Proposed Environmental Education Activities for the Sustenance of Fish on the Kafue Wetland of Southern Zambia

By

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A Dissertation submitted to the University of Zambia in partial fulfilment of the requirements for the Degree of Master of Education in Environmental Education

THE UNIVERSITY OF ZAMBIA

LUSAKA
2012

Declaration

I Kashinga Salome Mwitwa hereby declare that this dissertation for the Master of Education in Environmental Education is a product of my personal research work. It has not previously been submitted for a degree, diploma or other qualification at this or another university.

Signed: é é é é é é é é é é é é é .....

Date: é é é é é é é é é é é é é é é é é .

Certificate of Approval

This dissertation of KASHINGA SALOME MWITWA has been approved as fulfilling part of the requirements for the award of the degree of Master of Education in Environmental Education by the University of Zambia.

Examiners' Signatures

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Abstract

The role of Environmental Education as a remedial measure to counter over-exploitation of fish is often not fully utilised. This study set out to propose an Environmental Education Programme of Activities to mitigate over-exploitation of fish in the Kafue Wetland of Southern Zambia. The objectives of the study were; to determine the form and levels of Environmental Education awareness among fishermen, to identify the type of Environmental Education required to effectively address over-exploitation of fish and, lastly, to propose Environmental Education activities that would enhance fish sustenance.

The study revealed that the form of Environmental Education awareness among fishermen consisted mainly of a combination of ecosystem conservation and fishing regulations. The study further showed that levels of Environmental Education awareness among the majority of fishermen were low. In addition, Environmental Education - related information relevant to the sustenance of fish and survival skills coupled with compliance to fishing regulations was needed in Kafue fishing camps to sustain fish. To this effect, Environmental Education activities proposed to address over-fishing included; a documentary on unsustainable fishing, drama on ósCramble for fishô, debate on fish ban as well as hands-on activities in the environment involving the cleaning of the river banks and tree planting.

The study was descriptive with a design that was predominantly qualitative, though few quantitative approaches were also applied. Data was collected using questionnaires and interviews. Respondents were fisheries extension officers and fishermen of Kafue.

The study concludes that Environmental Education programmes were not standardised and not adequately carried out. Furthermore, a holistic approach was not taken by previous awareness ï raising activities during the implementation of environmental education prior to this study. Another conclusion drawn was that information on Environmental Education biased to fish sustenance needed to be given together with other survival skills. The study recommends that the Zambian Central Government should help fishermen to acquire other survival skills to reduce pressure on the rivers. In addition, the Ministry of Agriculture and Cooperatives should adequately fund the Department of Fisheries to enable the department train more extension officers to carry out Environmental Education. Finally, the general public as fish consumers and fish mongers should be sensitised to become good citizens by not supporting fishermen without licences through boycotting buying fish during the fish ban.

Dedication

To the memory of my late father, Mr. Kashinga Joshua who encouraged me to aim higher academically. To my mother, Mainess Kalumbwa Kashinga, for being my best life-time teacher.

Acknowledgements

A lot of thanks go to the Almighty God for keeping me healthy throughout the study period. Profound thanks go to my Supervisor Dr. C. M. Namafe for his guidance and unceasing encouragement, without whose expertise, this work could not have been completed.

I also wish to extend my utmost gratitude to Mrs. Chilufya, Officer in Charge (Department of Fisheries, Kafue) for facilitating transport logistics during my field work.

Lastly but not the least, special thanks go to my family (my husband and children) for their encouragement and sponsorship. To them I say, ôMay God bless you in abundanceô.

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF IMAGES

Page

LIST OF ACRONYMS

DoF:	Department of Fisheries
ECZ:	Environmental Council of Zambia
FAO:	Food and Agriculture Organisation
IPOPCORM:	Integrated Population and Coastal Resource Management
IUCN:	International Union for the Conservation of Nature
UN:	United Nations
UNEP:	United Nations Environment Programme
UNESCO:	United Nations Education Scientific and Cultural Organisation
WCF:	World Conservation Fund
WFC:	World Fish Centre
WWF:	Worldwide Fund for Nature

LIST OF APPENDICES

CHAPTER ONE

INTRODUCTION

1.0 Overview

This Chapter presents the framework and preliminary ideas in which this research has been conducted. The starting point is the presentation of the background that generated the need to undertake this research. This is followed by contextual factors, statement of the problem, purpose of the study, objectives of the research, specific research questions, as well as the significance of the study, limitations of the study, operational definitions and delimitations of the study.

1.1 Background

Globally, about thirteen million people make their living from fishing. Together with their immediate families, they comprise some fifty million people directly dependent on fishing for their livelihoods. These people depend upon healthy oceans and abundant fish populations to sustain their life styles (archive.greenpeace.org). In Zambia, the fisheries sector enables up to 300 000 people to earn part of their income directly as fishermen, fish farmers as well as indirectly as traders, processors and other service providers in the fish industry (Musumali *et. Al.* 2009). Fish is a significant component of the diet for many people around the world. However, it is not always possible to maintain a continuous supply so that consumers can continue to have the right amount and quality of fish products (Kent, n.d.).

There has been widespread over-fishing in coastal and shelf areas, and also on the high seas. Fisheries are endangered not only by over-fishing but also by pollution and other

environmental stresses in spawning and feeding areas along the coasts (Kent, n.d.). From the 1970s to 1980s, per capita consumption of fish in Zambia was 12.0kg /person/annum. Recent estimates have put per capita consumption at 7.0kg /person/annum. The ACF/FSRP Report (2009) attributes the drop in per capita consumption of fish to the decline in fish stocks in some of the fisheries as a result of excessive fishing and use of bad fishing methods, as well as an increase in human population. Kent (*n.d*) points out that between 1961 and 1990, the fish food supply per capita declined rather steadily in Banglandesh, Jamaica, Laos, Lebanon, Mauritania and Suriname.

The report of 2006 entitled ó The State of World Fisheries and Aquacultureô by SOFIA (http://www.fao.org) stated that the scale of the problem of over-fishing is as follows; 52% of fish stocks are fully exploited, 20% are moderately exploited, 17% are over-exploited, 7% are depleted, 1% is recovering from depletion. A total of almost 80 % of the worldôs fisheries are fully over-exploited, depleted or in a state of collapse.

Mwale (2005) points out that the increase in demand for fish has a direct effect on the increase in fishing pressure to the extent of using environmentally unfriendly methods of capturing fish. Over-exploitation of fisheries resources in the Zambian water bodies presents a threat to fish sustenance. It is now an established fact that both artisanal and commercial fishermen employ various methods to increase their catch as they compete for the resource. The use of unorthodox methods by the fishermen is done with little concern to the fisheries and the other organisms in the water bodies. This practice has at times culminated in disturbing breeding grounds and harvesting of fingerlings, thereby

affecting the sustenance of fish. The use of unsound methods has contributed to the decline in the quantity of fish.

The study by Leonila (2008) reveals that the decline of fish in the Phillipines on Bohol Island was as a result of the population swell and high demand for fish, which led to the influx of both local and commercial fishermen reducing fish stocks to unsustainable levels. The study further reveals that the phenomenon was turning into a race for fish with many fishermen resorting to the highly destructive yet effective use of dynamite. This method trebles the fishermenôs catch as compared to the hook and line method, but the explosion (from the dynamite) destroys coral reefs and sea grass. These are areas that serve as nurseries and habitat for fish.

At global level, there is currently a widespread concern on over-fishing of marine and fresh water resources and many of the coastal and river habitats that sustain the fisheries are being degraded. Dugan (2003) asserts that unless action is taken to address the problems, the fisheries industry risks to fall into a sustained decline.

The decline of the fisheries as pointed out by Foskett and Foskett (1999) is not entirely caused by over-fishing but also by other human activities. For example, farming using chemical fertilizer near the river banks, damping of industrial waste in the rivers and introduction of alien species of fish and plants in the water bodies pose a danger to fish sustenance. Unfortunately, the noted decline in the fisheries at the Kafue wetland will continue to increase if conglomerations of people connected to fishing are not helped to understand the relationship between their fish life styles and that of the sustenance of the fisheries resource.

According to Mwale (2005), the management and exploitation of any fishery, partly depends on the knowledge of the processes, which occur in the aquatic ecosystem. In order to reduce over-exploitation of the fish resource, it is important in this regard to know the form of Environmental Education given to fishermen of Kafue fishing camps, understand fishermenôs Environmental Education awareness levels and attitudes toward the fisheries resources. In the same vain, various stakeholders of the Kafue wetland such as; fishmongers, fish consumers, fish managers, policy makers all need to address the negative exploitation of fish. The present study, therefore, attempts to find out from the local Kafue fishermen and officers from the Department of Fisheries, environmental related activities that can enhance fish sustenance.

1.2 Contextual Factors

Fish decline in most of Zambiaôs water bodies is caused by many factors that are as a result of human activities at various levels. The contextual factors presented below provide an insight of some of the issues at play in the sustenance of the fish resource.

Kafue Wetlands

The Kafue flats is among the major fisheries in Zambia with sixty fish species of which twenty-one are commercially significant to the fishing communities in the country, Muyanga and Chipungu in Chabwela and Mumba, 1998.

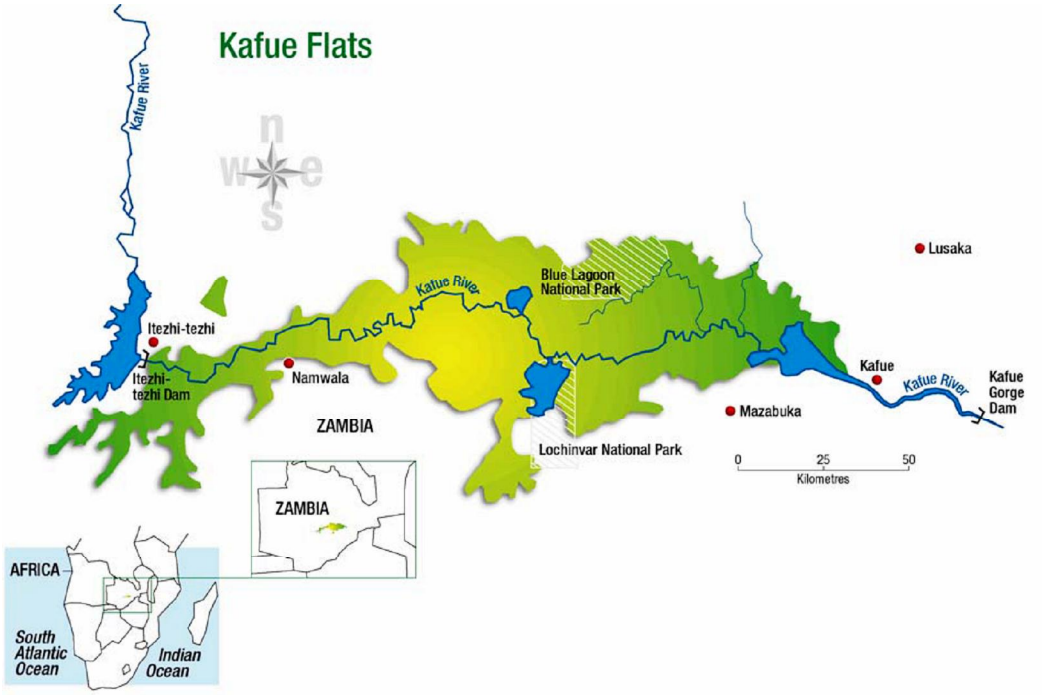


Image 1: Kafue Wetlands (Adapted from: http:// www.eawag.ch/../Kafue Gorge dam)

Importance of Wetlands

Other than wetlands being of commercial significance, they play an ecological role in as far as resource sustenance is concerned. All variety of animals from fish to birds, insects to reptiles find refuge and sustenance in wetlands (http://www.toronto.ca). More than one-third of the United States' threatened and endangered species live only in wetlands, and nearly half use wetlands at some point in their lives. Many other animals and plants depend on wetlands for survival. Estuarine and marine fish and shellfish, various birds, and certain mammals must have coastal wetlands to survive. Most commercial and game fish breed and raise their young in coastal marshes and estuaries. Menhaden, flounder, sea trout, spot, croaker, and striped bass are among the more familiar fish that depend on coastal wetlands. Shrimp, oysters, clams and blue and Dungeness crabs likewise need these wetlands for food, shelter and breeding grounds (http://water.epa.gov).

