altered growth patterns of Nile tilapia, a trend that undermined both biodiversity and long-term productivity (Tibihika et al, 2023). These findings indicated that regulating gears was necessary to restore ecological balance.

Regional experiences offered further evidence on the ecological benefits of gear restrictions. Studies across Lake Victoria reported that enforcement of gear bans contributed to partial stock recovery, with increases in biomass and catch per unit effort being recorded following intensified regulation (Nyamweya et al, 2023). Similar modeling work in Lake Turkana showed that adjusting mesh sizes directly improved stock sustainability by reducing juvenile capture and enhancing recruitment potential (Lomodei, 2022). Globally, the Food and Agriculture Organization (2022) reinforced that gear restrictions were critical in maintaining breeding populations and sustaining fishery resources. However, while positive ecological outcomes were reported in several contexts, the success of restrictions remained closely tied to the consistency of enforcement and the biological characteristics of the targeted species. For the Kazinga Channel, these ecological insights provided the foundation for assessing whether gear regulation effectively safeguarded Nile tilapia populations in a unique ecosystem under increasing pressure.

2.3.4 Nile Tilapia Fisheries and Sustainability Challenges

Nile Tilapia is a highly valued species in many African countries, including Uganda, where it contributes significantly to food security and the economy. However, overfishing, habitat degradation, and unsustainable fishing practices have led to a noticeable decline in Nile Tilapia stocks in major water bodies, including Kazinga Channel (Ogutu-Ohwayo, 1990). This decline has prompted the need for effective regulatory frameworks to conserve the species. Studies in Lake Victoria and other East African water bodies reveal that overfishing, illegal fishing methods, and insufficient enforcement have contributed to reduced fish populations and the degradation of fishery resources (Njiru et al, 2014).

Recent studies indicate that many exploited stocks in the Lake Edward system are classified as collapsed or overfished, necessitating immediate management interventions (Musinguzi et al, 2020). Nevertheless, many stocks still show signs of growth overfishing, as indicated by low length at maturity (L_{m50}) values, highlighting the need for effective regulatory frameworks (Musinguzi et al, 2020)

Recent management changes, including the deployment of a fish protection unit to ban illegal fishing gear and protect breeding areas, have shown preliminary positive impacts on fish populations (NPA, 2019). However, challenges remain in monitoring and assessing the effectiveness of these interventions. The analysis of size structure in fish populations, including L_{max} and mean length

(Lmean), is essential for evaluating the exploitation status of stocks (Shin, 2005). Declines in Lmean across various species indicate unsustainable fishing practices, highlighting the need for regular monitoring and data collection to inform management decisions.

2.3.5 Socio-Economic Implications of Gear Restrictions on Local Communities

Fishing is a vital source of income and sustenance for approximately 23,000 fishers in the communities surrounding Lakes Edward and George (NBI, 2021). Implementing gear restrictions can lead to significant socio-economic impacts, both positive and negative. On the other hand, successful restrictions can enhance fish stocks, leading to more stable, long-term income for fishers (Silva et al, 2018) However, immediate income losses may occur as fishers struggle to adapt to new regulations or purchase compliant gear. The fisheries in the Lake Edward system support around 22,000 fishers, making the socio-economic implications of management practices particularly significant (Bassa et al, 2014). Additionally, understanding gender dynamics in fisheries is crucial, as women play significant roles in processing and marketing fish. Addressing the socio-economic dimensions of gear restrictions is essential for promoting both ecological sustainability and community well-being (Grima, 2014).

Educating communities about the long-term benefits of sustainable fishing practices can foster support for regulations. The findings from stock assessments in the Lake Edward system underline the importance of effective management strategies that consider both ecological sustainability and socio-economic realities faced by local fishing communities (Musunguzi et al, 2020).

2.4 Conclusion/Summary of the Literature

The literature demonstrated that Nile tilapia is a critical species for both food security and income generation in Uganda and across Africa. Ecological studies revealed that destructive gears such as monofilaments and undersized gillnets depleted stocks by targeting immature fish and reducing genetic diversity. These findings confirmed the importance of gear restrictions in safeguarding recruitment potential and maintaining ecological balance (Tibihika et al., 2020; Tibihika et al, 2023). Globally and regionally, gear restrictions were shown to support stock recovery, although outcomes varied depending on enforcement consistency and fisher cooperation (Nyamweya et al., 2023; Lomodei, 2022) Enforcement mechanisms in Uganda were strengthened through the Fisheries and Aquaculture Act of 2023 and the active role of the Fisheries Protection Unit. However, reports indicated that compliance remained a challenge, with recurrent cases of resistance and re-use of banned gears (Uganda Radio

Network, 2023; Nile Post, 2025). Regional experiences also highlighted that coercive enforcement, though effective ecologically, often weakened trust between regulators and communities (Mpomwenda et al, 2023). Socio-economic implications were significant, as restrictions disrupted household incomes and created conflicts where fishers had limited alternatives.

Despite these insights, a gap remained regarding the actual effectiveness of gear restrictions in the Kazinga Channel. Existing literature emphasized the need for systematic evaluations that integrated ecological, enforcement, and socio-economic perspectives. This study therefore addressed the gap by focusing on the Kazinga Channel, providing evidence to guide both academic debates and policy interventions in fisheries management.

CHAPTER THREE: METHODOLOGY

3.1 introduction

This chapter presents the methodological procedures that guided the study. It explains the study area, design, population, criteria for inclusion and exclusion, sample size, sampling procedure, study variables, data collection methods, quality control measures, and analytical approaches. The methodological framework was structured to capture ecological, enforcement, and socio-economic dimensions of gear restriction on Nile tilapia in the Kazinga Channel

3.1 Area of study

The Lake Edward system is important for freshwater biodiversity and fisheries. The system is the fourth largest among the African great lakes in terms of fish species richness (Snoeks, 2000). Lakes Edward, George and the Kazinga channel, which do not depend on fish stocking, support about 23,000 fishers in the two riparian countries. In Uganda, the water bodies are the fourth most important producers of fish after Lakes Victoria, Lake Kyoga and Lake Albert. In the DRC, Lake Edward is a major contributor to inland fish production, with its annual catches placing it among the top 5 major fish-producing inland water bodies in the country (Breuil & Grima, 2014). Other key features of the system and the water bodies within the system were described in detail by (Decru et al, 2020)

Kazinga channel located in the western region of Uganda, lies between Kasese in the north, Kitagwenda in the East, Rubirizi in the South and Rukungiri districts in the West in Queen Elizabeth National Park. It serves as a natural waterway connecting Lake George and Lake Edward. It stretches approximately 36km in length and is less than a kilometre wide, with a depth of around 4 meters.

