ASSESSMENT OF THE PRIVATE COST OF ADULT LEARNING; USING PIONEER AND PANACEA LITERACY CENTERS, AS A CASE STUDY.

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MAY, 2024.

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A RESEARCH WORK WRITTEN AND SUBMITTED TO THE DEPARTMENT OF ADULT AND NON FORMAL EDUCATION, FACULTY OF EDUCATION, UNIVERSITY OF BENIN, BENIN CITY. IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF EDUCATION (B.Ed) DEGREE IN ADULT EDUCATION (ENGLISH AND LITERATURE)

MAY, 2024.

APPROVAL PAGE

I hereby certify that this research work carried out by Kelechi Prosper OGU with matriculation number: EDU1902722 in the Department of Adult and Non- Formal Education, Faculty of Education, University of Benin and approve of it as adequate in quality and scope in partial fulfillment of the requirement for the award of Bachelor of Education (B.Ed) degree in Adult Education (English and Literature**).**

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Dr. F. U. Aghedo

Project supervisor

Date: ____________________

CERTIFICATION

We the undersigned certify that this project work was carried out by **KELECHI PROSPER OGU** with matriculation number **EDU1902722** of the faculty of Education, University of Benin, Benin City, Nigeria, in partial fulfillment of the requirements for the award of B. A (Ed) in Adult and Non- Formal Education

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DEDICATION

With Heartfelt Joy and gladness; this work is dedicated to God Almighty the Keeper of my Life, for safeguarding me in Good health; upon the Beginning and Successful completion of this Research study, my Dearest father Comrade Jonah Ogu, and supportive Sponsor Mr. Uwabueze Nnadi for their Constant Love, assistance, and advice. They all contributed, in making this Research study possible.

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I am sincerely grateful to Almighty God; the source of my Knowledge for grace towards the success of this project and for, embracing me with bold strength.

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I express my Deep appreciation to my H.O.D Professor (Mrs) L. A. Okukpon and the Lecturers in the Department of Adult and Non-Formal Education, University of Benin; Dr. N. R. Erharuyi, Mrs. R. O. Oronsaye, DR. S. O. Olawale, Mrs. M. O. Akerele and other lecturers in the Faculty of Education for Empowering me with; the necessary knowledge throughout the time of my study, which helped me to reach the Expectations of this Research study.

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May God continually Bless and keep you all, Amen.

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ABSTRACT

This study examined private cost of adult learning, using Pioneer and Panacea adult literacy centres as a case study. In order to achieve the objectives of the study, Four research questions were raised and answered while, one 1 hypothesis was tested at a 0.05 level of significance.

The descriptive research design was adopted for the study. The population of the Study consists of 78 adult learners enrolled in Pioneer and Panacea literacy centers. Using, a census sampling due to the small population size. The study adopted the questionnaire as instrument for data collection. The instrument was validated through experts' judgment approach and was tested for reliability through the Cronbach's alpha method. After computing, the data collected was analyzed using the Cronbach's alpha method, and thus, a Cronbach's alpha co-efficient of 0.70 were obtained. The data collected in the study was analyzed using both descriptive and inferential statistics which involved; the use of frequency count, simple percentages, means score and standard deviation.

The findings of the Study revealed that private cost of adult learning influences the participation of adult learners as; there are socio-economic factors like; poverty, cost of living and employment opportunities that influences adult learners' ability to fund their learning and the issue of the various components of private cost like; tuition, transportation, materials and time cost Incurred by adult learners which, contributes to their participation in the literacy programmes. Based on the findings of the study, it was concluded that; Private cost of Adult Learning influences the participation of adult learners, in Pioneer and Panacea literacy centres. The study therefore recommended that the government should ensure sufficient provision of learning materials, to cut expenses for the adult learners private cost of learning as; the cost of materials which is one of the critical components that constitutes the private cost of adult learning. There should also be adoption of multiple strategies for payment of private cost of adult learning, to allow adult learners who may be faced with financial burden.

CHAPTER ONE

1.0 INTRODUCTION

Fishes are the largest group of vertebrates that live in a water body, they are also an important means of nutrition. They inhabit freshwater, marine and brackish water. Fish is any aquatic vertebrate animal that is covered with scales and equipped with two sets of paired fins and several unpaired fins (Helfiman et al, 1997). Fishes are coldblooded vertebrate with gills that live its life solely in water due to special body parts they possess. Such body parts are, stream line body to move smoothly through water, pairs of fins which aid in movement, gills that aid them in respiration.