Besides wetlands being a habitat to a number of fauna, the water and wetland resources provide numerous socio-economic development benefits such as:

- Flow regulation
- Erosion control
- Flood plain farming
- Plant and animal products
- Conservation
- Tourism and recreation
- Water Quality

Therefore, careful and appropriate management is important to sustain the various sectors of the economy that depend on wetlands and their effect on water resources. In most areas with wetlands, much of the population is concentrated near wetlands and many depend on associated springs and shallow wells for potable water. In addition to socio-economic benefits, wetlands can provide significant biophysical benefits, including groundwater recharge and improved water quality.

Other than wetlands serving as sources of streams, they also regulate flow and attenuate floods. Flood-plains store water during the wet season, slowly releasing it throughout the dry periods. This helps to maintain flow in the perennial rivers of the basin and in some of their tributaries.

Wetland functions equally extend to control of soil erosion. Plants in marshes and swamps hold the soil and trap sediments in their roots. Wetlands, therefore, play an important role in flood control and erosion prevention. Well-vegetated rivers and

floodplains are excellent flood wave absorbers. The deposited sediments and the variations in flooding create fertile soils that can be used to support subsistence floodplain farming. The nutrients in the wetland environment of the basin support diverse plant and animal species. Wetlands are principal habitats for fish species, providing cover as well as suitable breeding and feeding grounds.

The rich biodiversity and natural beauty of wetlands make them an important focus for conservation. Wetlands support large numbers of wetland birds and animals of diverse species. Despite the important role that wetlands play, human activities continue to pose a major threat to wetlands. Threats to wetlands include reduction of flows caused by droughts and water abstractions, aquatic weed infestations, application of pesticides and fertilisers, development of infrastructure such as dams, river water intake installations and bridges, over-exploitation of resources due to human pressure, uncontrolled fires, pollution and deforestation. Conservation efforts to minimise or avert threats to wetlands require both short and long-term strategies.

Wetlands sustain flow in the basin and support fish biodiversity. As a result, tourism and fishing activities within the wetlands, as well as in the main river system and reservoirs, is very common. Due to the lack of dangerous animals and high water levels during summer, the river is also used for recreational canoeing particularly at the Orange River mouth, on upper reaches of the river and in several reservoirs.

Depending on the soil, geology and landscape of a wetland ecosystem, wetlands can contribute to groundwater recharge if water can filter down to the groundwater system. This function of wetlands can be very important where communities rely on

groundwater resources for drinking water. Due to their storage capacity, wetlands often retain water during wet periods and release water during periods of drought, contributing to stream flow during these dry periods.

Wetlands play an important role in improving surface water quality by filtering out suspended material (e.g., organic or inorganic sediments) and by retaining nutrients and pollutants. Both physical and chemical processes are important in this process. Wetland vegetation can help to trap suspended material and the slower-moving or static waters in wetlands allow suspended particles (and any adsorbed chemicals) to settle down. Nutrients dissolved in water inflows can be used as resources by aquatic organisms or vegetation within the wetland, and can, along with pollutants and other chemicals, be chemically altered, stored within plants, or attached to wetland sediments. The benefits of water quality improvement to downstream ecosystems can include prevention of eutrophication, removal of water-borne pathogens and toxic chemicals, and protection of fish health and navigation routes as the load and deposition of suspended sediments is reduced(Adopted from: http:// www. orangesenqurak.org.). In view of the role that wetlands play as a habitat to wildlife resources, the Kafue wetland equally remains a significant ecosystem to fish sustenance.

Human Activities and Challenges to wetlands

The study by Godet and Pfister (n.d.) point out that there have been some ecological changes that have occurred in the Kafue wetland due to human activities and these include:

Å Changes in vegetation of different nature.

- Wildlife is severely threatened by poor grazing grounds, loss of breeding ground and poaching.
- Livestock grazing range has been reduced.
- Reduction in fish catches and size of fish.

The study further revealed that there was a decline in fisheries as well as in the population of Kafue Lechwe. Part of this partial dramatic decline is attributed to the dams as habitats have decreased. Godet and Pfister (n.d.) stated that changes in flow regime in the Kafue flats led to a decrease in households supported by fishing from 2 600 to 1 150 between 1977 and 1984. The reduction in fish and size of fish is acknowledged by Chabwela and Haller in a case study in the Journal of Commons(2010) in which they pointed out that fishermen spent more time and effort to catch fewer fish while commercial fishermen experienced a decline in catches between 1996 and 2003/2004.

Other reasons for the decline in fisheries are unsustainable fishing methods, pollution and bio-accumulation of heavy metals (Syakalima *et. al.* 2001).The study further points out that until recently, the Kafue flats area was sparsely populated and people had traditionally made a living by fishing and grazing livestock. The study, however, indicates that this is changing as many people arrive in search of work, for example, on sugarcane estates. This has additionally promoted illegal hunting and over-fishing. As a consequence certain parts of the flats are now suffering from increasing human pressure (awsassets.panda.org/mrwkafueflats).

Due to human activities over the years, the Kafue River has been receiving all sorts of pollutants from mining, industrial and agricultural activities. The continuous discharge of pollutants into the Kafue River has led to a decline of the river water quality. Kambole (2003) asserts that the consequences (of the human activities) have been high eutrophic levels, increased heavy metal concentration in the river sediments and aquatic life which led to decreased fish catch and fish size.

1.3 Statement of the Problem

If the world remains on its current path of over-fishing, by 2050, all fish stocks would become uneconomic to exploit or actually extinct (The Guardian, UNEP Report, 2010). The importance of the fish resource has been acknowledged as a driver of rural commerce in otherwise remote parts of the country where fisheries are the only source of income and purchasing power (Musumali *et.al.* 2009). The depletion of fish in the long run has the potential to affect both small and large scale local fishermen who depend on it for their livelihood. In order to ensure fish sustenance, the Department of Fisheries has put up measures such as the fish ban that is carried out between 1 December and 28 February each year to foster fish breeding and conservation. Despite this well intended effort, the department faces difficulties in enforcing the ban as evidenced by a number of violations reported during the ban. This development suggests that the ban needs to be reinforced by attitude change through Environmental Educational awareness activities, which can complement the fish ban and ensure fish sustenance. However, at the time of this study in the year 2010, the detailed nature and form of such Environmental Education was not known and was not even available in Zambia. Such a situation constituted a problem in need of addressing as education is widely considered to be a useful tool in addressing environmental problems globally.

1.4 Purpose of the Study

The purpose of this research was to propose Environmental Educational activities that would assist in providing a practical means of enhancing fish sustenance in the Kafue wetlands of Southern Zambia.

1.5 Research Objectives

Following the purpose of the study, the main objective of this research was to propose Environmental Education activities that could facilitate the sustenance of fish in the Kafue wetlands of Zambia.

The objectives of the research included the following:

1. to determine the form and levels of Environmental Education awareness among fishermen of the Kafue wetland fishing area.
2. to identify the type of Environmental Education the Department of Fisheries requires in order to effectively address over-exploitation of fish on the Kafue wetlands, and
3. to propose Environmental Educational activities that would enhance fish sustenance.

1.6 General Research Question

What form of Environmental Education activities can be designed for Kafue Wetland fishermen in order to help sustain the fish of the area?

1.7 Research Questions

The study addressed the following specific research questions:

1. What form and levels of Environmental Education awareness were available to fishermen of the Kafue Wetland fishing area?
2. What type of Environmental Education did the Department of Fisheries require in order for it to effectively address over-exploitation of fish?
3. What Environmental Education activities would be proposed to enhance fish sustenance?

1.8 Significance of the Study

Even if there is substantial literature on fish, studies on Environmental Education awareness activities for fishermen in Zambia are yet to be undertaken. Studies on fish have mostly focused on species diversity and aqua-culture. The present study is significant in that it will fill the knowledge gap that exists regarding the role that Environmental Education is expected to play in fish sustenance. The study further hoped to provide an additional programme that Extension Officers from the Fisheries Department can adopt to enhance fish sustenance. It was also hoped that the study would contribute information on the conservation of the Kafue wetlands ecosystem, the sustenance of fish and other resources to ensure a continuous supply of the much needed resources and enable stakeholders continue benefiting for now and in the future.

1.9 Limitations of the Study

A period of five weeks was earmarked for conducting interviews and to observe fishing activities at the various fishing camps in this study. However, the period was reduced to two weeks due to financial constraints. To this effect, the researcher did not observe other fish-related activities as priority was given to conducting interviews. With regard

to the target sample, only four out of the five targeted fishing camps were visited, these were: Chanyanya, Chilumba, Nanga and Namiloli. The researcher did not visit Cheeba fishing camp owing to the fact that at the time of the study (mid September), the harbour at Cheeba fishing camp, which was a common meeting place to access the fishermen, was artificially flooded thereby resulting in fishermen resorting to landing at different preferred areas. This situation prevented the researcher from accessing the fishermen. Besides the problem of accessibility, the researcher had difficulties in meeting fishermen for interviews owing to the fishermenôs lifestyle; the researcher could only access the respondents between 07.00 hours and 09.30 hours upon the completion of their business. In most cases, fishermen were usually drunk by 10.00 hours and others were rushing to prepare nets or take a rest after a hectic early morning when nets were pulled out of the water.

1.10 Operational Definitions of Terms

The terms below will carry the following meaning in this study:

Environmental Education: A process through which individuals acquire information in order to protect, nurture, conserve and develop a positive attitude towards nature.

Environmental Education Activities: A planned deliberate action carried out in any space with the view to nurture and care for both living and non living things.

Sustenance of fish/fish sustenance: The ability to ensure or maintain sustainable levels of fish yields.

1.11 Delimitations

The study was limited to Chanyanya, Chilumba, Nanga and Namiloli fishing camps of Kafue rural from which fishermen were sampled including Fisheries Extension Officers

from Chilanga Fisheries Headquarters and the Department of Fisheries in Kafue.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This chapter provides information on the importance of fish, causes of over-exploitation, general sustenance of resources and fish sustenance at global and local levels. The focus of the chapter is to provide information pertaining to fish and provide general information about resource sustenance and environmental education activities spelling out the role of environmental education in environmental protection and resource conservation.

2.1 The Value of Fish

Despite the adverse effects of human activities on fresh water bodies, fish remains a valuable resource. Porter (1998) points out that fish contributes to the food supply, economy and health of many nations. He further argues that fish and seafood are among the most widely traded commodities, worthy billions of dollars annually. According to The Guardian Report (18 May 2010), the UN estimates that there are about 35 million people directly employed in fishing, which translates to about 120 million taking into account indirect business such as packaging, freezing and transportation. The value of fish goes beyond employment and economic value. It is

Image 2: Fish Trading at Chanyanya Harbour

Source: Field Data, 2012

also a huge health issue as fish provides the main source of animal protein for one billion of the worldôs poorest people (The Guardian).

2.2 Causes of Over-exploitation of Fish

Over-exploitation of the fisheries can be attributed to several factors. Due to the high value that fish has in many peopleôs lives, this aspect has created a high demand for the product. High population and poverty levels are perceived by many as drivers for fish over-exploitation. A case study conducted in the Philippines on The Integrated Population and Coastal Resource Management (IPOPCORM) proposed a project that helped the community to see that the growing population was a major factor in the continuous exploitation of its marine resources as most fishermen had more than six children each, making fishermen under pressure to provide for their large families (http://www.usaid.gov).