This study covered all the landing sites at Kazinga channel that are located in Rubirizi District which include; Katunguru, Kasaka, Kazinga and Kisenyi landing sites (Figure 1)

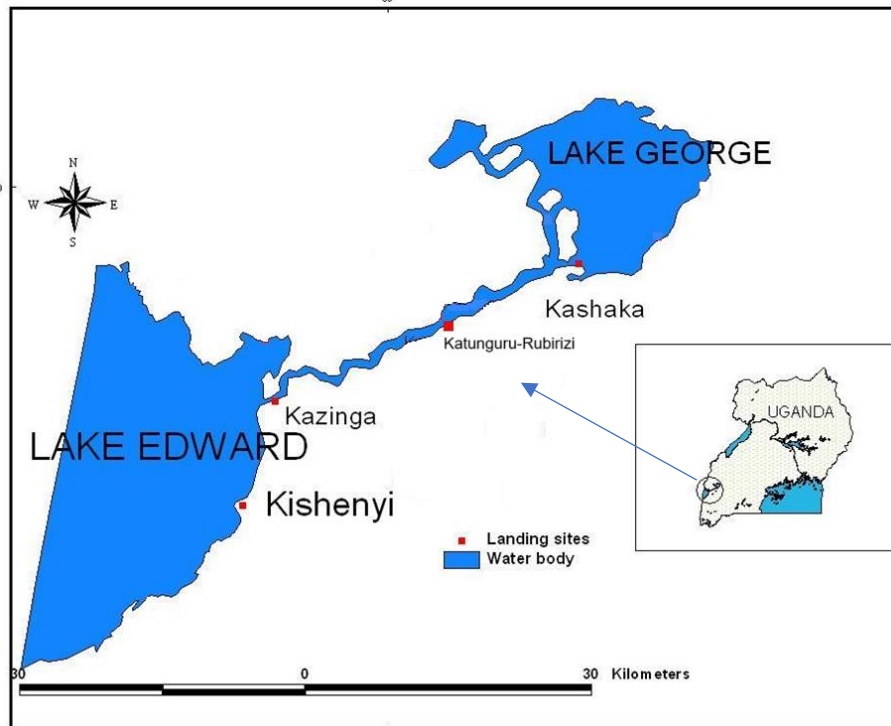


Figure 1: location of study area

3.2 Research Design

The study employed mixed methods to investigate the effectiveness of gear restriction to the Nile Tilapia fishery at Kazinga channel, Rubirizi District. The research was aimed at synthesizing and analyzing existing data to provide a comprehensive understanding of the current state of gear restriction policies, their implementation processes, and their impacts on the Nile Tilapia fishery. The review utilized a structured approach to identify and evaluate relevant studies from various sources such as; fisheries databases, journals, government reports, and other pertinent literature. Besides, the study also relied on primary data collected using oral interviews with key stakeholders and surveys. The findings of the study contributed to the knowledge base on fisheries management in Rubirizi District and may inform future policy development and decision-making in the region.

3.3 Sample Size and sampling procedures

3.3.1 Study Population

The study was focused on fishers, community leaders, fishery officers, and conservation officials involved in the Nile Tilapia fishery within Katunguru Sub County at Kazinga channel.

The study targeted a total of 149 participants, comprising 126 fishing household representatives, 9 fisheries enforcement officers, and 10 landing site committee members. This target was informed by both statistical determination and practical field realities. Initially, Yamane’s formula (1967) was applied to an estimated fisher population of 237, producing a minimum requirement of 126 household respondents at a 95% confidence level and a 5% margin of error. Out of the 149 targeted participants, 140 successfully took part in the study, yielding an overall participation rate of 93.9%. Specifically, 126 households (90.0% of target), 7 enforcement officers (77.7% of target), and 7 landing site committee members (70.0% of target) were achieved. This strong response rate minimized non-response bias and enhanced the reliability and robustness of the findings.

Table 1: Targeted and Achieved Study Sample

Category	Targeted (n)	Achieved (n)	Completion Rate (%)
Fishing Households	149	126	90.0
Enforcement Officers	9	7	77.7
Landing site committee members	10	7	70.0
Total	168	140	83.3

3.3.2 Sampling Method

A stratified random sampling method was used to select fishers from different landing sites within the Kazinga Channel. For each selected landing site, a random sample of fishers was drawn proportionally to the fisher population at the site. This approach ensured representation from various fishing communities and maximized diversity in opinions and experiences.

3.3.3 Sample Size

The sample size was determined using the Yamane’s formula (Adam, 2020) as shown below

$$n = \frac{N}{1 + N(e)^2}$$

Where;

- n is the sample size=149
- N is the population size (total number of people in the population) =237

- e is the level of precision (margin of error) =5%

3.4 Data type and data collection

3.4.1 Compliance of fishers with gear restriction policies and explore their perceptions regarding these regulations at Kazinga channel.

The dependent variable was the level of compliance and compliance statuses of gear restriction policies capturing how many fishers are compliant and how many are non-compliant towards the policy

The Independent variable included perception of gear restriction such as perceived fairness of the regulations, social demographic factors such as Age, Gender, Education level, Household size and fishing experience, economic factors such as primary source of income and cost of compliant gear.

Documentary analysis was used to gather the data for this goal, and pertinent literature from the fisheries reports of the Rubirizi District and Fisheries Protection Unit (FPU) were reviewed. This approach was to yield the information about compliance of fishers that is needed to determine complaint and non-compliant fisher. Primary Data included compliance and perception of fishers to gear restriction, household income, and shift in livelihood activities due to gear restriction was collected through surveys, focus group discussions (FGDs), and key informant Interviews with local leaders, fisheries officers and community representatives to understand enforcement and community dynamics will be conducted.

Survey Participants Selection: A stratified random sampling method was used to ensure representation from different fishing communities across the four selected landing sites (Katunguru, Kasaka, Kazinga, and Kisenyi). Fishers, community leaders, and fisheries officers were surveyed to assess their compliance and perceptions of gear restrictions.

Focus Group Discussions (FGDs): Each FGD consisted of 6-10 participants who included fishers of varying experience levels, community leaders, and BMU representatives. This provided deeper insights into the socio-economic impact of gear restrictions.

Key Informant Interviews Fisheries officers, conservation officials, and law enforcement personnel were interviewed to understand enforcement dynamics and compliance challenges.

3.4.2 Impact of gear restriction on Nile tilapia catches or stock abundance

The dependent variables were Fish catches including the weight of individual fish caught and number during a fishing period. The independent variables included banned gear type and mesh size restriction, fishing effort and the number of fishing trips. The data for this objective was collected through documentary analysis by reviewing of relevant literature from fisheries reports Rubirizi District Local Government and Fisheries Protection Unit

3.4.3 Socio-economic implications of the gear restrictions on local fishing communities.

Dependent variables: household income from fishing, change in fishing revenue before and after restriction, number of fishers displaced, shift to alternative livelihoods, cost of compliant fishing gear and reduced fishing effort

Independent variables: type of restriction, level of enforcement, age, gender and level of education of fishers, household size and dependency ratio, availability of alternative livelihoods, fish stock trends and compliance levels. Interviews with fishers to acquire data on household income and change from fishing revenue to alternative livelihoods More interviews with key informants, including community leaders, fisheries officers, and conservation officials, was conducted to gain insights into enforcement challenges, community attitudes, and the perceived impact of gear restrictions

3.5 Data analysis

3.5.1 Compliance of fishers with gear restriction policies and explore their perceptions regarding these regulations at Kazinga channel

Descriptive Statistics: Frequencies, percentages, and means were calculated for survey data to analyze compliance levels, perceptions, and socio-economic impacts.

Frequencies were used to determine the number of compliant and non-compliant fishers, Percentages will be used to express the proportion of fishers adhering to gear restrictions, Mean was calculated to analyze the average perception scores of fishers regarding gear restriction policies.

Inferential Statistics: The chi-square Test was used to assess the relationship between Fisher's demographic factors, including age and education level and their compliance with gear restrictions.

Regression Analysis was used to examine the impact of gear restrictions on fish catch levels, controlling for factors such as fishing effort and gear type.

Hypothesis: Null Hypothesis (H_0): Gear restrictions have no significant impact on Nile tilapia stock abundance and socio-economic conditions of fishers.