Fishes are important in human nutrition, livelihood and source of income. They are an important aspect of aquaculture providing job opportunities. Fishes are a source of protein, vitamin A, D and calcium. Fishes also supplies to the body, a range of inorganic minerals such as Phosphorus, Fluorine, Potassium, Iron, Zinc, Magnesium, copper and in marine species iodine as well as vitamins A and B complex (Adeniyi et al., 2019). It has been identified as the best source of animal protein medically recommended to the old and young people (Blurtit, 2009), Fish oil is the most important fish by product which contains vitamins A, D, E and K which is used to treat coronary heart diseases, arthritis, atherosclerosis, asthma, auto immune deficiency diseases. Fish possess omega 3 fatty acids which keeps the brain and heart healthy.

Fish gives a lot of by-products which includes fish manure, fish glue, 'isinglass' (a gelatinous substance which is obtained from the air bladder of perches, Indian salmon and cat fish which is used in preparation of special cement and in clarification of wine and beer) another by-.

product of fish is '**shargreen**' (the skins of sharks and rays which has pointed scales which is used in polishing wood) it is also used for covering jewellery boxes and swords (Wikipedia, Z016). Fish glue is made by boiling the skin, bones and swim bladders of fish, while fish fertilizer is made from whole but decaying fish. and other carcass products such as bones, scales and skin. Fish fertilizer improves soil life, provides nutrients for plant growth.

There are also fishes used to beautify homes and offices by putting them in aquariums such as gold fish (*Carassius auratus*). Fishes are also used for tourist attraction in large scale aquariums which house larger fishes and mammal species such as dolphins (Delphinus delphis), great white sharks (*Carcharodon carcharias*), sting rays (*Myliobatoidei*) and angle fish (*Pterophyllus*).

Length-weight relationship is an important factor in fisheries biology, and is used to compare growth in fishes. The length-weight relationship of a fish is a measure of its growth pattern in conjunction with age of the fish sampled, their growth and production. The knowledge of length-weight relationship is important to fisheries biology as it helps to evaluate the condition of the fish, reproductive history, life cycle and general health of the fish. The negative changes in growth rate observed during sampling and analysis can be caused by increase in predation, disease and reduction in birth rate and an overall increase in mortality. Studying the length-weight relationship of fish gives an in-sight in the estimation of average weight of fish of a given group. It also provides a solid ground for the morphological comparisons between populations of fish.

There are two types of growth pattern in fishes namely isometric and allometric. in allometric growth, when b=3 the fish is said to have undergone isometric growth while when b>3 it has undergone positive allometric growth (Freose, 2006).

Length is a linear measure (in centimetres) and the weight of a fish (in grams) is approximately equal to its volume (cubic centimetre). Hence weight of a fish is a function of length. The relationship is expressed by the hypothetical law W = aL^3. Length weight relationship also provides information on the changes in the well-being of the fishes that happens during their life cycle This can be estimated by comparing the expected weight estimated by using the length-weight relationship with actual weight of fish. Like other morphometric measurements, length-weight relationships may change during the events of life cycle like metamorphosis, growth and onset of maturity.

Sex ratio can be defined as the ratio of males to females in a population Sex population estimation is the abundance of any sex in a particular time in natural condition. Knowledge of the sex ratio of fishes is important to ensure a proportional fishing of two sexes and provides information necessary in assessing the reproductive potential of a population (Ibrahim *et al.,* 2017). information on sex ratio is important for understanding the relationship between individuals, the environment and the state of the population. The sex ratio may vary from the expected 1:1 from species to species, or even in the same population at different times, being influenced by several factors such as adaptation of the population, reproductive behaviour, food

availability and environmental conditions. For example, the reproductive success of female is normally related to access to resources and the environmental conditions, and not to the number of mating partners as in the case of males. Thus, the lifetime reproductive success of

male is limited by access to females, while females are not limited by access males which lead
1o an unbalance in the number of individuals of each sex in the population. The sex ratio provides basic information to assess the reproductive potential and to estimates stock size of fish populations. The length-weight relationship is useful in determining the weight when only
the length measurements are available, and it also indicates the condition of the fish and permits comparisons of the parameters of the relationship between species from different regions. (Oliveiral *et al.,* 2012).