In the Philippines, poverty and a rapid population growth of about 2.3 per year and fishermen over-capacity have resulted in major over-exploitation of Philippine reef fisheries (http:archives.org). At Pulau Banggi Island in Malaysia, a study on Malthusian over fishing identified poverty as the main cause of fishing problems (http://www.incofish.org).

While high rising populations and high poverty levels have been cited as causes of over-exploitation of fish, Chabwela and Mumba, (1998) argue that institutional weakness and the rapid rising population are the most critical factors in the case of Kafue flats of Zambia. The authors further add that Kafue natural resources are not adequately managed.

2.3 General Sustenance of Resources

Many countries in the world today have seen the urgent need for the protection of the environment and its resources. A number of conferences and seminars have been

sponsored by the United Nations in order to maintain the quality of life in the world. Some organisations that support environmental related issues and programmes are the International Union for the Conservation of Nature and Natural Resources (IUCN), the World Conservation Union (WCU), the United Nations Environment Programme (UNEP) and the Food and Agriculture Organisation (FAO). In terms of the fish resource, the Worldfish Centre has been promoting fish sustenance in many parts of the world.

Protection of natural resources and the environment is equally done at regional level in Africa. In July, 2008 SADC region undertook action to combat Illegal Unreported Unregulated fishing (IUU) by requesting member countries to eliminate IUU in the region through the use of at-sea, port, state or through trade related measures in accordance with international law (Palma et.al 2010)

In case of Zambia, the Umbrella body charged with the responsibility of Environment and Resource Conservation is the Environmental council of Zambia. According to the website www.mtenr.gov.zm, the Environmental Council of Zambia (ECZ), a statutory body was created under an Act of Parliament, the Environmental Protection and Pollution Control Act of 1990, Cap 201 of the laws of Zambia. The Council which was established in 1992 was mandated to protect the environment and control pollution so as to provide for the health of persons and the environment. The core functions of the ECZ include the following:

- Draw up and enforce regulation related to water, air and noise pollution, pesticides and toxic substances, waste management and natural resources management
- Advise the Government on the formulation of policies related to good management of natural resources and environment

- Advise on all matters relating to environmental conservation, protection and pollution control, including necessary policies, research investigations and training
- Conduct studies and make recommendations on standards related to improvement and maintenance of sound ecological systems.
- Identify projects, plans and policies that need environmental impact assessment.
- Monitor trends in the use of natural resources and their impact on the environment.
- Request information on the quality, quantity and management methods of natural resources and environmental conditions in Zambia(adapted from www.tenr.gov.zm)

The core function of the Environmental Council of Zambia has however been viewed by certain individuals and cooperate bodies as not performing to expectations. A press-release by the Citizenôs Democratic Party once labelled Environmental Council of Zambia as a ótoothless watchdogô in apparent reference to the inability by the institution to exercise its authority and offer protection to humans and the environment (http://www.citizensdemocraticparty.com).

The website http:// www.belizeaudobon.org recognises the fact that the resources of the earth are finite and the human population is out-growing our planet. The earth is a relatively small planet with limited resources to support a number of people for a given period. If the number competing for the resource exploits it in a wasteful way and at a fast rate, the resource will not last long and people who need it will be immensely affected.

Hanna (1998) observes that the direct involvement of resource stakeholders in the planning and control of resource use offers the potential for improving resource

sustainability. The argument by Hanna is valid, but it is also important to state that the involvement of the stake holders must be preceded by some form of education that should equip the stakeholders with necessary information and skills in order for them to effectively participate in the planning and control of that resource.

Oduro (1992) underscores the need for people to manage resources prudently. He argues that ómanôs survival is directly related to the survival of the earth and its resources. Robinson and Redford (1991) argued that conservation could be achieved only if people perceived wildlife as useful and valuable. Pearce and Moran (1994) point out that people must see how benefits from conservation out-weigh the cost of uses forgone. Similarly, it is observed that fishermen fail to understand the benefit of the fish ban, hence they flout the ban.

In terms of resource conservation, it appears that human actions at both individual and community level today reflect a society that lacks an understanding of the connectivity between people and resources as demonstrated by manôs exploitative tendencies that abound everywhere.

Oduro (1992) further suggests that (lack of understanding) is due to traditional belief systems, which he explains tend to regard the earth as a reservoir of unlimited resources to be exploited. He further notes that the said misconception is still held by many adults in various communities. Oduro (1992) proposes that the man-environment relation must essentially be one of mutualism as opposed to survival of the fittest. The proposal made by Oduro is in tandem with the main focus of this research.

2.4 Fish Sustenance

The importance of sustaining the fish resource is a concern for all nations. Various efforts to ensure sustenance of this important resource were initiated long ago. Currently, there are deliberate efforts to sustain the fish resource both at global and local levels. Global institutions interested in the conservation and sustenance of fish includes the World Fish Centre (WFC), the Food and Agriculture Organisation (FAO), and the International Union for the Conservation of Nature (IUCN). In Zambia, the Department of Fisheries (DoF), which falls under the Ministry of Agriculture and Cooperatives, is charged with the responsibility of handling fish related issues. Under this section, literature in this study will be reviewed according to the following categories:

- Fish sustenance at global level
- Fish sustenance at local level

2.5 Sustenance at Global level

Palma et.al (2010) point out that Illegal Unregulated Unreported fishing is considered as the most significant threat to the sustainability of the fisheries resource. In order to sustain fish, International Instruments have been put in place to protect the fisheries resource through the adoption of the International Plan of Action to prevent, deter and eliminate Illegal Unregulated Unreported fishing (IPOAIUU). Lumb (2006) observes that global marine fish catches were increasing until the mid 1980s. The next image provides data on global marine fish catches between 1970 and 2000.

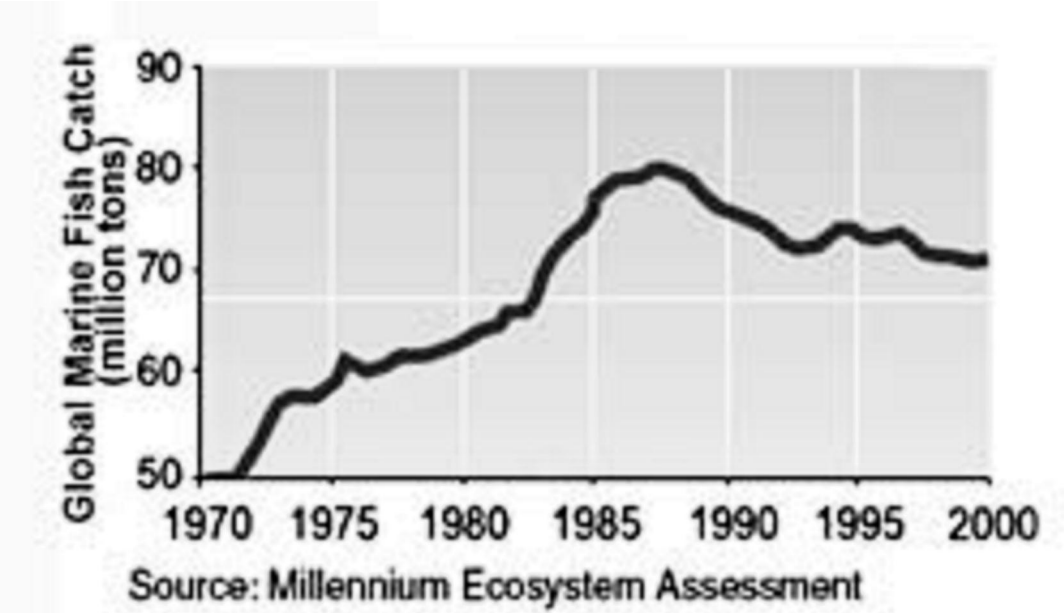


Image 3: Global Marine Fish Catch (Adapted from http://www.belizeaudon.org).

The decrease in fish is equally noted in the report document entitled, An International call for a Moratorium in the Pacific Ocean on Pelagic long line and Gillnet Fishing (2004), signed by various interest groups to protect water body resources. The United Nations reports that over 70 per cent of global fish populations are over-fished or are at the brink of being over-fished, compared to just five per cent reported 40 years ago. Indiscriminate commercial fishing practices wastefully harm and kill millions of non-targeted species per year, causing unsustainable mortality to sea turtles, sea birds, blue fin, tuna, billfish and sharks.

Observations noted by the various interest groups regarding over fishing and indiscriminate fishing practices are indeed a threat to the sustenance of the resource and the well being of the people who depend on this resource. It is on this premise that the said groups in their diverse ways work to conserve and sustain the resource. However, much of the works carried out in this area basically involves the spelling out of regulatory instructions and prohibitions with little or no environmental education given

in some countries to help fishermen conduct their business in a sustainable manner. The omission of this important aspect impacts negatively on the resource, its sustainability and the benefits it brings to the various stakeholders.

One of the interest groups concerned with the sustenance and conservation of fish is the World Fish Centre (WFC), a non-governmental, non- profit making organisation established in 1977 with a commitment to contribute to food security and poverty eradication in developing countries. The World Fish Centre Quarterly Report of 2002 has spelled out some of the aims of the organisation such as the task to remove pressure on fragile natural resources and to come up with people-centred policies for sustainable development through research, capacity building, partnership and policy support.

The organisation has so far done a lot in research, especially on matters to do with the documentation on fish species diversity, fish production and data compilation on the fish species in most of the water bodies globally in partnership with local authorities. Other works involve routine publications on fish related issues.

One of the factors which is considered as the main causes of failure by countries to enjoy sustainable production from fisheries as stated by Silvestre, (Asian countries) is habitat degeneration, where the habitat on which the fish rely is being degraded (World Fish Centre, 2004 Vol.27, p 66). In this scenario, the surrounding area where the fish is supposed to breed from and get the nourishment for its growth and shelter is destroyed creating unfavourable conditions for the fish.

The image below shows types of degraded sea grass and plants that are important in the breeding of fish but are destroyed through use of illegal nets during fishing.

Image 4: Degraded Sea/ River Grass and Plants at Nanga Fishing Camp

Source: Field Data, 2012

In respect of habitat degeneration, some deliberate interventions have been put in place by some countries in an effort to sustain the fisheries. The website http://www.mdba.gov reveals that the River Communities in Southern Queensland and New South Wales have a 50 year programme whose aim is rehabilitation of native fish population to sustainable levels through a fish awareness week, an annual strategy which has been operating since 2003 that targets fishermen and fish farmers. The annual strategy involves different activities each year at different places. Some examples of the activities range from talks on fish rehabilitation to physical activities like planting of native vegetation along the rivers.

2.6 Sustenance at Local level

According to the ACP/FSRP Report of 2009, Zambia has nine major fisheries, namely Kariba, Tanganyika, Itezhi-tezhi, Bangweulu, Mweru Luapula, Mweru Wantipa, Kafue River, Zambezi River and Lukanga Swamps. Other fisheries though minor include

Lusiwashi dam, Lower Zambezi and Chambeshi River. The fisheries have more than 400 fish species.

The ACP/FSRPôs report on the status of fish population in Zambiaôs water bodies reveals some of the strategies that the Department of Fisheries has developed in order to conserve fish. The Department of Fisheries in the Ministry of Agriculture and Co-operatives is mandated through the Fisheries Act Cap 200 of the Laws of Zambia, to manage the fisheries resources of the country. In its quest to manage this resource and ensure sustainable utilisation, the Department in line with the provisions of the Act effects the annual fish closure, which runs from 1 December to 28 February(2009) .

The fish ban that is effected every year as a control measure enables fish to breed and multiply, creating a continuous flow of the resource. However, despite the well intended efforts by the Department, problems of violation of the closure are evident through statistics of people caught during the period, as reported on the 6 of February on the Zambia National Broadcaster (19.00 hours Main News) on Television Zambia (2010).