Alternative Hypothesis (H_1): Gear restrictions have a significant impact on Nile tilapia stock abundance and the socio-economic conditions of fishers.

Significance Level: A 95% confidence level ($p < 0.05$) was used to determine statistical significance.

3.5.2 Impact of gear restriction on Nile tilapia catches or stock abundance

These time-series data on fish catch levels, stock abundance and impact of gear restrictions were analyzed using linear regression and moving averages to observe patterns before and after the implementation of gear restrictions.

3.5.3 Socio-economic implications of the gear restrictions on local fishing communities.

Data from interviews and focus groups were transcribed and coded to identify recurring themes related to compliance challenges, enforcement issues, and the social impacts of gear restrictions. Key themes may include perceived fairness, challenges with alternative livelihoods, and the role of community involvement.

3.6 Ethical Considerations

Informed consent was obtained from all participants before data collection. Participants were informed about the purpose of the study, their rights, and the voluntary nature of their participation. All data collected from participants was kept confidential and used solely for research purposes.

3.7 Quality Assurance and Control

All tools were pre-tested in a nearby landing site outside the study area, and necessary modifications were made to improve clarity and accuracy. Field editing of data was done daily to check for completeness, and gaps were rectified immediately where possible. Cases of missing data were minimized by immediate verification; where not possible, they were documented and excluded from analysis. These measures strengthened the reliability and validity of the findings.

3.8 Ethical Considerations

The study adhered to ethical principles of research. Clearance was obtained from relevant institutional review boards, and permission was sought from Rubirizi District authorities and Queen Elizabeth

National Park management. Informed consent was obtained from all participants, who were assured of confidentiality and the voluntary nature of participation.

3.9 Study Limitations

The study encountered challenges such as reliance on self-reported socio-economic data, which may have introduced response bias. Enforcement records were sometimes incomplete, limiting the depth of official data available. Ecological sampling was restricted to a defined period, which may not have captured seasonal variations in stock dynamics. Despite these challenges, triangulation of data sources provided a more robust assessment, and the findings remained credible for understanding the effectiveness of gear restriction in the Kazinga Channel.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.0 introduction

This chapter presents the results of the study on the effectiveness of gear restriction on the Nile tilapia fishery at Kazinga Channel, Rubirizi District. The findings are organized according to the study objectives, with results presented using descriptive and inferential statistics, complemented by qualitative insights from respondents. Tables and figures are numbered sequentially, with clear titles and captions. Comparisons are drawn between pre-restriction and post-restriction conditions to highlight trends, while response rate and demographic background of participants are reported first to establish validity of the dataset

4.1 Response Rate

The study targeted a total of 149 participants, including 126 fishing household representatives, 9 fisheries enforcement officers, and 10 landing site committee members. Out of this total, 140 participants successfully took part in the study, representing a response rate of 93.9%. This high rate of participation demonstrates strong cooperation from the fishing community and relevant stakeholders, thereby reducing the likelihood of non-response bias and strengthening the credibility of the results. The near-complete coverage across categories ensures that the findings are both reliable and representative of the study population.

4.2 Background Characteristics of Respondents

The socio-demographic characteristics of respondents provide essential context for understanding the effectiveness of gear restriction in the Nile tilapia fishery at Kazinga Channel. These characteristics include age, gender, education, household size, and fishing experience, which collectively shape how individuals interact with fisheries management practices. Out of the 140 human participants (126 from fishing households, 7 landing site committee members and 7 enforcement officers), the majority were male (90.2%), reflecting the male-dominated nature of the fishing sector. Female respondents, although fewer (9.8%), played a critical role in fish processing and small-scale trading, suggesting that their perspectives are equally important in assessing compliance and sustainability.

4.3 Compliance with Gear Restriction Policies

The effective management of fisheries resources at Kazinga Channel relies heavily on fishers' adherence to gear restriction policies designed to sustain fish populations and aquatic ecosystems. Out of 149 fishers surveyed, only 25.9% reported full compliance with the gear restriction policies. A dominant 70.4% admitted to only partial compliance, while 3.7% openly stated non-compliance. These figures highlight a significant gap between policy expectations and actual behaviour on the ground. The reasons behind this include both economic and social factors, as well as systemic enforcement challenges. This finding reflects the challenges noted by Akyoo et al. (2019), who highlighted that inadequate resources and personnel for monitoring fishing activities hinder the implementation of regulations. Corruption among enforcement officials further complicates the situation, as it can lead to non-compliance and illegal fishing practices. These results also support Pomeroy (2006) who argued that the effectiveness of gear restrictions depends significantly on local compliance and the capacity to enforce regulations. The fact that compliance is generally low even when awareness is high (96.3%) suggests that awareness alone is insufficient without complementary economic and institutional support.

4.3.1 Compliance by Age Group

Fishers across all age groups reported varying levels of compliance, with some notable trends: The highest full compliance (36%) is seen among fishers aged 35 years and above, suggesting this middle-youth group may be more open or able to adhere fully to gear restrictions. The youngest (18–25) and oldest (55+) exhibit lower full compliance rates, as illustrated in figure 2. This finding supports Njiru et al. (2008) whose observation revealed that fishers aged 35 and above showed higher compliance levels.

Most fishers across all ages “sometimes” comply, indicating partial adherence is widespread regardless of age.

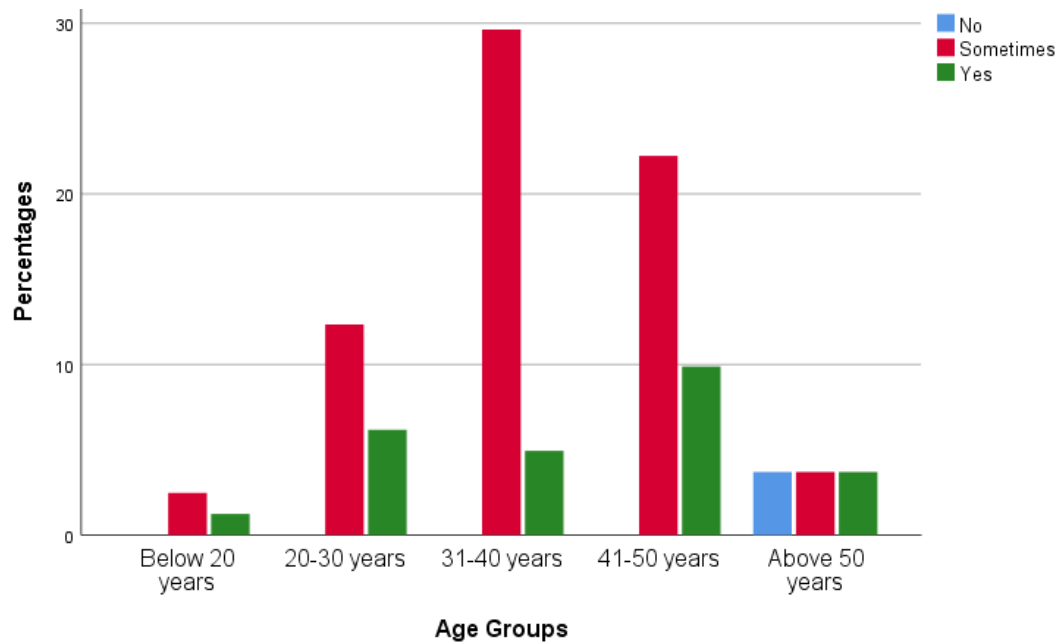


Figure 2: Compliance level by age groups

4.3.2 Compliance by Education Level

Education often correlates with awareness and attitudes toward regulatory policies. The compliance pattern observed across education levels is as follows: Fishers with secondary education show the highest full compliance (38.1%), indicating that better-educated fishers may understand and appreciate the policies more effectively. Those with no formal education have the lowest full compliance (11.1%). Primary education holders predominantly comply “sometimes,” reflecting moderate understanding or constraints figure 4.