Proximate composition determination involves analysis for moisture, protein, lipid, fibre, ash, and carbohydrate and they are important to meet the requirements of ood regulations and commercial specifications (Watchmann. 2000). The human body needs nutrients to enable t function effectively and to maintain good health, such nutrients are sourced from foods. Food nutrients include water, carbohydrates, proteins, fats, vitamins and minerals amongst others. Fishes are known to provide protein, fat and vitamins which are of great benefit to human health as it has been proven by many scientists including Akpambang (2015) Proximate analysis is carried out in the laboratory. After sample is collected, chemical analysis is carried out to know the level of nutrients in the muscle of the fish.

1.1 Aim and Objectives:

The aim of this research is to study the length-weight relationship and sex ratio of two species of different family's namely; *Mumyrus rume.*

The objectives are:

- To provide data on length-weight relationship of *Mormyrus rume.*
- To determine the proximate analysis of *Mormyrus rume.*

- To determine sex ratio of *Mormyrus rume.*

CHAPTER TWO

2.0 Literature review on *Mormyrus rume.*

In Nigeria investigation into the biology of freshwater fishes have been conducted by ldodo Umeh (2003); Igejongbo et al (2018) and Fagbenro (20 10)

The Mormyridae is native to Africa and is found in every freshwater along the sub-Sahara. Their habitats range from bottom dwellers to top feeders of deoxygenated swamps to with rapids. The family Mormyridae consist of different species with some bearing common names

such as elephant nose fish. Adekunle (2018) stated that the species *Mormyrus rume* possess some unique characteristics such as trunk like snout, small and terminal mouth part, a dorsal fin that possesses 81-96 soft rays, anal fin with 18-2 1l soft rays and 20-2 1 scales around the caudal peduncle which are coloured greyish-yellow dorsally and silvery ventrally.

ldodo Umeh (1987) also observed a specimen that has 32.8cm standard length with a weight of 287.3g in river Ase. Lewis (1974) recorded a specimen with a length of 1m weighing 5kg in kainji lake. *Mormyrus rume* can be found in swamps, rivers, streams and lakes. It is omnivorous in nature with its diet consisting mainly of chironomid and chaoborid larvae, plant

materials, crustaceans and detritus. Idodo-Umeh (1987) also stated that *Mormyrus rume* can discharge an electric shock of 25-30 Hz.

The food and feeding habits of different fishes often differ widely. Maar et al (1983) observed

that the same fish also may show a preference for different types of food when the desired food

is unavailable. In River Ose, *Mormyrus rume* fed mainly on benthic insects (Notonectidae, Belastonatidae Hydrometridae, Nepidae, Corixidae, Chironomidae, and Chaoboridae) and crustaceans (Petaonidae, Hydracarina spp.. remains of docapods). Omotosho (1993) reported that *Mormyrus rume* fed on detritus, algaae and macrophytes in Oyun mini-dam, llorin

Nigeria, which agrees with Fawole (2002) who stated that the major food items of *Mormyrus rume* in Lekki Lagoon were detritus and plant parts According to Ugwumha (2007), these differences can be attributed to differences in food availability between the different habitats During the dry season, chirohomid larvae dominate the insect fauna while chaoborid larva became more abundant in the rainy season, Moreover, during the rainy season, there is a continuous input of materials of allochthonous origin. notably insects (coleopterans, dipteran ants, and termites), seeds, leaves and pollen from flooded/inundated forests into River Ose, which settle at the bottom where they are decayed by bacterial and fungal activities. Odedeyi and Fagbenro (2010) observed that the high percentage occurrence of detritus coupled with he high ranking index of detritus suggest that *Mormyrus rume* is a bottom dweller and a detritivore; indeed, the trunk-like snout coupled with the small terminal mouth of *Mormyrus rume* encourages detritivory.

Olatunde and Ogunbiyi (1977) and Olatunde *et al* (1988) confirmed that digestion of protein in *Mormyrus rume* started in the stomach. The' absence of proteases in the oesophagus showed that this region only serves for the passage of food items to the stomach while the rectum retains undigested food materials or waste prior to being voided from the body. The high peptic activities recorded in the stomach of both juvenile and adult *Mormyrus rume* suggest the consumption of protein-rich food items by this species. Lissmann and Machin, (1958) observed

that Mormyrids produce weak electric discharges which function in spatial orientation and in communication. According to Hopkins (1986). Mormyrid- EODs (electric organ discharges) ae generally species-specific.