The Department of Fisheries had put in place measures to ensure the sustainability of fish and fish species in the water bodies of Zambia as follows:

- Control of fishing gear
- Protection of fish breeding ground
- Control of fishing practices
- Establishment of co-management systems
- Control of introduction of alien fish species

- Enforcement of the fish ban and regular monitoring and inventory of the fisheries
- Domesticated code of conduct for responsible fishing
- Developed the National Plan of Action to look at illegal fishing, unregulated and unrecorded fishing.

The vehicle below is for extension services at Kafue. At the time of the study it was discovered that most of the time the vehicle was immobile due to insufficient funding at the department of fisheries.

Image 5: Vehicle for Fisheries Extension Services

Source: Field Data, 2012

The sound measures put in place by the Department are not sufficient enough to mitigate fish sustenance. The measures lack the inclusion of deliberate Environmental Education activities, which can create linkages between benefits and good resource management among stakeholders. ôIn most areas (of resource management) communities can not link the benefits they are receiving from wild resources, for instance, to good managementô (Mbewe *et.al.* 2005, p 54). Failure by the stakeholders

to see and appreciate the linkages is viewed as what translates into the use of wrong fishing methods and rare observation of the fish ban.

It is a well known fact that the Department of Fisheries lack the capacity to monitor these illegal activities. Musumali *et al.* (2009) argues that limited resource availability for enforcement meant that generally, the department only had a token presence in most fisheries. Failure by the fisheries department to singularly manage the resource resulted in the department collaborating with interest groups to pilot co-management projects with a view to rescue the fish industry from over exploitation in the natural water bodies.

Musumali *et al*. (2009) points out some co-management initiatives piloted in various places, for example Lake Kariba in 1993/1994 to present. Other places include Lake Mweru Luapula, which commenced in 1986 to present. Much as the idea of co-management is brilliant, it is still at its infancy stage and its applicability to all fisheries is not yet known. Piloted projects still have a number of unresolved issues ranging from resentment by a significant number of off-shore fishermen, resenting the changes made, to tensions between various stakeholders (Musumali *et al*, 2009).

Arising from the numerous ideas implemented by the fisheries department, and the persistent prevalence of unsustainability in the fisheries resource, Environmental Education Programmes remain a significant option that could be pursued. The programmes would consolidate past efforts so as to provide awareness to fish stakeholders in order to provide the missing link and ensure fish sustainability, thereby reducing the lapses and gaps.

Kim Le Roux (2001, p.151) states that ó there is little they can do (communities) if they lack the power to act.ô The notion underlying (the absence of power to act by communities) should be perceived to imply that there should be in place deliberate interventions by those with the right knowledge and skills to offer solutions as the case is with environmental education. However, the success of enabling communities to live sustainably is wholesomely to an extent based on affected communitiesô willingness to be helped.

With regard to sustenance of fish, Swaminathan (2002) argued that we should be mindful of whether our actions support the é pillars of sustainable fish production, which is pro- environment. William (1996) in the same vein pointed out that sustaining fisheries will require social change and that no single solution exists other than the managing of human impact on natural stocks by way of relieving the human impacts by using some standard but powerful levers of social change.

2.7 Environmental Education and resource conservation

Due to the beneficial nature of environmental education, it is currently viewed world over as a major tool that can be used to bring about social change. Environmental education promotes behavioural change by motivating people to act in a responsible way that does not exploit the resource base in an unsustainable way. To this effect, environmental education helps to create a sense of empathy for the environment.

Environmental education as a global movement came into existence at the United Nations Conference on Human Environment held in Stockholm in 1972. The

conference clearly recognised the close inter-relationship between the environment and society and envisioned ways through which education could be used to create effective environmental policies and management (Otiende, 1997).

Otiende (1997, p.15) states that "Environmental Education is seen as the only way of developing an awareness of the environment and a sense of responsibility for its protection, and hence it is the most effective vehicle for persuading the human race to adopt a rational attitude towards the natural environment and to avoid the deterioration of human life as a result of unwise exploitation and misuse of nature".

Environmental education is understood to include all means which advance personal learning processes and life management during all phases and tasks in an individual's life (Helsinki, 1991). UNESCO (1985) outlines a twofold purpose of environmental education as that of educating citizens capable of being responsible to the environment and to make various populations more conscious of questions raised by ecosystems and socio-cultural environments in which they live and by the activities engaged into.

In order for society to have conservation oriented people, deliberate programmes should be put in place. Environmental education in all settings, whether formal or informal, calls for organisation if the intended objectives are to be adequately achieved. According to the website http://www.sciencedirect.com successful implementation of conservation policies, management measures and environmental education programmes requires consideration of those attitudes (of the target population) and resolution of conflict between humans and the natural environment.

Consideration of the target population in the formulation and implementation of environmental programmes is viewed as critical in as far as conservation is concerned.

Chabwela and Mumba (1998) advocated for the involvement of local communities in both planning and implementation of conservation strategies. They argued that local communitiesô participation and cooperation was critical.

According to the study conducted in Sao, environmental education has been shown to be a valuable tool in creating changes to how people manage and care for natural resources and the environment (http://wwww.worldfish.org). In Australia, all environmental education programmes are based on a framework which consists of the following premises:

- Education about the environment
- Education in the environment
- Education for the environment

The framework *about*, *in* and *for* the environment is a popular way of organising the experiences within an environmental education programme. **Education *about* the environment** focuses on studentsô understanding of important facts, concepts and theories. **Education *in* the environment** involves students in direct contact with a beach, forest, street or park to develop awareness and concern for the environment. **Education *for* the environment** aims to promote a willingness and ability to adopt life styles that are compatible with the wise use of environmental resources.

(Adopted from: Australian Government, Department of the Environment Heritage).

(http://www.environment.gov)

According to the website http://wwww.worldfish.org, the study conducted in Sao suggests that for environmental education programmes among fishermen to be successful and sustainable, the following should be done:

- Identify a project that is relevant to the community.
- Build a network of partners.
- Local person to coordinate the environmental education programme.
- Work and displays to be circulated in the communities to increase public awareness and encourage increased involvement by the large community.
- Build awareness among professional fishers and extended community in vicinity on issues of:
    - Spawning
    - Pollution
    - Water use

Oduro (1992, p.255) provides some ideas on how environmental education can be implemented in a non-formal way:

> The non- literate adult could be reached through radio and television programmes such as discussions, talks and drama sketches, relevant films could also be shown on the television to educate target group especially, as related to specific occupations of such groups. Drama troupes can stage plays to educate non-literate groups. Cinema vans as operated by Community Development Departments could also be involved in showing films on environmental problems, measures and dangers/consequences of degrading and polluting the environment. Public lectures, symposia, talks and discussions could be organised to educate non-literate groups by extension/field workers and other voluntary leaders.

Panneerselvam and Ramakrishna (2005) point out that environmental protection starts by creating awareness in people in order to make it become part of their lifestyle. Chabwela and Mumba (1998) argued that public awareness and education are essential to any conservation strategy and emphasised the point that enhancement of the publicôs knowledge would be important in terms of natural resources exploitation.

2.8 Environmental Education Activities

There are various methods that can be used in creating awareness among communities. The choice of the method used can be determined by the availability of resources needed.

Documentary: This activity is in form of a visual tool meant to convey a message in pictorial form using motion pictures. The activity should run between ten to fifteen minutes. This activity can be done in an open space or enclosed place using a screen and projector. A documentary has the potential to present ideas in two ways; by audio and by visual, this makes this tool a good conveyer of messages as it can produce a double impact. A follow up activity should be conducted where questions and answers are given by a facilitator.

Drama/Theatre: The activity involves the dramatisation of desired words and actions to convey a message. This activity can be conducted in both open and closed spaces. Characters can be out sourced and given a theme that can address environmental issues in a particular fishing camp, for example dramatisation of fishermen scrambling for few fish in the river. Care should be taken during planning to avoid making the activity viewed as entertainment. Every action and verbal utterance should, therefore, be linked to the broader environmental issue. In order to maximise the intended effect, it is always advisable to conclude the activity that can engage the fishermen, members of their families and the entire community in either a discussion or questions and answers.

Debate: This activity can take the form of an ordinary debate; the motion should be one that centres on issues in the community, for example *Fish ban is a form of punishment to fishermen*. Two groups should debate as the audience listens**,** question and answer

session should follow. A moderator should be available to control the flow of the debate. At the end of the debate, a key message should be given.

Education in the Environment: This activity involves physical activities conducted to improve the environment. Activities can range from tree planting to clean ups of any area that can pose a threat to the well-being of the environment and the community. All fishermen and community members can participate in this activity. This activity should end with a talk or some form of environmental campaign.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Overview

Chapter three explains the methodology used in the study to collect the desired data. The chapter presents the following; research design, general description of study area, study location, sample study population, study sample and sampling procedure, research instruments, data collection procedure and data analysis.

3.1 Research Design

The research design used in this study was a descriptive survey. Kerlinger in Kombo and Tromp (2006) points out that a descriptive study may often result in the formulation of important principles of knowledge and solutions to significant problems. The study incorporated both qualitative and quantitative aspects of research. It aimed at collecting information from respondents on their attitudes, habits and opinions surrounding fish sustenance for the purpose of generating an Environmental Education programme. The programme can be used to ensure fish sustenance at the Kafue wetland of Southern Zambia. The tool employed in the initial identification process of fishermen was the register obtained from the Chairman at each fishing camp. Structured open-ended interviews and observations were conducted and pictures were taken as additional data. The internet supplemented data for the study.

3.2 General Description of Study Area

The study area comprised of four different fishing camps that form part of Kafue rural, a town that is about 40 Kilometres from Lusaka. The fishing camps are set near the

Kafue River with temporal structures made of wood, mud and grass. The main socio-economic activity of the people is fishing. The fish caught in this area is basically sold to surrounding compounds near the fishing camps though at Chanyanya and Chilumba the market is the surrounding compounds near the fishing camps and Kafue town.

3.3 Study Location

The study was carried out in Kafue, Zambia. Kafue district was purposively chosen as it has a number of active fishing camps along the Kafue River, one of Zambiaôs major rivers that forms part of the Kafue wetlands of Southern Zambia. The area has attracted a lot of people with various interests ranging from fishing, cattle rearing and agricultural activities, which have been going on for many decades.

3.4 Sample Study Population

Kafue district comprises five fishing camps with an estimated population of between 600 to 800 people of which 118 are active fishermen. The participants of the study were drawn from four fishing camps namely; Chilumba, Chanyanya, Namiloli and Nanga. All the participants had been actively involved in fishing in the Kafue wetland for the past five years. For the purpose of collaboration, officers from the Department of Fisheries in Kafue and Chilanga who were involved in monitoring fish related activities participated in the study.

3.5 Study Sample and Sampling Procedure

The study sample comprised of fifty participants of which forty were fishers from four selected fishing camps. 10 fishermen from each fishing camp were interviewed. The interviewees were randomly picked. In order to carry out the exercise, the researcher

used registers found at the fishing camp. Participants were identified by using systematic random sampling. Random sampling was used in order to allow each fisherman an equal chance of being selected. According to Rudestam and Newton (1992; 24) random sampling of subjects ópermits a researcher to generalise the results from a sample to a population.ô Besides the fishermen, 10 officers from the Fisheries Department were purposively picked to answer the questionnaire. Respondents for the questionnaire comprised fisheries extension officers drawn from the fisheries Headquarters at Chilanga and Kafue Fisheries Department respectively.

3.6 Research Instruments

In order to obtain the desired data, the research instruments, which the researcher used included questionnaires and interviews. Appendix ii shows the questionnaire used for collecting information from fisheries officers. Questions posed were deemed to be relevant for this study because they sought to obtain information pertaining to the environmental education and fish sustenance.

3.7 Data Collection Procedure

Questionnaires were distributed by the researcher through the Officer in-charge for onward transmission to different fisheries extension officers at both Chilanga fisheries and Kafue Fisheries Departments. Questionnaires were later retrieved after a couple of weeks.