These patterns suggest that education enhances compliance likely through improved policy awareness and possibly access to resources enabling adherence. This detailed demographic compliance analysis demonstrates that age and education are significant factors influencing compliance with gear restriction policies, highlighting groups needing focused awareness creation and support mechanisms. These findings align with Njiru et al. (2008) who found that younger and

better-educated fishers tend to be more adaptable to change and more responsive to sustainable fishing regulations.

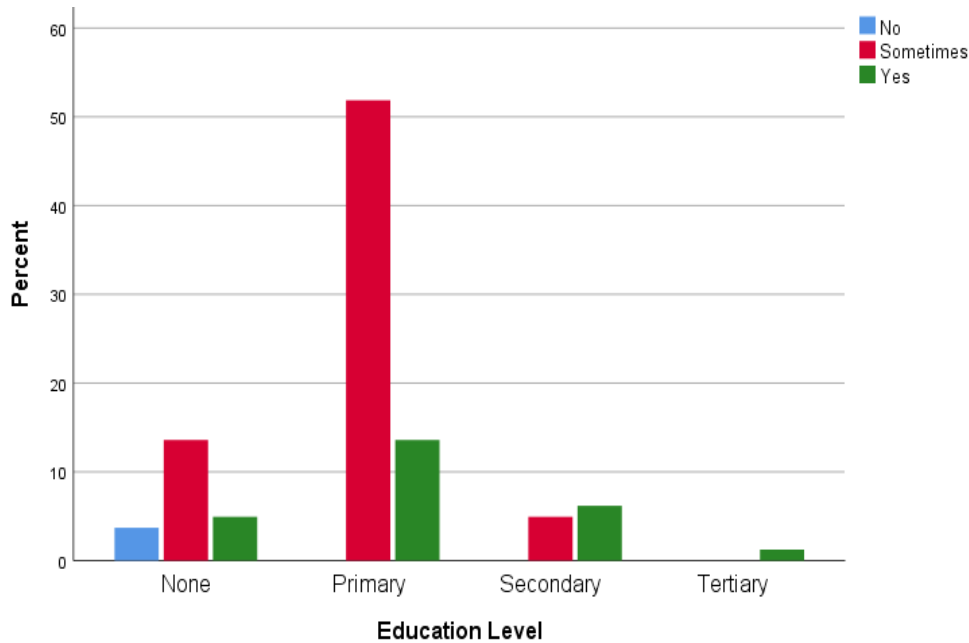


Figure 3: Compliance levels by education levels of respondents

4.3.2 Reasons for Non-Compliance

Five primary barriers emerged from the study figure 5. Fear of Reduced Catch (82.9%); many fishers perceive that using legal gear (such as larger mesh sizes) results in reduced catch volumes, which directly threatens their income and household food security.

High Cost of Legal Gear (82.9%); the cost of acquiring or replacing legal gear is prohibitive for many, especially small-scale fishers who rely on daily earnings. This is in support of Silva et al. (2018) and Grima (2014) who both recognized that economic concerns, such as gear costs and income loss, often outweigh long-term ecological benefits in the minds of fishers. The perception that legal gear leads to reduced catch echoes Ogutu-Ohwayo (1990) and Njiru et al. (2014) who described how fishers resist sustainable practices due to immediate livelihood concerns.

Lack of Awareness and Knowledge (71.4%); some fishers lack sufficient understanding of why certain restrictions exist, leading to reluctance to comply voluntarily. This is in support of Musinguzi (2024) emphasized that the lack of reliable data on fish stocks makes it harder for fishers to see the tangible benefits of regulation, further discouraging compliance.

Weak and Inconsistent Enforcement (17.1%) Perceptions that monitoring and enforcement are irregular reduce the perceived risk of non-compliance.

Corruption among Enforcement Officers (8.6%) this aligns with Akyoo et al., (2019), Kolding et al. (2014) and Bassa et al. (2013), who all reported in their findings that corruption and inconsistent enforcement as well as perceptions of unfairness erode trust in fisheries governance

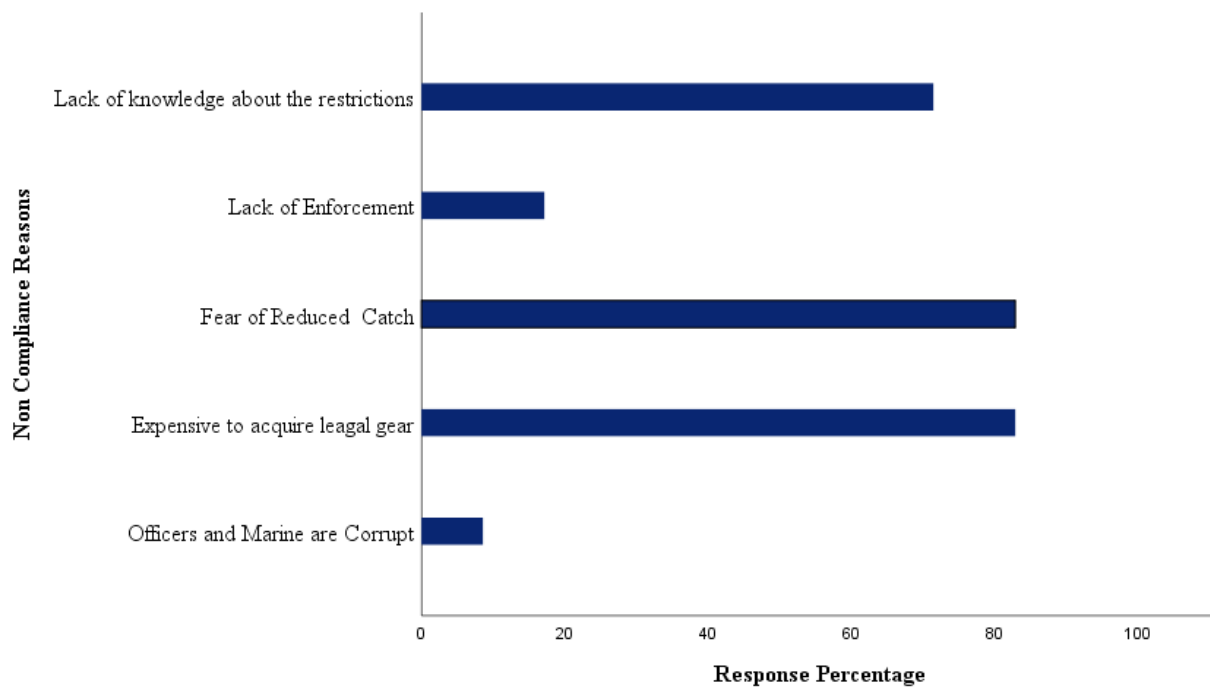


Figure 4: Shows most compliance barriers reported by respondents

Challenges Faced While Complying

Beyond individual motivations, community-level barriers, such as limited alternative income sources, contribute to the challenge. For instance, fishers often continue illegal practices when they believe enforcement is selective or temporary. Economic hardship and lack of financing for approved fishing

gear reinforce dependency on unsustainable practices. The study highlights that without addressing these structural issues, compliance levels are unlikely to improve significantly.