Igejongbo et al (2018) recorded that the most important of these biological processes is the reproductive cycle and formation of gametes. Development of fish seeds production has been

identified as a rational way of augmenting the dwindling fish supply from the capture fisheries

or the female, gonads are weighed individually, but for males, all gonads of the same length.

Few Literature works exist on *Mormyrus rume* or its family and with time, I believe more research will be carried out bringing more information about the species for knowledge.

2.1 Length weight relationship

Analysis on length - weight relationship is aimed at showing the relationship between length and weight of fish. It also measures the variation from the expected weight for length of individual fish, length -weight relationship can be used to estimate the general well-being of a fish in a particular habitat (Sinovic *et al.,* 2004). Various factors may be responsible or differences in length-weight relationships of fish. Some of these factors are sex, stage of maturity, season and time of the day (Bagenal and Tesch, 1978). King (1996) also, observed that temperature, salinity, food (quality and quantity), time of the day/y ear and stage of maturity is responsible for differences in length-weight relationship. According to Olurin and

Aderibigbe (2006), differences in total length and body weight distribution are dependent on sex and developmental stages of the fish.

There are two types of growth in fish, namely isometric and allometric growth. When the value

of coefficient b is3, the fish has negative allometric growth i.e, the fish becomes thinner with increase in length, when b= 3 fish is said to have undergone isometric growth i.e. fish becomes

more robust with increasing length and when b is > 3 lish is said to have undergone positive allometric growth i.e. the fish becomes robust with increase in length.

Beyer (1987) stated that length weight relationship is very important in fisheries biology because it allow estimation of average weight of the fish of a given length group. This

relationship is very important in fisheries biology because it allow estimation of average weight of the fish of a given length group. Pauly (1993) stated that length-weight relationship (LWR) provides valuable information on the habitat where the fish lives while Kulbicki *et al.* (2005) stressed the importance of LWR in modelling. aquatic ecosystems.

Ibrahim *et al.* (2009) observed allometric growth pattern in fishes caught from Kontagpra Reservoir while Ude *et al.,* (2011) made similar findings in an evaluation of length weight relationship of fish species of Ebonyi River. Ibrahim et al., (2009) observed allometric growth

pattern in Kontagora Reservoir while Agali and Edema (2018) got similar results from the dominant and sub-dominant fish species in Obueyinomo River, Edo state.

2.2 Condition factor

Ahmed et al. (201l) observed that the relationship of length-weight can be used in the estimation of condition factor (K) of fish species. In fisheries science, the condition factor is used in order to compare the condition, fatness or wellbeing of fish which Bagenal and Tesch (1978) based it on the hypothesis that heavier fish of a particular length are in a better physiological condition. Anene (2005) observed that condition factor is strongly influenced by

both biotic and abiotic environmental conditions and can be used as an index to assess the status of the aquatic ecosystem in which fish live. Khallaf et al. (2003) suggests that fish condition factor can be affected by a number of factors such as stress, sex, season, availability of food, and other water quality parameters.

Quarcoopome (2010) studied the condition factor of fish species (*C. nigrodigitatus*) In Weija Reservoir, male and female of *C. nigrodigitatus* condition factors based on standard length

were $1.965 \pm 0{,}059$, 2.025 ± 0.140 and 1.996 ± 0.039. Oluajo (2005) reported that in Epe Lagoon

in Nigeria *C. nigrodigitatus* had mean condition factor of 0.8 ± 0.2 which is comparable to the results of this study, based on total length despite the differences in environmental conditions. Kumolu-Johnson and Ndimele (2011) obtained a K-value of between 0.91 and 8.46 from Ologe Lagoon in Lagos. But Ibrahim *et al.* (2012) recorded a mean K-value of 1.98 ± 0.35 in Kontagora Reservoir in Niger State. While in Sudan Ahmed et al. (20ll) recorded a K-value range of 0.506 and 3.415. Also, Agali and Edema (2018) got a condition factor range of 0.40 -3.06 in Obueyinomo River while Abowei (2004) stated, that condition factor decreases with increase in length and also influences the reproductive cycle in fish.

2.3 Sex ratio

Sex ratio is the study of the ratio of males to females among fish population in a habitat. The sex ratio was given as males: females (M: F), calculated using the formula: total number of males/ total number of females.