Structured open-ended interviews were conducted at different fishing camps for two weeks. The researcher enlisted the services of an assistant researcher to collect data. Prior to the commencement of interviews, the researcher discussed key words

contained in the interview guide with the assistant to obtain a uniform meaning and understanding. Interviewees were informed about the purpose of the interview. Each fisherman was interviewed individually. Responses given were immediately recorded on the recording space catered for on the interview guide.

3.8 Data Analysis

Data generated from the interview guide were analysed manually, though some quantitative techniques were applied to data collected using the questionnaires. Though the larger part of the research was qualitative by design, the researcher also used the Statistical Package for Social Sciences (SPSS) and Microsoft Excel to analyse data generated using the questionnaires. Results obtained from the respondents were coded and arranged according to themes, which emerged from the findings. The emerging themes were later used to interpret data from questionnaires and interviews.

CHAPTER FOUR

FINDINGS

4.0 Overview

This chapter presents the findings of the research in two parts. The first part covers findings from the Department of Fisheries generated by officers involved in the management of fish. The main purpose of the first presentation is to show various aspects of environmental education in the fisheries department in order to provide answers to the first research question posed in chapter one of the study. 10 fisheries officers responded to questions pertaining to environmental education for fishermen, questions asked ranged from what fisheries officers think were levels of environmental education awareness among fishermen, the role of fishermen in fish sustenance and the form of environmental education that fishermen need in order to sustain fish.

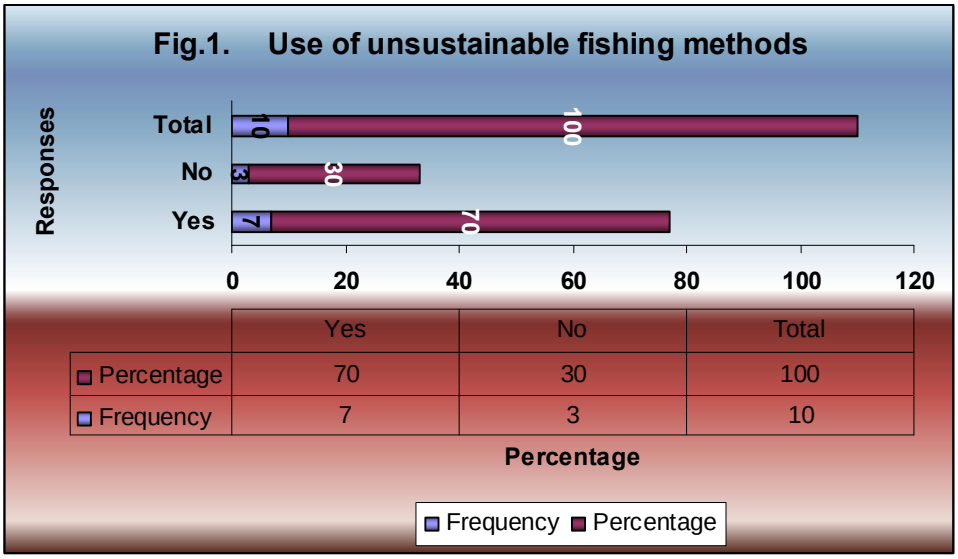
The second part presents findings obtained from 40 fishermen from four fishing camps who participated in the study. The purpose of the second presentation is to show fishermenôs views of environmental education and what activities could be proposed for fishermen in order to provide answers to the second and third research questions. Fishermen responded to questions intended to bring out their opinions on questions ranging from what they (fishermen) need in order to sustain fish and how they would like the fish resource to be managed sustainably.

4.1 Department of Fisheries and Fish Sustenance

The responses from Fisheries Officers generated information necessary to understand the environmental education awareness related issues and fish sustenance at Kafue fishing camps.

4.1.1 Use of Unsustainable Fishing Methods

It was important to determine the use of unsustainable fishing methods by fishermen for the purpose of confirming the general assumption that fishermen at Kafue fishing camps were engaged in unsustainable fishing.



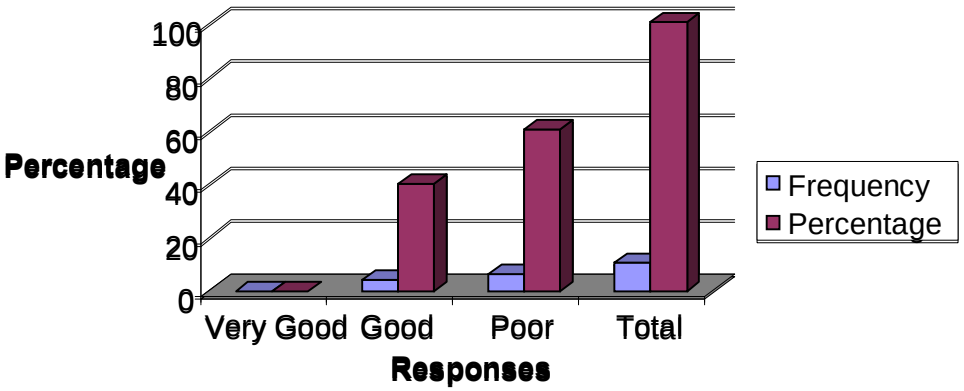
Source: Field data 2012

Figure 1 shows use of unsustainable fishing methods among fishermen. From the figure presented, it can be seen that 70 per cent of the respondents agreed that fishermen used unsustainable methods when fishing, while 30 per cent used sustainable fishing methods. From this table, it can be seen that the majority of fishermen used wrong fishing methods. This implies that the rate of environmental degradation in Kafue fishing camps was higher than conservation efforts. This aspect equally could imply that the impact on the ecosystem was big; this translated into high decline of fish.

4.1.2 Environmental Education Awareness Levels

It was necessary to ascertain levels of environmental education awareness among fishermen in order to obtain prerequisite information needed to propose environmental education activities that could be suitable for all fishermen at Kafue fishing camps.

Fig.2. Level of Environmental Education Awareness Among Fishermen

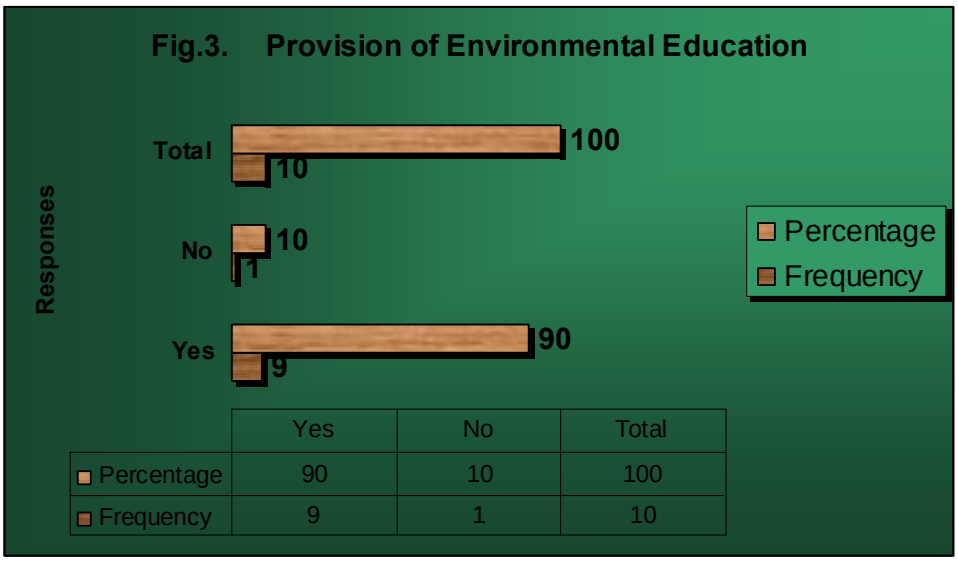


Source: Field data 2012

The above figure shows the various levels of environmental education awareness among fishermen. As shown in the figure, there were no responses that indicated that environmental education among fishermen was very good, 40 per cent of responses indicated that environmental education awareness among fishermen was good. The figure also indicates that an environmental education awareness level among the fishermen was poor; this response is represented by 60 per cent. As can be observed from the table, the level of environmental education awareness for the majority of fishermen was not good. As the figure shows, about 40 per cent of fishermen could be said to be in a position to apply environmental education in their fishing business while the majority could not.

4.1.3 Environmental Education Provision to Fishermen

It was important to assess whether environmental education was being provided to fishermen in order to establish if environmental education was one of the extension services provided to fishermen at Kafue fishing camps.



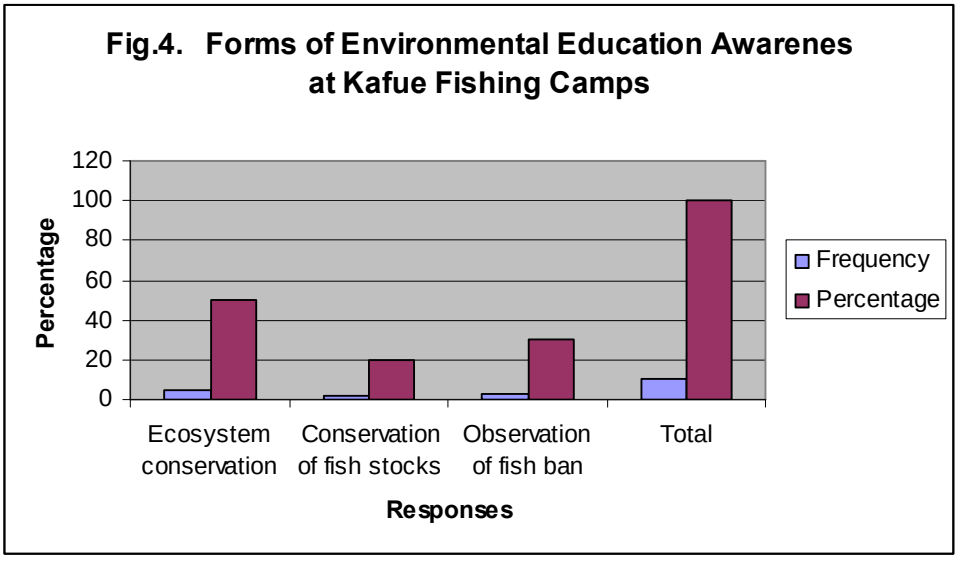
	Yes	No	Total
Percentage	90	10	100
Frequency	9	1	10

Source: Field data 2012

This figure shows responses on the provision of environmental education to fishermen by the department of fisheries. Nine out of 10 respondents indicated that environmental education was provided to fishermen while one respondent stated that there was no provision of any environmental education to fishermen. From the figures given, it can be concluded that 90 per cent of fisheries extension officers engaged fishermen in some form of environmental education. However, the response by one respondent that there was no form of environmental education given to fishermen could be attributed to a misunderstanding by the respondent concerning what environmental education is and what it consists of.

4.1.4 Environmental Education Awareness at Kafue

It was necessary to determine the form of Environmental Education awareness given to fishermen in order to understand the content of Environmental Education awareness and gaps therein.



Source: 2012 field data

The above figure shows the forms of environmental education awareness given to fishermen. From the responses obtained, it can be seen that the form of environmental education given by 50 per cent of the respondents as demonstrated in the figure was on ecosystem conservation. Responses on observation of fish ban as a form of environmental education was also given by 30 per cent of the respondents, 20 per cent of respondents stated that environmental education awareness was equally given in form of conservation of fish stocks. As indicated in the figure, the bulk of what was given to the fishermen with regards to environmental education was mostly on ecosystem conservation, implying that this is the form of knowledge that the department viewed to be more important in as far as the provision of environmental education is concerned.

4.1.5 Environmental Education Methods Administered to Fishermen

It was important to know the methods used to administer environmental education to fishermen by fisheries extension officers in order to have an understanding of methods that could be used to propose environmental education activities.