4.4 Existing Policies beyond Gear Restrictions

Although gear restrictions remain a key regulatory strategy at Kazinga Channel, fishers operate within a broader set of management policies. These include:

- **Closed Seasons:** Periodic fishing bans during breeding cycles to allow fish populations to replenish.
- **Licensing Systems:** Mandatory licenses for fishers and vessels, which help regulate fishing effort and ensure traceability.
- **Minimum Fish Size Limits:** Restrictions on harvesting juvenile fish to maintain breeding populations.
- **Prohibition of Destructive Fishing Methods:** Practices such as poisoning, explosives, or habitat-destructive gears are strictly prohibited.

These measures collectively aim to strike a balance between conservation and livelihoods. However, the overlapping nature of these policies can create confusion and resentment among fishers who view them as overly restrictive, particularly if not coupled with clear communication and economic support mechanisms. These measures align with a report of the UN (2017) which stated that Fishers at Kazinga Channel also navigate other regulations such as closed seasons, minimum size limits, and licensing systems and FAO (2020) which stated that overlap with gear restrictions sometimes leads to confusion or perceived overregulation, especially when not accompanied by community engagement and economic support.

4.5 Effects of Gear Restrictions on Fish Catch and Socioeconomic Standards

The primary objective of gear restrictions is to ensure sustainable fish stock levels while maintaining community livelihoods. Analysis of historical fish catch data across four landing sites Katunguru, Kashaka, Kishenyi, and Kazinga provides insight into the impact of these restrictions.

4.5.1 Fish Catch Trends

The data from 2017 indicates that fish catches were highly variable, with certain months such as August 2017 recording an extraordinary 101,323 kg at Kishenyi. This suggests seasonal abundance or possibly overfishing during unregulated periods. In contrast, the 2024–2025 data shows much lower but more stable catch volumes, with most months reporting between 2,000kg to 14,000 kg, reflecting the possible effects of regulation, improved sustainability, or declining stocks due to overfishing in previous years.

Katunguru and Kashaka recorded moderate declines but remained relatively stable, with peaks seen during high fishing seasons like February 2025 (26,152 kg at Kashaka).

Kazinga consistently had higher catches across the years compared to other sites, however, its 2025 data shows a sharp decline (e.g., only 2,907 kg in February 2025), which could indicate stricter enforcement or reduced fish populations.

Kishenyi exhibited the sharpest decline, from over 100,000 kg in a single month in 2017 to around 2,000–3,000 kg in 2025. This downward trend might reflect the ecological benefits of restrictions as larger more valuable fish are being caught instead of large volumes of small, less marketable fish. This sharp catch decline may be interpreted as either a reflection of stock recovery efforts or a past history of overfishing, consistent with the findings of Musinguzi (2020), who classified many Lake Edward system stocks as overfished or collapsed. Furthermore, Shin (2005), emphasized that metrics such as L_{max} and L_{mean} are essential to assess exploitation status. The observed shift toward larger fish sizes suggest a positive ecological response to regulation, albeit at the cost of reduced immediate catch volume

4.5.2 Socioeconomic Impacts

Household Income: About 12% of fishers reported a decrease in income, but two-thirds (80.25%) indicated stable or improved earnings due to the higher value of larger fish as shown in figure 6 below.

Livelihood Diversification: Approximately 79% of fishers or their household members have taken up alternative economic activities, such as farming or small businesses, to cope with reduced fishing days and restrictions.

Community Adaptation, there is evidence of improved market prices for larger fish, which partially offsets the reduced quantity caught. However, not all fishers benefit equally due to disparities in access to better fishing equipment or markets.

Despite the ecological gains, 21% of fishers reported income losses. This reinforces the findings of Silva et al. (2018) who noted that gear restrictions can initially impose economic strain on fishers, particularly small-scale operators lacking access to capital.

However, the 66.7% of fishers who experienced stable or improved earnings, largely due to better fish quality and market price premiums, reflect the longer-term potential benefits highlighted by Cooke et al (2016) and Garibaldi et al (2014) that sustainable fisheries can enhance economic resilience if managed well.

The fact that 79% of households have diversified livelihoods (e.g., into farming or small-scale trade) echoes Grima et al (2014), who stressed the importance of socio-economic resilience and alternative income sources in ensuring compliance and sustainability

4.6 Enforcement Mechanisms and Community Participation

Enforcement remains a cornerstone of the policy's effectiveness. Nearly all fishers (92.6%) acknowledged weekly compliance checks, showing that enforcement is present. Yet, 27% rated it as ineffective, pointing to issues of inconsistency and corruption, also documented by Akyoo et al. (2019) and Bassa et al. (2013).

Community participation in enforcement is still minimal but increasingly recognized as vital. The lack of community involvement in enforcement is a missed opportunity.

Awareness of gear restriction policies is high (96.3% of fishers are aware), but awareness alone is insufficient without addressing economic and trust-related barriers.

4.6 Discussions

The comparison of historical and recent catch data reveals both positive and negative outcomes:

Positive: There is growing evidence of ecological recovery, with reports of larger fish sizes and more sustainable harvesting practices. Such larger fish sizes and sustainable catches align with findings from Ogutu-Ohwayo (1990) who found that reduced gear-based pressures improve ecosystem health

Negative: Short-term economic hardship persists for many fishers, especially those without alternative income sources or financial support. The data also highlights the need for policy integration with economic interventions. Subsidies for legal gear, microcredit programs, and cooperative fish marketing could help align conservation efforts with fisher welfare. This reflects the socio-economic dilemmas described by Cooke et al (2016) and Pollnac et al. (2010). Fishers often weigh immediate needs over long-term sustainability, particularly when no safety nets or economic incentives are in place.

Furthermore, the dramatic differences between 2017 and 2025 catches emphasize that without continuous monitoring and enforcement, overfishing can occur rapidly, jeopardizing long-term fishery sustainability. This points to a critical need for policy integration gear restrictions should not stand alone but be accompanied by microcredit schemes, gear subsidies, and education programs, as advocated by Garibaldi 2014 and UN 2017

The findings reveal a complex, nuanced reality shaped by ecological, socio-economic, and governance factors. Although almost all fishers (96.3%) are aware of gear restriction policies, only about one-quarter (25.9%) report full compliance. The vast majority (70.4%) comply only sometimes, indicating significant barriers prevent consistent adherence. This partial compliance highlights the tension between conservation goals and livelihoods in local fishing communities. The low full compliance rate (25.9%) reflects barriers similar to those identified by Kolding et al. 2014 and Njiru et al. 2014 including economic hardship, lack of capacity, and governance weaknesses. Awareness levels are high, but as Pollnac et al. (2010) noted, awareness does not automatically translate into compliance unless fishers perceive benefits and fairness in enforcement

The primary reasons for non-compliance identified include economic concerns such as the high cost of acquiring legal fishing gear (82.9%) and fear of reduced catch and income (82.9%). Furthermore, over 70% of fishers cited lack of knowledge as a key issue, suggesting gaps in effective communication and education despite widespread awareness. Weak enforcement and perceptions of corruption also erode compliance incentives, though these were less frequently mentioned. These findings confirm the hypothesis that socio-economic constraints and enforcement weaknesses are major determinants of compliance behaviour. Fishers with higher education and middle-age groups comply more, echoing findings from Njiru et al. (2008). Demographic analysis demonstrates that compliance varies with age and education. Fishers aged 30 years and above and those with secondary education exhibit higher full compliance rates, pointing to the role of awareness, capacity, and adaptability in fostering rule adherence. Conversely, younger fishers (18–25) and fishers with low or no formal education tend to comply only occasionally, underscoring the need for targeted outreach and capacity building.

While gear restrictions appear to have contributed to ecological improvements, particularly in fish size and diversity, their socio-economic impact remains uneven. This confirms Grima et al (2014) and Silva et al. (2018), who caution that restrictions must be socially sensitive to avoid marginalizing vulnerable fishers.

Ultimately, this study echoes the call by Cooke et al (2016) and FAO (2020): for inland fisheries like Kazinga Channel to be sustainable, we must combine strong ecological management with inclusive governance, economic incentives, and continuous data-driven monitoring.

Socio-economically, the restrictions have mixed effects. While a majority (66.7%) experienced increased or stable household income—likely due to market premiums on larger fish and sustainable yields—about 21% reported income decreases linked to reduced catch volumes or costs of compliance. Importantly, 79% have had to shift their livelihoods or diversify income sources to cope with these changes, affirming that gear restrictions affect fishing-dependent households beyond catch itself. These findings align with hypotheses predicting socio-economic strain among affected communities and reinforce the importance of livelihood diversification support.

Effective enforcement remains a critical challenge. Although most fishers (92.6%) report that authorities conduct weekly compliance checks and 82.7% have faced penalties for violations, nearly a quarter rated enforcement as ineffective or very ineffective, often pointing to corruption and inconsistency. The limited direct involvement of local communities in enforcement processes further weakens overall compliance levels, suggesting governance arrangements could be more inclusive and transparent.

4.7 Implications of the Findings

The findings carry significant implications at multiple levels. From a policy perspective, they highlight the urgent need for enhanced enforcement mechanisms, including community co-management approaches, to ensure compliance with gear restrictions. Practically, the results emphasize the importance of promoting alternative income-generating activities to reduce pressure on fisheries, as poverty-driven non-compliance undermines sustainability. For research, the study points to the need for further investigations into the role of gender, climate change, and governance in shaping fisheries management outcomes in Uganda and beyond. These implications demonstrate that effective gear regulation cannot be divorced from broader socio-economic and institutional contexts.

4.8 Conclusion of the Discussion

In conclusion, the study confirmed that gear restrictions are ecologically effective when adhered to, as they promote sustainable catch rates, preserve fish size distribution, and stabilize CPUE. However, partial compliance driven by poverty, weak enforcement, and livelihood dependence on fishing undermines these benefits. The findings support the argument that technical regulations alone are insufficient without robust community engagement, enforcement, and livelihood diversification. These insights pave the way for the next chapter, which will present the study's conclusions and practical recommendations for fisheries management in the Kazinga Channel and similar inland water bodies.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

In conclusion, the impact of gear restriction policies at Kazinga Channel is multifaceted. While awareness is widespread and partial compliance high, full compliance remains limited by

socioeconomic barriers, costs of legal gear, fears of income loss, and governance challenges such as inconsistent enforcement. Changes in fish catch trends indicate some ecological benefits, with larger fish sizes observed, offering hope for stock recovery.

Compliance with gear restriction policies at Kazinga Channel is generally low, only 25.9% of surveyed fishers fully comply, 70.4% comply only partially, and 3.7% do not comply at all. While awareness is very high (96.3%), perceptions are shaped by strong economic and social pressures. Many fishers view the regulations as economically burdensome, particularly due to the high cost of legal gear (82.9%) and fears of reduced catch volumes (82.9%). Weak or inconsistent enforcement and corruption further erode trust in fisheries governance. Compliance is higher among fishers aged 35+ and those with secondary education, suggesting that experience, understanding of policy objectives, and resource access influence adherence. Overall, the perception is that regulations are important for conservation but difficult to follow without economic support and fair enforcement.

Historical catch data suggest that gear restrictions have contributed to ecological recovery, particularly through increases in average fish size and reduced capture of juveniles, which supports stock replenishment. From 2017 to 2025, there was a marked decline in catch volumes especially at Kishenyi (from over 100,000 kg in a peak month to around 2,000–3,000 kg) which could indicate reduced overfishing and more sustainable harvesting. However, this also reflects possible prior stock depletion. The shift toward fewer but larger fish aligns with sustainable fishery goals, though from the fishers' perspective, lower volumes create short-term income pressures. In summary, the restrictions seem to have helped improve stock structure, but the full ecological benefits may take longer to realize.

The socio-economic impacts are mixed. While 66.7% of fishers reported stable or improved income mainly due to better market prices for larger fish 21% experienced income losses linked to reduced catch volumes and compliance costs. Most households (79%) diversified livelihoods into farming or small businesses to offset fishing income fluctuations. However, high gear costs, limited access to capital, and lack of alternative income opportunities remain significant barriers to equitable benefits. The uneven distribution of gains means that smaller-scale fishers are more vulnerable to the restrictions' economic impacts. Without targeted support (e.g., gear subsidies, microcredit, cooperative marketing), gear restrictions risk deepening economic strain despite their conservation value.

These findings highlight the delicate balance between conservation objectives and fisher livelihoods, emphasizing the need for integrated approaches combining policy enforcement, community engagement, and socioeconomic support.

Overall, the analysis confirms the interconnectedness of awareness, socio-economic factors, enforcement efficacy, and community participation in determining the success of gear restriction policies. It provides empirical evidence supporting the research questions and hypotheses, emphasizing that without addressing economic barriers, strengthening enforcement, and broadening community engagement, gear restrictions alone may fall short of their conservation and livelihood goals

5.2 Recommendations

Based on the comprehensive analysis, several key recommendations emerge to enhance compliance and improve fisheries sustainability at Kazinga Channel:

Improving compliance with gear restriction policies at Kazinga Channel will require a combination of economic support, fair enforcement, and community engagement. One of the most immediate needs is to make legal fishing gear more affordable and accessible. This could be achieved through subsidies, microcredit facilities, or cooperative purchasing schemes, particularly targeting small-scale fishers. Encouraging local production or bulk procurement of approved gear would also help reduce costs. When fishers are equipped with the right tools at a manageable cost, adherence to regulations becomes far more realistic.

Enforcement mechanisms must also be strengthened and applied consistently to build trust in fisheries governance. This means increasing patrol frequency, ensuring transparent monitoring systems, and actively addressing corruption. Community leaders, fisher associations, and trusted local representatives should be directly involved in co-enforcement, which can help reduce perceptions of unfair treatment and promote shared responsibility for the fishery's future. At the same time, awareness campaigns should go beyond simply informing fishers of the rules, instead focusing on explaining the benefits of compliance such as long-term income stability, sustainable stock recovery, and food security. Special attention should be given to younger fishers and those with limited formal education, using local languages and practical demonstrations to improve understanding.

Long-term sustainability will depend on integrating gear restrictions with other fisheries regulations, such as closed seasons, minimum size limits, and licensing, in a way that avoids confusion and policy fatigue. Clear and consistent communication is essential to help fishers navigate the full regulatory framework. Supporting livelihood diversification should be another priority. Many fishing households have already turned to farming, aquaculture, small businesses, and eco-tourism to cope with reduced fishing days; these efforts should be strengthened through training, micro-enterprise support, and improved market linkages, particularly to capture higher prices for larger, legally caught fish. Continuous monitoring of both fish stocks and socio-economic conditions is necessary to assess progress and adjust strategies over time. Crucially, local communities should be given a formal role in fisheries governance through co-management committees and fisher-led surveillance groups, ensuring that conservation efforts are rooted in shared ownership and mutual benefit

5.3 Areas for Future Research

Although this study generated valuable insights, it also highlighted areas where further research is required. Future studies could examine the role of climate variability and water quality changes in shaping fish population dynamics in the Kazinga Channel, as these ecological factors may interact with gear use to affect stock sustainability. There is also a need to explore gendered participation in fisheries management, particularly the role of women in compliance and post-harvest processes, which remains under-researched. In addition, longitudinal studies tracking CPUE and fish size distribution over extended periods would help establish stronger causal links between enforcement levels and resource outcomes. Finally, further investigations into the socio-economic trade-offs of alternative livelihoods could provide practical pathways for reducing dependence on illegal fishing practices.