Table 1: Environmental Education Methods for Fishermen

Responses	Frequency	Percentage
Sensitization meetings and seminars	8	80
Drama	2	20
Total	10	100

Source: Field data 2012

Table 1 shows the frequency of methods used to administer environmental education to fishermen by fisheries officers. From the responses given, it can be seen that the majority of fisheries officers used sensitization meetings and seminars to do environmental education awareness; this method is represented by 80 per cent. The table also shows that drama was used too; this method is represented by 20 per cent as deduced from the responses obtained. It can also be seen that most extension officers engaged in sensitisation meetings and seminars to raise awareness among fishermen while very few used drama. This discovery may be indicative of the fact that the department of extension services had limitations on the methods to use or that those charged with the responsibility of generating environmental education activities for fishermen preferred certain methods.

4.1.6 The Role of Fishermen in Sustenance of Fish

It was inevitable to know the role of fishermen in sustenance of fish for the purpose of generating ideas that could contribute to the formulation of environmental education activities. The table below illustrates the role of fishermen in sustenance of fish.

Table 2: Role of Fishermen in Sustenance of Fish

Responses	Frequency	Percentage
Compliance with fishing regulations and protection of habitat	9	90
Fishermen to diversify to reduce pressure on rivers	1	10
Total	10	100

Source: Field data 2012

From the distribution in this table concerning the role of fishermen in the sustenance of fish, it is clear that compliance to fishing regulations and protection of habitat should be the main role to be played by the fishermen. This response is represented by 90 per cent. On the other hand, diversification to reduce pressure on rivers as stated in the table is represented by 10 per cent. This could imply that other than compliance to regulations, there are other alternatives to fish sustenance that could be employed.

4.1.7 Fishing Activities that Threaten Fish

The researcher sought to establish from fisheries officers fishermenôs activities that threatened fish in order to know and understand these threats so that suitable counter activities could be proposed. In this regard, the table below shows fishermenôs activities that threatened sustenance of fish at Kafue fishing camps.

Table 3: Fishermen's Threats to Fish

Responses	Frequency	Percentage
Agricultural activities	2	20
Use of poisonous chemicals	1	10
Use of draw nets/ illegal fishing methods	7	70
Total	10	100

Source: Field data 2012

Three fishermenôs activities have been identified in Table 3 as threats to the sustenance of fish. These are the use of draw nets or illegal fishing gear popularly known as (Ifikukula) that is represented by 70 per cent, agricultural activities represented by 20 per cent and the use of poisonous chemicals represented by 10 per cent. As can be seen in the table, the main threat to fish sustenance was the use of illegal fishing gear indicating non compliance to regulations. However, agricultural activities and the use of poisonous chemicals appeared not to be the main threat to fish sustenance. Therefore, measures to mitigate fish sustenance must pay more attention to the use of illegal fishing means.

4.1.8 Form of Environmental Education for Fish Sustenance

It was necessary to ascertain the form of environmental education needed by fishermen so that the specific needs could be known and taken into consideration when proposing environmental education activities. Therefore, the subsequent table illustrates forms of environmental education needed.

Table 4: Form of Environmental Education for Fish Sustenance

Responses	Frequency	Percentage
Conservation of the ecosystem	9	90
Co-management of the fisheries	1	10
Total	10	100

Source: Field data 2012

The form of environmental education needed by fishermen to sustain fish as depicted in the table is conservation of the ecosystem; this is represented by 90 per cent. However, one respondent was of the opinion that co-management was also needed to sustain fish; this opinion is represented by ten per cent. This opinion could be attributed to the lack

of understanding of the difference between environmental education and co-management by the respondent.

4.2 Fishermen and Fish Sustenance

Fishermenôs responses were significant in the evaluation of both forms and levels of environmental education awareness and formed the basis for the generation of Environmental Education activities.

4.2.1 Fishing Experience

It was important to know the length of fishing experience for the fishermen for the purpose of establishing and confirming from fishermen the trends in decline of fish. In this regard, the table below depicts fishermenôs fishing experience.

Table 5: Fishing Experience

Responses	Frequency	Percentage
5 to 10 years	11	27.5
11 to 20 years	18	45
21 to 30 years	5	12.5
31 to 40 years	4	10
41 and above	2	5
Total	40	100

Source: Field data 2012

Table 5 shows years of experience in fishing. As can be seen, the majority of the respondents had been fishing from 11 to 20 years; this is represented by 45 per cent and followed by those with 5 and 10 years represented by 27.5 per cent. The differences in

the number of years of experience could be attributed to various circumstances. The fishermen with experience between 5 to 20 years could either be retirees who could have spent part of their lives doing other things or these could be youths born from fishermen. A few respondents had been fishing for a period of between 21and 40 years with very few over forty-one years; this indicates that very few fishermen were old. However, the many years spent fishing without diversification could be indicative of the depletion rate and pressure on the fish resource or that the fishermen had no alternatives to fishing.

4.2.2 Fish Decline in Recent Years

The decline of fish in recent years as observed by fishermen had to be established as this was important to confirm the wide-spread assertions that there was a decline of fish resource in most of Zambiaôs water bodies. Respondents were asked the question: ñHas there being any noticeable decline in fish catch over recent years?ò Below is a table that illustrates the fishermenôs perception.

Table 6: Fish Decline in Recent Years

Responses	Frequency	Percentage
Yes	39	97.5
No	0	0
Not sure	1	2.5
Total	40	100

Source: Field data 2012

The table indicates that nearly all fishermen agreed that there had been a serious decline in fish catches in recent years. The response is represented by 97.5 per cent showing awareness by the fishermen that there was a serious decline of fish. No response was

recorded on increase. However, 1 respondent indicated that he was not sure whether there was a decline or not. This response could be attributed to either the fisherman being new in the area or having little fishing experience.

4.2.3 Fishing Activities that Threaten Fish Sustenance

The researcher further sought to establish from fishermen activities perceived to be threats to fish in order to propose precise environmental education activities. In this regard, the question which was posed was: ñWhat fishers ï related activities cause the decline of fish at Kafue?ò Therefore, the next table shows fishermenôs activities that threatened fish at Kafue fishing camps.

Table 7: Fishing Activities Threatening Fish Sustenance

Responses	Frequency	Percentage
Use of wrong fishing methods	2	72.5
Increase in fishing pressure	8	20
Fishing from breeding areas	2	5
Reduction in water levels	1	2.5
Total	40	100

Source: Field data 2012

The majority of respondents as can be seen from the table believed that use of wrong fishing methods caused fish to decline. This is represented by 72.5 per cent. Twenty per cent of the respondents thought that increase in pressure was the cause while five per cent attributed the decline to fishing from breeding areas. However, one respondent was of the opinion that the cause of decline was the reduction in water levels resulting from activities at the Kafue hydro-power station and rain patterns. As can be seen from the

table, use of wrong fishing methods was perceived to be the main cause of fish decline. The high percentage for use of wrong fishing gear as a major threat went on to show that the problem could be the number one concern for the fisheries department and a long standing issue.

4.2.4 Environmental Education Awareness for Fishermen

Understanding the forms of environmental education that was given to fishermen was necessary for the purpose of collaborating ideas from fisheries officers and those of fishermen in order to devise precise activities. To this effect, the following table shows the forms of environmental education awareness given to fishermen.

Table 8: Form of Environmental Education Awareness for Fishermen

Responses	Frequency	Percentage
Conservation of breeding areas	10	25
Observation of right fishing gear	11	27.5
Care of the ecosystem	12	30
Not sure	7	17.5
Total	40	100

Source: Field data 2012

Basically, the table above elaborates that there were three main forms of environmental education given with care of the ecosystem represented by 30 per cent, followed by observation of the right fishing gear with 27.5 per cent and conservation of breeding areas represented by 25 per cent. However, 17.5 per cent of the respondents indicated that they were not sure of the form of environmental education given by the fisheries department. The implication could be that fisheries officers did not clearly distinguish

to fishermen what environmental education was or what it entailed. It could also imply that fisheries officers took it for granted that fishermen knew.

4.2.5 Levels of Environmental Education Awareness among Fishermen

It was necessary to determine levels of environmental education awareness among fishermen in order to ascertain their Environmental Education knowledge levels. In this regard, the subsequent table shows the following levels.

Table 9: Levels of Environmental Education Awareness among Fishermen

Responses	Frequency	Percentage
Good	10	25
Poor	23	57.5
Not sure	7	17.5
Total	40	100

Source: Field data 2012

Only 25 per cent out of 40 fishermen indicated that their levels of environmental education were good. This could be indicative of the possibility that these were fishermen who attended most if not all awareness campaigns mounted by the fisheries department while the other 23 and 7 could be fishermen who shunned such meetings or were very nomadic such that they missed awareness campaigns.

4.2.6 Fish Conservation Activities

It was important to know activities done by fishermen to conserve fish for the purpose of adapting the suggested activities that needed to be proposed. To this effect, the next table shows activities done by fishermen to conserve fish.

Table 10: Fishermen Conservation Activities

Responses	Frequency	Percentage
Observation of fishing regulations	26	65
Returning fish with fingerlings back in the river	5	12.5
Observe fish ban	1	2.5
Sensitization of fishing regulations to fishermen	1	2.5
Nothing	7	17.5
Total	40	100

Source: Field data 2012

From the table above, it can be clearly seen that observation of fishing regulations was believed to be the main activity done by fishermen to conserve fish and the environment. This was represented by 65 per cent. Other activities included returning fish with fingerlings back in the river represented by 12.5 per cent, observation of fish ban 2.5 percent and sensitization of fishing regulation to fellow fishermen 2.5 per cent. However, it can also be noted from the table that some respondents did not do anything to conserve fish and the environment during and after fishing. This was represented by 17.5 per cent of the total respondents. This may be attributed to lack of information on their role in conserving fish or just apathy. To this effect some interviewees had this to say:

'God is the one who provides fish; my activities have no bearing on the increase or reduction on the number of catches'. (Fisherman from Chanyanya fishing camp)

'There is nothing I can do; it is up to the fisheries to find a solution. I cannot tell someone to follow regulations because I cannot feed him'. (Fisherman from Chanyanya fishing camp)

ôFish reproduces on its own. I cannot do anything to conserve it'. (Fisherman from Nanga fishing camp)

4.2.7 Environmental Related Information Needed by Fishermen

It was necessary to determine the form of environmental related information needed by fishermen for the purpose of incorporating environmental aspects deemed important by fishermen when proposing environmental education activities.

Table 11: Forms of Environmental Related Information for Fishermen

Responses	Frequency	Percentage
Habitat protection	3	7.5
Fish breeding patterns	1	2.5
Ethics of fishing	1	2.5
Care of renewable resources	1	2.5
Ecosystem protection	1	2.5
Other survival skills to diversify	2	5
Compliance to fishing regulations	22	55
Information on impact of artificial floods on fish	1	2.5
Protection of breeding areas	1	2.5
No idea	7	17.5
Total	40	100

Source: Field data 2012

Table 11 shows that 55 per cent of the fishermen were of the opinion that compliance with fishing regulations was a type of environmental related information needed. This implied that fishermen had more knowledge about fishing regulations or that the department of fisheries placed more emphasis on observation of regulations than other

information related to the environment. Further, 17.5 per cent of the respondents had no idea, while 7.5 per cent of the fishermen thought that habitat protection was the type of environmental information needed. Others gave a number of responses as indicated above. This was indicative of the fact that the majority of fishermen were to an extent equipped with a form of knowledge of fish sustenance. The variety of responses given also could imply that the problem of over-exploitation could be tackled by a combination of many ways as opposed to one. From the table, it can also be inferred that the majority of fishermen took compliance of regulations to be the same as environmental education. However, a few fishermen appeared to know the difference as exemplified by the following response from one interviewee from Chanyanya:

ôMore information on how different fish breeds, how to protect their breeding areas and understanding their breeding patterns throughout the year must be known by all fishermenô (Fisherman from Namiloli fishing camp).