REFERENCES

- Adam, A. M. (2020). sample size determination in survey research. *Journal of scientific research & reports*,26(5), 90-97. <https://doi.org/10.9734/JSRR/2020/v26i530263>
- Breuil. C., & Grima. D. (2014) Fisheries in the ESA-I0 Region in Kenya (pp. 1-40) Fisheries Management FAO component

Balirwa, J. S., Chapman, C. A., Chapman, L. J., Cowx, I. G., Geheb, K., Kaufman, L., ... & Welcomme, R. L. (2007). Biodiversity and fishery sustainability in the Lake Victoria Basin: an unexpected marriage? *BioScience*, 53(8), 703-715.

CEBioS (Royal Belgian Institute of Natural Sciences). (2024, July). Reference points to improve effective management of fish stocks in lakes Edward, George and the Kazinga Channel (Policy brief). https://cebios.naturalsciences.be/wp-content/uploads/2024/07/policy-brief-on-stateful-of-fisheries_Firstversion.pdf

De Silva, D. A. M., & Yamao, M. (2007). Effects of the Tsunami on Fisheries and Coastal Livelihood: A Case Study of the Sri Lankan Fishing Sector. *Disasters*, 31(4), 386-404.

De Graaf, G. & Garibaldi, L., (2014). The value of African fisheries. FAO Fisheries and Aquaculture Circular No 1093

Food and Agriculture Organization (FAO). (2020). The State of World Fisheries and Aquaculture. FAO.

Food and Agriculture Organization (FAO). (2022). The state of world fisheries and aquaculture 2022: Towards blue transformation. <https://openknowledge.fao.org/server/api/core/bitstreams/a2090042-8cda-4f35-9881-16f6302ce757/content>

FAO. (2021). The State of World Fisheries and Aquaculture 2021: Sustainability in Action. Rome: Food and Agriculture Organization of the United Nations.

FAO. (2022). The State of World Fisheries and Aquaculture 2022: Towards Blue Transformation. Rome: FAO.

García, S. M., Rice, J., & Charles, A. (2018). Fisheries management: Progress towards sustainability. Wiley-Blackwell.

- Jentoft, S., Chuenpagdee, R., Bundy, A., & Mahon, R. (2010). Poverty Eradication and Sustainable Development of Small-Scale Fisheries: A Policy Brief. Developing Fisheries for Poverty Reduction and Sustainable Livelihoods, FAO Fisheries and Aquaculture Technical Paper No. 549.
- Kolding, J., van Zwieten, P. A. M., & Mkumbo, O. C. (2014). Effects of Exploitation and Climate on Fish Stocks in African Lakes. In M. H. Taylor, P. Warren, & L. Jones (Eds.), *Global Change in African Lakes* (pp. 101–119). Springer.
- Lake Victoria Fisheries Organization (LVFO). (2016). *The Fishery Resources of Lake Victoria. Regional Fisheries Report.*
- Lomodei, E. (2022, December 21). Simulating mesh-size and selection pattern impacts on the Lake Turkana fisheries sustainability in Kenya. *International Journal of Advanced Research*.
<https://journals.eanso.org/index.php/ijar/article/view/1017>
- McClanahan, T. R. (2010). Effects of fisheries closures and gear restrictions on fishing income in a Kenyan coral reef. *Conservation Biology*, 24(6), 1519–1528.
<https://pubmed.ncbi.nlm.nih.gov/20497202/>
- Mpomwenda, V., Natugonza, V., Kundu, R., & Nyamweya, C. (2023). From co-operation to coercion in fisheries management: What we gain and what we lose. *Fishes*, 8(11), 563.
<https://doi.org/10.3390/fishes8110563>
- McClanahan, T. R., & Mangi, S. (2004). Gear-Based Management of a Tropical Artisanal Fishery Based on Species Selectivity and Capture Size. *Fisheries Management and Ecology*, 11(1), 51-60.
- Musinguzi, L., Kanya, A., Nsega, M., Natugonza, V., Okello, W., Snoeks, J., & Van Steenberge (2024). Estimates of life-history and growth parameters of exploited fish species in lakes Edward and George:
- Musinguzi, L., Nathan, V., Nutugonza, V., Okello, W., & van Steenberge (2023) State of knowledge of aquatic ecosystem and fisheries of the Lake Edward System, East Africa

- Musinguzi, L., Bassa, S., Froese, R., Natugonza, V., Okello, W., Snoeks, J., & Van Steenberge (2020). Assessment of exploited fish species in the Lake Edward System, East Africa
- MAAIF. (2020). Annual Fisheries Sector Report. Ministry of Agriculture, Animal Industry, and Fisheries, Uganda.
- Mbabazi, D., Nyakuni, A., & Okello, W. (2012). Ecological and socio-economic assessment of Kazinga Channel fisheries in Queen Elizabeth National Park, Uganda. *Uganda Journal of Agricultural Sciences*, 13(1), 29-44.
- NEMA. (2019). National State of the Environment Report for Uganda. National Environment Management Authority.
- Njiru, M., Kazungu, J., Ngugi, C. C., Gichuki, J., & Muhoozi, L. (2008). An Overview of the Current Status of Lake Victoria Fishery: Opportunities, Challenges, and Management Strategies. *Lakes & Reservoirs: Research & Management*, 13(1), 1-12.
- Njiru, M., Okeyo-Owuor, J. B., Muchiri, M., & Cowx, I. G. (2014). Fishing Impacts in Large Tropical Lakes: The Lake Victoria Experience. *Hydrobiologia*, 739, 213-223.
- Njiru, M., Kazungu, J., Getabu, A., & Ngugi, C. C. (2020). Declining fish stocks in Lake Victoria: The case of Nile tilapia and its implications for fisheries management. *Lakes & Reservoirs: Research and Management*, 25(2), 97-108
- NEMA & UBOS. (2022). Fisheries Resources Accounts for Uganda. Uganda Bureau of Statistics and National Environment Management Authority.
- Nambi, R. W., et al. (2023). Impacts of land cover changes on catches of Nile perch and Nile tilapia in Lake Kyoga, Uganda. *Fishes*, 8(3), 158. <https://www.mdpi.com/2410-3888/8/3/158>
- Nile Post. (2025, June 19). Illegal fishing gear worth Shs 431M burnt at Katunguru landing site. <https://nilepost.co.ug/news/266416/illegal-fishing-gear-worth-shs-431m-burnt-at-katunguru-landing-site>
- Nyamweya, C. S., Natugonza, V., Kashindy, B. B., Mangeni-Sande, R., Kagoya, E., Mpomwenda, V., Mziri, V., Elison, M., Mlaponi, E., Ongore, C., et al. (2023). Response of fish stocks in Lake

Victoria to enforcement of the ban on illegal fishing: Are there lessons for management? *Journal of Great Lakes Research*, 49, 531–544.
<https://www.sciencedirect.com/science/article/abs/pii/S0380133023000242>

LVFO. (2016). State of the Fisheries Resources of Lake Victoria and Their Management. Lake Victoria Fisheries Organization

Obiero, K. O. (2015). Institutional and gear restriction challenges shaping co-management of Lake Victoria fisheries in Kenya. *Fisheries Research Papers, University of Michigan – Deep Blue Repository*. <https://deepblue.lib.umich.edu/handle/2027.42/113679>

Ogutu-Ohwayo, R. (1990). The Decline of the Native Fishes of Lakes Victoria and Kyoga (East Africa) and the Impact of Introduced Species, Especially the Nile Perch, *Latesniloticus*, and Nile Tilapia, *Oreochromis niloticus*. *Environmental Biology of Fishes*, 27(2), 81-96.