4.2.8 Sustainable Ways of Managing Fish

There being many ways of managing fish sustainably, it was prudent to obtain information that would be incorporated into activities to provide long term solutions to fish sustenance. Therefore, the subsequent table illustrates sustainable ways of managing fish obtained from the respondents.

Table 12: Suggested Sustainable Ways of Managing Fish

Responses	Frequency	Percentage
Improvement on enforcement of regulation	9	22.5
Improve water management	1	2.5
Participatory approach	9	22.5
Create fish reserve areas	1	2.5
Use uniform fishing gear	9	22.5
Construction of fishing dams by government	1	2.5
Chiefs to be given powers to enforce regulations	2	5
Restricting number of vessels per person	3	7.5
Consumers to boycott buying fingerlings	1	2.5
Government to provide loans for fishermen to diversify	4	10
Total	40	100

Source: Field data 2012

From Table 12, the majority of the fishermen thought that fish could be sustainably managed in three ways; use of uniform fishing gear, improvement on enforcement of regulations and use of the participatory approach. As indicated in the table, each of these responses was represented by 22.5 per cent. A few fishermen suggested that the government should provide loans for fishermen to diversify. This response is represented by 10 per cent. Some other fishermen indicated that there should be restrictions on the number of vessels owned per person. This response in the table is represented by 7.5 per cent. Very few fishermen gave the following responses;

- Improve water management- 2.5 per cent
- Create fish reserve areas- 2.5 per cent
- Construction of fishing dams by government- 2.5 per cent

- Chiefs to be given powers to enforce regulations- 5 per cent
- Consumers to boycott buying of fingerlings ï 2.5 per cent

Overally, as indicated in the table, three categories of fishermen, each represented by 22.5 per cent respectively, thought that the use of uniform fishing gear, enforcement of regulations and participatory approach were the main ways of managing fish sustainably. However, the responses given may indicate in an obscure manner some form of knowledge about environmental aspects that may be connected to the responses given in respect of how the use of wrong fishing gear impacts the ecosystem.

CHAPTER FIVE

DISCUSSION OF RESEARCH FINDINGS

5.0 Overview

Chapter four has presented the findings of the study. In this chapter, discussions of the findings will contribute to the proposal of environmental education activities for the sustenance of fish. The discussion will be centred on the research objectives and themes emanating from research questions of the study.

5.1 Form and Level of Environmental Education Awareness among Fishermen

The first objective of the study was to determine the form and level of environmental education awareness among fishermen of the Kafue wetland fishing area. The form of environmental education awareness among fishermen has been discovered to be a combination of Environmental Education and fisheries regulations based on ecosystem conservation, conservation of fish stocks, conservation of breeding areas, use of right fishing gear and observation of the fish ban as indicated in Figure 4 and Table 8 of the findings.

With respect to what environmental education is termed to be, various scholarly definitions have been given. Janse Van Rensburg as cited by Fien (1991, p. 74) defines environmental education as a ópplanned process which enables participants to explore the environment, to investigate recognised concern and to take action to make the world a better place for all living thing.ô

Oduro (1992) defines environmental education as the process of developing certain attitudes, skills and knowledge in an individual that will allow him to interact successfully and live in harmony with his environment.

Environmental education is further defined by Srinivas (2009) as a process in which individuals gain awareness of their environment and acquire knowledge, skills, values, experiences and also the determination, which will enable them to act individually and collectively to solve present and future environmental problems.

With regard to the current form of environmental education given to fishermen at Kafue fishing camps and the definitions of environmental education given above, it could be deduced that the form of environmental education at Kafue fishing camps qualifies to be termed as environmental education.

As observed from Figure 4 and Table 8, both fisheries extension officers and fishermen presented a form of environmental education that appeared to address important aspects in fish sustenance. The form of environmental education given to Kafue fishermen is in agreement with the Food and Agriculture Organisation Report on fish sustenance that emphasises the need for a full protection of key parts in the ecosystem, for example spawning and nursing ground of fish and delicate sea floor (http://wwww.fao.org/fi).

In a similar manner, the form of environmental education given at Kafue fishing camps is in agreement with measures adopted to ensure sustainability of fish in the water bodies of Zambia namely; protection of breeding ground, control of fishing gear,

control of fishing practices and enforcement of fishing ban as reflected in the ACP/ FSRP report on The Status of Fish in Zambiaôs Water Bodies (2009).

The nature and characteristic of environmental education spells out to an extent what could be termed as environmental education. Rao and Reddy (1997) explained the nature and characteristic of Environmental Education as education through the environment, about the environment and for the environment in which the environment is used as a teaching-learning aid.

The current form of environmental education given to Fishermen at Kafue fishing camps is in agreement with what constitutes the nature and characteristic of environmental education. Furthermore, the form appears to be responsive to the needs of the fishermen and the environment (refer to pages 42 and 45).

In view of environmental education awareness levels among the fishermen, all the respondents stated that environmental education awareness levels among the majority of the fishermen at Kafue fishing area were poor as indicated in Figure 4 and Table 5 of the findings. However, the findings at Kafue fishing area were in disagreement with a study on environmental issues conducted in the Emirates. In this study, all respondents had particular good awareness on various impacts of over-fishing on marine life as well as the environment. Awareness among fishermen on environmental issues and its impact on their profession and marine life was found to be quite high (http://www,ameinfo.com).

From the foregoing, much as the form of environmental education awareness that obtains at Kafue fishing camps qualifies as environmental education, the form appears not to fully address environmental related issues concerning fish sustenance as evidenced in Table 7. The poor levels of environmental education awareness are indicative of the need to step up the implementation of environmental education awareness activities.

5.2 Environmental Education Needed to Address Over-exploitation of Fish

The second objective was on the type of Environmental Education needed to address over-exploitation of fish. The study revealed that a combination of environmental related information relevant to the sustenance of fish, coupled with survival skills (diversification) and compliance to fishing regulations were perceived as the type of Environmental Education needed at Kafue fishing camps as indicated in Table 7.

The findings at Kafue indicated that environmental education could be a necessary element in devising any practical solution, but cannot be a sufficient solution by itself. This notion is supported by a study on ólimits of environmental educationô, which encouraged the combination of environmental education with economic assistance or economic incentive mechanisms as being more likely to prove effective than exclusive reliance on education programmes (http://www.ecovitality.org.ca).

However, despite the limits that may be noticed in environmental education being one of the many solutions to over-exploitation of fish, the role that environmental education can play in fish sustenance is a major one. This position is shared by Mbewe et. al

(2002) who stated that environmental education still remained as an avenue that had the potential to make people act in a responsible way.

The view by Mbewe et. al (2002) is in line with Otiend (1997) who had earlier explained that environmental education is seen as the only way of developing an awareness of the environment and a sense of responsibility for its protection. It is the most effective vehicle for persuading the human race to adopt a rational attitude towards the natural environment and to avoid the deterioration of human life as a result of unwise exploitation and misuse of nature.

CHAPTER SIX

PROPOSED ENVIRONMENTAL EDUCATION ACTIVITIES

6.0 Overview

This chapter provides details on proposed specific environmental education activities which could be conducted in fishing camps in line with the third objective. The chapter shows proposed detailed activities, it also outlines specific threats to fish, points to emphasise under each activity and details on the procedure to follow during each activity.

6.1 Proposed Environmental Education Activities for Fish Sustenance

As a result of the decline in the quantity of catches per fisherman and the degradation of the Kafue river environment, the following environmental education activities are being proposed with the hope of sustaining fish and peopleôs livelihood as well as the well-being of the Kafue wetland. In this study, the fishermen and their families in the fishing camps were the target. Headmen and environmentalists were to sensitise the communities on sustainable fishing methods and protection of the wetland. Identified specific threats to fish sustenance presented in Chapter four (Table 3 of the findings from the Department of Fisheries officers and Table 3 of the findings from fishermen) were used to propose environmental education activities for the study area.

Table 13: Proposed Environmental Education Activities for the Study Area

Type of threat to fish	**Points to emphasise**	**Environmental Education activities and procedure**
1. Fishing in	• Damages fish	**Documentary**: Fishing the

spawning areas	nurseries and, therefore, affect the bio-physical environment in the river • Disturbs fish production and, therefore, alters eating habits of those who depend on fish • Reduces fish population and, therefore, creates an imbalance in the food chain • Affects fish catches and as a result affects the countryôs Gross Nation Product	unsustainable way **Activity A** Show documentary depicting a closed ecosystem with fishermen demonstrating adherence to fishing regulations. Second part of documentary should show an open ecosystem where fishermen are fishing in spawning areas, documentary to show damaged fish nurseries with small fishes. **Activity B** Audience discussion Key questions to ask: - What are the functions of spawning areas? - What should fishermen do to enable fish to reproduce? **Activity C**: Wrap up A good fisherman must not fish from spawning areas.
2. Increase in fishing pressure	• Causes fish depletion and, therefore, fishermen resort to exploitation of other natural resources thereby	**Drama** Theme: Scramble for fish **Activity A** **Scene 1**.(Dramatisation) Several characters compete for fish using both approved and illegal

	creating a vicious circle • Damages ecosystem and as a result affects the well being of other non- fish products • Reduces quantity of catches which in turn results in strained relationships among fishermen when they compete over limited fish	fishing gear. **Scene 2**.(Dramatisation) A group of four fishermen laments about less fish catches, each suggests one of the following: - Itôs about time to think of farming in place of competing for fish. - I will make use of my blacksmith skills to make a living. - I am still young; I can always go back to school. - I will quit fishing to open a little shop. **Activity B**: Wrap up There are many other avenues that can be exploited to make a living other than fishing.
3. Non observation of fish ban	• Decreases fish availability and, therefore, this affects the lifestyle of people who depend on fish • Reduces fish production and, therefore, affects the generation of income among	**Debate** **Motion**: Observation of the fish ban is a form of punishment to fishermen. **Activity A**: Debate **Proposers' points**: - Stopping a fisherman from fishing is like stopping a patient on life supporting drugs from taking the drug.Fish

	households, this in turn results in unstable homes • Diminishes fish species (tilapia) and as a result affects biodiversity	cannot finish, nature has its own way of regulating things, human effort cannot do. Ban creates artificial shortage of fish. - Ban escalates fish prices. **Opposers' points**: - Ban allows breeding, multiplication and growth of fish. -Ban controls depletion of fish. -Ban creates enough time for fishermen to do other things for example, farming activities, repair of boats and nets. **Activity B:** Questions and answers from the audience. **Activity C**: Wrap up No ban no fish tomorrow. Ban allows fishermen to always have fish; adherence to the ban is the way forward.
4. Pollution of water from farming activities and inorganic materials.	• Poisons water and fish and, therefore, degrades the natural environment • Reduces quality of	**Education in the environment** **Activity A**: Clean up of the shores and river banks. Removal of plastics, pieces of old nets,

	fish and affects the heath of consumers Therefore, this results in the creation of unnecessary health burdens for the government and health personnel • Disturbs fauna and flora and, therefore, this result in a compromised environment • Creates a risk to fish consumers and, therefore, creates anxiety on the part of consumers and government	cigarettes pieces and other inorganic products. **Activity B**: Wrap up **Sensitisation talk** Effects of inorganic material and farming materials e.g. fertilizer and pesticides on the ecosystem are explained to the audience.
5. River line degradation from tree cutting	• Changes river system and alters ecosystem and, as a result affects the environment needed for fish production • Causes soil erosion and, therefore,	**Education in the environment** **Activity A**: Planting of indigenous trees along the river line (to be done once in a year by fishermen and the community members). **Activity B**:

	affects quality of water in the river • Eutrofication is faster and, as a result, the natural river environment is altered. • Oxygen demanding waste and, therefore, affects oxygen intake in the river • Affects rainfall pattern and, as a result alters the bio-physical environment	**Audience discussion** **Discussion Questions**: _ What are the functions of trees along the river line? _ What is the benefit of conserving trees found along the river line to: a) The river ecosystem. b) The living things found in the river. c) The fisherman. d) The community. **Activity C**: Wrap up Trees found along the river line should be conserved as they support the wellbeing of the river on which fish depend.
6. Use of wrong fishing gear/method : a) **'Ifikukula'** (improvised draw nets made from synthetic potato/onion bags) 	• Affects breeding of fish and, therefore causes depletion of fish. This results into loss of biodiversity deprivation of main source of protein for poor families and economic gain. • Reduces fish production	**Documentary:** Fishing to finish (applicable to threats under 6) **Activity A**: Show documentary depicting fishermen fishing using wrong fishing gear and effects arising from use of such gear. **Activity B**: **Audience discussion**

	• Damages fish nurseries • Causes wastage due to increase in by-catch • Causes increase in loss of biodiversity • Reduces nutrients for fish • Causes water to become mucky	**Discussion Questions**: _Why is the use of draw nets, poisonous chemicals, water beating and chasing fish into traps discouraged? _ What are the effects of use of wrong fishing gear to: a) the river b) the fishermen c) the community d) the future generation - Why should all fishermen and the community work together to conserve the fish resource?
b) ó**Ukutumpula**ô (Use of Mundili drum stick to beat the water)	• Causes fish to panic • Disturbs breeding • Reduces fish production	**Activity C**: Wrap up **Replacement of wrong fishing gear** Appeal to all fishermen to abandon and surrender wrong fishing gear. Right fishing gear to be traded for surrender of wrong gear. Fishermen to be assured of no penalties for surrendering wrong gears. (Conservation societies/ fisheries department to
c) ó**Ukusowa**ô (chasing and trapping fish)	• Increases by-catch • Causes fish to panic • Affects breeding of fish • Disturbs fish production	

d) Use of traditional fish poison commonly known as ó**Ububa'**(Tephrosia Vogelii) Plant leaves and pods are used to poison fish.  **Tephrosia Vogelii**	• Affects water quality • Makes fish unsafe for consumption Causes loss of biodiversity	source right fishing gear).

CHAPTER SEVEN

CONCLUSION AND RECOMMENDATIONS

7.0 Overview

The purpose of this section is to bring out the conclusion and recommendations drawn from the study, which sought to propose an environmental education activities for the sustenance of fish at the Kafue wetlands of Southern Zambia.

7.1 CONCLUSION

The conclusion of the study was basically centred on the research objectives and the various issues that arose during data collection. It was discovered that the form of environmental education that the Department of Fisheries gives to the fishers at Kafue fishing camps consists of ecosystem conservation, conservation of fish stocks and observation of the fish ban. It was further discovered that among the forms of environmental education given by most fisheries extension officers, ecosystem conservation took pre-eminence. However, the form appears not to fully address environmental related issues concerning fish sustenance.

The study has shown that the levels of environmental education awareness among the majority of fishermen at Kafue fishing camps were low. Only a few fishermen had a moderately high level of awareness. Besides the low levels of environmental education, some fishermen indicated a high level of understanding of fish related environmental issues while others indicated a complete lack of knowledge in the same area. To this effect, the low levels of environmental education awareness required stepping up the implementation of environmental education awareness activities.

Finally, the current study has shown that despite past and present efforts by the Department of Fisheries to control exploitation of fish, the decline continued to be high. To this effect, the study also identified and proposed the type of environmental education activities required by the extension officers at the department of fisheries at Kafue in order to effectively address the scourge.

7.2 RECOMMENDATIONS

Considering the overall purpose of the study and conclusions drawn, the following are some of the recommendations:

Central Government

A variety of skills, basic tools and implements, which must be more attractive compared with fishing, should be given to communities near fishing areas to reduce pressure on the rivers. This arises from the research finding that fishermen needed to diversify to reduce pressure on rivers in order to sustain the fish resource.

Ministry of Agriculture and Cooperatives

A paradigm shift towards environmental education in the management of the fisheries sector is encouraged. More funding should be allocated for training of extension workers and to enable the Department of Fisheries carry out environmental education awareness campaigns for fish sustenance. In the same vain, more research work to find solutions to over-exploitation of fish must be encouraged and be adequately funded. These suggestions are based on the finding that levels of environmental education among fishermen were low and that over-exploitation of fish had continued to persist in recent years.

Department of Fisheries

The approach used in finding solutions to the problem of over-exploitation of fish should be broad based and take into consideration the needs of the fishermen and the demands on conservation of the fish resource. In this regard, combining environmental education with some economic incentive mechanism is encouraged. Creation of fish reserves and tighter enforcement of fishing regulations, coupled with intensified patrols is recommended. These recommendations emanate from the findings that sustenance and management of fish at Kafue wetland fishing camps required the employment of many ways, notably, the use of uniform fishing gear, improvement on enforcement of fishing regulations and the participatory approach.

7.3 Recommendations for Further Research

The discoveries of the study were that although the Department of Fisheries had in place a number of legislation and some form of environmental education was given to fishermen with a view to sustain the fish, very few fishermen adhered to the regulation and depletion of the fish resource continued. The fact that environmental education was capable of making people develop empathy and act responsibly towards the environment and the realisation that fish was an important resource as a food item and an economic driver in most rural settings, there would be need to have more research conducted on the role of environmental education in the sustenance of the fish. The researcher, therefore, recommends further research on the following topics:

- An investigation of environmental education methods used in awareness campaigns at the Department of Fisheries.
- Fishermenôs attitudinal differences towards environmental education and its impact on fish sustenance.

- An exploration on the impact of the provision of environmental education to fishermen.
- The impact of indigenous knowledge systems in the management of the fish resource.

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Appendix i

THE UNIVERSITY OF ZAMBIA

DIRECTORATE OF POSTGRADUATE STUDIES

LETTER TO RESPONDENTS OF THE QUESTIONNAIRE

RESEARCH TITLE: **PROPOSED ENVIRONMENTAL EDUCATION ACTIVITIES FOR THE SUSTENANCE OF FISH AT KAFUE FLATS IN SOUTHERN ZAMBIA**

Dear Respondent,

I am a postgraduate student undertaking a Masters of Education Course in Environmental Education. You have been purposively chosen to answer a questionnaire. The information you will provide will be used for academic purposes and will enable me fulfil one of the requirements for the attainment of a Masters Degree.

I thank you and look forward to your cooperation.

Yours truly,

Kashinga Salome M. (Student).

Appendix ii

QUESTIONNAIRE

To be answered by officers from the Department of Fisheries at Chilanga and Kafue.

Position : é .

Station : é ...

Nature of work: é .

Years in service: é .

1. Do fishermen use unsustainable fishing methods? Yes/ No (Tick correct answer)
2. What is the level of Environmental Education awareness among the fishers?

A.High B. Moderately high C. Low D. No idea (Tick correct answer)

3. Is there any Environmental Education awareness given to fishermen? Yes / No(if the answer is Yes, elaborate)

é é
é é
é é
é é
é é é é

4 What form of Environmental Education awareness is given to the fishermen?

é é
é é
é é
é é é

5. What methods does the Fisheries Department use to administer environmental education to the fishermen?

é é
é é
é é

6. Beside the Fisheries Departmentôs efforts to sustain fish, what role should fishermen play to sustain fish in natural water bodies during and after fishing activities?

é é
é é
é é

7. What environmental related fishermenôs activities threaten the sustenance of fish at Kafue flats of southern Zambia?

é é
é é
é é
é é

8.What kind of environmental education do fishermen need in order to sustain fish at the Kafue Wetlands of Southern Zambia?

é é
é é
é é
é é

End of questionnaire

I thank you.

Appendix iii

INTERVIEW GUIDE FOR FISHERMEN

NAME OF FISH CAMP…………………………………………………………..

QUESTIONS

1. How long have you being fishing?

é é

2. Has there been any noticeable decline in fish catch over recent years?

é é

é é

é ..

3. What fisherõs related activities cause the decline of fish at Kafue

é é

é é

é é

é é

é é

é é é é é é é é é é é é é é

4. What environmental related information does the fisheries department give you?

é é

é é

é é

5. How would you classify your level of environmental education awareness in respect to sustenance of fish?

é é

é é

6. What activities do you do to conserve fish and the environment when fishing?

é é

é é

é é

7. What other environmental related information do you think fishers at the Kafue Wetlands should know in order to sustain fish?

é é
é é
é é
é é

8. Which activities are you directly engaged in that pose a threat to fish sustenance?

é é
é é
é é
é é

9. How would you like the fisheries resource to be managed sustainably?

é é
é é
é é

Thank you for your cooperation.

Appendix iv

LETTER TO DEPARTMENT OF FISHERIES KAFUE

C/O Brig . Gen . T. M. Lubaya
P.O. Box 31931
Lusaka

The Officer In-Charge
Kafue Fisheries Department

18th August, 2010

Dear Sir/ Madam,

RE: **REQUEST FOR PERSONNEL ASSISTANCE**

I am a postgraduate student from the University of Zambia due to undertake some research activities within Kafue (refer to attached document for topic).

In view of this, I am requesting for an officer to assist me identify various Chairmen of the following Fishing Camps; Chilumba, Chanyanya, Namiloli, Nanga and Cheeba.

Your positive response in this regard will enable me have access to the rightful respondents and therefore, make it possible for me to proceed with my research.

Your favourable response will be appreciated.

Yours sincerely,

Kashinga Salome M. (Student)

Appendix v

Images from the Research Field

Image 6: Fishing Pressure at Chanyanya Harbour

Source: Field Data, 2012

Image 7: Nanga Fishing Camp

Source: Field Data, 2012

Image 8: Interview in progress at Chanyanya by an Assistant Researcher

Source: Field Data, 2012

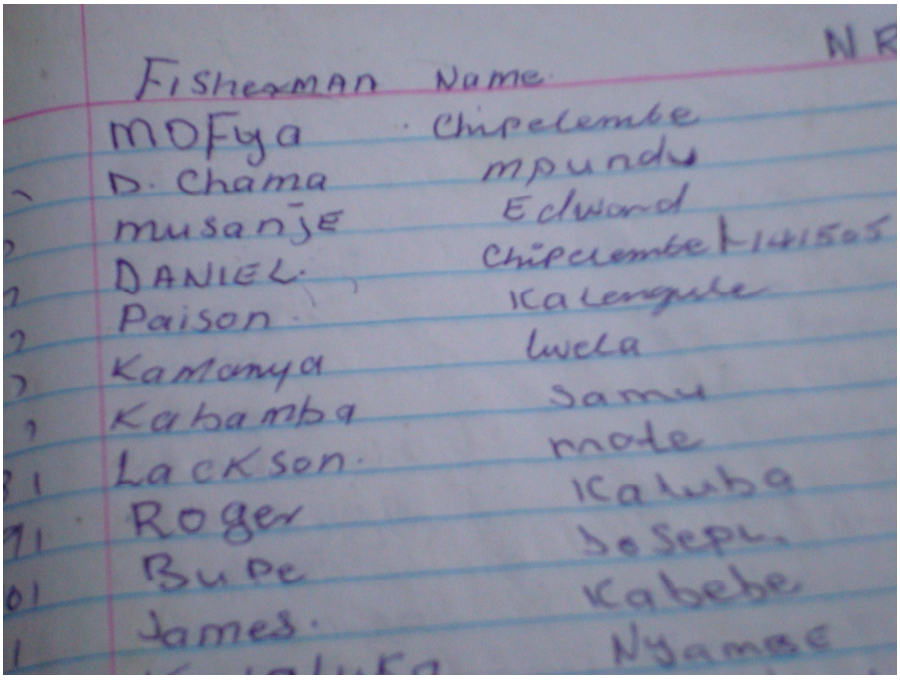

Image 9: Fishermenôs Register at Nanga Fishing Camp

Source: Field Data, 2012