Onyango, P. O. (2016). Governance of the Lake Victoria Fisheries in Kenya: From the Local to the Global. *Fishers and Fisheries Governance*, 21(3), 331-347.

Pollnac, R. B., Crawford, B. R., & Gorospe, M. L. G. (2010). Discovering Factors that Influence the Success of Community-Based Marine Protected Areas in the Visayas, Philippines. *Ocean & Coastal Management*, 43(8-9), 683-710.

Pomeroy, R. S., & Rivera-Guieb, R. (2006). *Fishery Co-Management: A Practical Handbook*. CABI Publishing.

Pomeroy, R. S., Katon, B. M., & Harkes, I. (2001). Conditions Affecting the Success of Fisheries Co-management: Lessons from Asia. *Marine Policy*, 25(3), 197-208

Republic of Uganda. (2023). The Fisheries and Aquaculture Act, 2023 (Act No. 5 of 2023). Uganda Legal Information Institute. <https://ulii.org/akn/ug/act/2023/5/eng%402023-03-24>

Silva, A., Veríssimo, A., & Orensanz, J. M. (2018). The Role of Socio-Economic Factors in the Management of Fisheries. *Fisheries Research*, 203, 81-90.

- Ssempijja, D., et al. (2025). An assessment of legislative, regulatory and policy gaps in the Lake Victoria Region fisheries. *Environmental and Sustainability Indicators*. <https://www.sciencedirect.com/science/article/abs/pii/S2211464525001150>
- Tibihika, P. D., Aruho, C., Namulawa, V., Ddungu, R., Atukunda, G., Aanyu, M., Nkambo, M., Vijayan, T., Kwikiriza, G., Curto, M., & Meimberg, H. (2024). Unlocking Nile tilapia (*Oreochromis niloticus* Linn., 1758) selective breeding programmes in Uganda through geographical genetic structure mapping. *Aquaculture, Fish and Fisheries*, 4, e197. <https://doi.org/10.1002/aff2.197>
- Tibihika, P. D., et al. (2020). Molecular genetic diversity and differentiation of Nile tilapia in the Edward–George–Kazinga catchment of Uganda. *Scientific Reports*, 10, 19872. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6990601/>
- Tibihika, P. D., et al. (2023). Exploring the morphological dynamics of Nile tilapia populations as influenced by anthropogenic activities in the Victoria Nile. *BMC Zoology*, 8, Article 190. <https://bmczool.biomedcentral.com/articles/10.1186/s40850-023-00190-9>

APPENDICES

Appendix 1: Questionnaire

Research Title: Assessing the Effectiveness of Gear Restriction on Nile Tilapia Fishery at Kazinga Channel, Rubirizi District.

Researcher: Erisa Arinaitwe

Student Number: BU/UG/2022/1226

Degree: Bachelor's in Fisheries and Water Resource Management, Busitema University

Section A: Demographic Information

(Please tick or fill in the appropriate response)

Variable	Response Options
Gender	Male <input type="checkbox"/> Female <input type="checkbox"/>
Age	18–25 <input type="checkbox"/> 26–35 <input type="checkbox"/> 36–45 <input type="checkbox"/> 46–55 <input type="checkbox"/> 56+ <input type="checkbox"/>
Marital Status	Single <input type="checkbox"/> Married <input type="checkbox"/> Widowed <input type="checkbox"/> Divorced <input type="checkbox"/>
Level of Education	No formal education <input type="checkbox"/> Primary <input type="checkbox"/> Secondary <input type="checkbox"/> Tertiary <input type="checkbox"/>
Occupation	Full-time fisher <input type="checkbox"/> Part-time fisher <input type="checkbox"/> Fish trader <input type="checkbox"/> Fisheries officer <input type="checkbox"/> Other (specify) _____
Fishing Experience	Less than 5 years <input type="checkbox"/> 5–10 years <input type="checkbox"/> 11–15 years <input type="checkbox"/> Over 15 years <input type="checkbox"/>
Gear Used	Gillnet <input type="checkbox"/> Hook & Line <input type="checkbox"/> Beach Seine <input type="checkbox"/> Cast Net <input type="checkbox"/> Other (specify) _____

Section B: Perceptions on Gear Restriction

(Using a 5-point Likert Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

Statement	1	2	3	4	5

Gear restrictions are necessary to protect Nile Tilapia stocks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Current restrictions are well communicated to fishers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enforcement of gear restrictions is effective.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Illegal gear users negatively affect compliant fishers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gear restrictions have improved fish catch sustainability.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section C: Impact of Gear Restrictions on Fishing Activities

Statement	1	2	3	4	5
Legal gears provide adequate catch to sustain my livelihood.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Illegal gears yield higher catch compared to legal gears.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The use of legal gears ensures larger-sized Nile Tilapia are caught.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Catch-per-unit effort (CPUE) is better with legal gears.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Using legal gears reduces fishing income significantly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section D: Compliance with Gear Restrictions

Statement	1	2	3	4	5
I always comply with the legal gear requirements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Non-compliance is mainly due to poverty and livelihood needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Penalties for illegal gear use discourage fishers from breaking rules.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Community sensitization on gear restriction is sufficient.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gear restriction policies are fair to all fishers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Thank You

Appendix 2: Interview Guide

Target Respondents: Fisheries Officers, Beach Management Unit (BMU) Leaders, Local Authorities

Introductory Statement:

This interview seeks to explore your views on the effectiveness of gear restrictions on Nile Tilapia fishery in the Kazinga Channel. The information will be used for academic purposes only and treated with confidentiality.

Guiding Questions

1. Perceptions of Gear Restrictions

- What is your understanding of the gear restrictions imposed on Nile Tilapia fishing in Kazinga Channel?
- Do you think these restrictions are effective in conserving fish stocks? Why or why not?

2. Impact of Gear Restrictions

- How have gear restrictions affected fishing practices and catches in this community?
- What differences do you observe in catches from legal vs illegal gears?

3. Compliance and Enforcement

- How do fishers generally respond to enforcement of gear restrictions?
- What challenges do enforcement officers face in controlling illegal fishing?

4. Community Perceptions and Livelihoods

- How do gear restrictions influence the livelihoods of local fishers?
- Are there alternative livelihood options available to reduce dependence on illegal fishing?

5. Recommendations

- What strategies would you suggest to improve compliance with gear restrictions?
- How can government and community efforts be strengthened to ensure sustainability?

Appendix 4: shows a catch ready for weighing at katunguru landing site



Appendix 5: shows a panel of gill nets with missed mesh sizes at kashaka landing site



Appendix 6: shows an interview with a fisherman at kazinga landing site



Appendix 7: shows a researcher weighing a catch at Katunguru landing site



Appendix 8: shows a panel of nets ready for deployment at kisenyi landing site