The sex ratio provides basic information to assess the reproductive potential and to estimate stock size of fish populations. The length-weight relationship is useful in determining the weight when only the length measurements are available, and it also indicates the condition of

the fish and permits comparisons of the parameters of the relationship between species from different regions. In North-eastern Brazil, Oliveira et al. (2012) worked on sex ratio of different

fishes the expected sex ratio of 1:1. However, the sex ratio of *C. chrysurus* was 2.03:l; O. oglinun was l.41:1 and *L. synagris* was 4.15:1, where males were significantly more numerous than the females during the study period. For *H. brasiliensis*, sex ratio was 0.75: l, showing a predominance of females in the population deviating from the expected sex ratio of

1:1. Information on sex ratio is important for understanding the relationship between sexes, the

environment and the state of the population. The sex ratio may vary from the expected from species to species, or even in the same population at different times, being influenced by several factors such as adaptation of the population, reproductive behaviour, food availability and environmental conditions.

According to Nikolsky (1963), sex ratio varies annually according to season. Hodgkiss and Hanson (1998) reported that sex ratio plays a considerable role in the determination of breeding activity. Factors such as geographic location and ecological habitat have also been known to influence sex ratio (Willoughby, 1974).

2.4 Proximate analysis:

In recent years, fish has become a favourite foodstuff for the majority of society because of several health reasons. Determination of proximate profile of fish is necessary to ensure that they are within the dietary requirement and commercial specifications (Watchman 2000). The knowledge of fish composition is essential for its maximum utilization. The nutrition of fish varies from one species individual to another depending on age, feed intake, sex and sexual changes connected with spawning the environment and season (Silva and Chamul, 2000). Researchers such as Abdullahi and Balogun (2006) studied the protein quality of cichlids and clariids, and found out the fishes indicated high protein content in clariids than in cichlids. Foran et al. (2005) stated that, fish is a highly proteinous food, consumed by a large percentage of the populace because of its availability and palatability' while, Adewumi, (2011) stated that fish has an edge over meat in Nigeria, because it is cheaper and relatively more abundant in Nigeria. According to Eyo (2001), proximate composition determination involves analysis of moisture, fibre, carbohydrate, protein, lipid and ash contents, while mineral composition

analysis involves the determination of mineral contents such as potassium (K), sodium (Na), calcium (Ca), magnesium (Mg), iron (Fe) and phosphorus (P).

Moisture content is frequently used to determine the degree of dehydration of fish and fish products. Adewumi et al. (2014) observed that high moisture content could be a disadvantage in that it increases fish susceptibility to microbial spoilage, oxidative degradation of polyunsaturated fatty acids and consequently decreases the quality of the fishes for longer preservation time while when the moisture content of a fish is low, it will take a shorter time to smoke-dry the fish hence encouraging its preservation and added value for the marketability of the species. Eyo (2001) discovered the usual method for lipid determination is to extract the

dried ground sample with a solvent, while the ash content is the inorganic matter which remains after the organic matter has burnt. Some workers (Abdullahi and Balogun (2006): Achionye-Nze and Omoridion (2002), have earlier, investigated the proximate/mineral content

of some fishes in rivers and reservoir in Nigeria and reported that freshwater fishes are good sources of minerals and protein also,

Burgess (1975) observed that the relatively high protein in freshwater fishes could be attributed

to the fact that fishes are good source of pure protein. Alli et al. (2001) reported that protein content which is a vital constituent of living cells tends to vary relatively little in healthy fish unless drawn upon during particular demands of reproduction or during food deprivation periods:

According to Ackman (1989), fish can be grouped into four categories according to their fat content viz. lean fish (< 2 %), 1low fat (2 to 4 %), medium fat (4 to 8 %), and high fat (> 8 %).

Ash is a measure of the mineral content of food item as defined by Adewumi et al., (2014). Ash is the inorganic residue that remains after the organic matter has been burnt off. The ash value for the tilapia species (0.41 %) was also reported by Adewumi *et al.* (2014) to be very relatively low. These values are lower than what some authors Fapohunda and Ogunkoya (2006) and Olagunju *et al.* (2012) recorded also, Agali and Edema (2016) worked on the proximate analysis of commercially important fishes in Obueyinomo River and found out, they

are rich in Protein, lipids, and carbohydrate.

CHAPTER THREE

3.0 STUDY AREA DESCRIPTION

3.1 Study Area:

This study was carried out in Ovia River, Benin city, Edo state which is the largest river in the

Kingdom of Benin (Ekhuosehi, 2017), Ovia River is located at latitude, 6o 23'42.76" -

6027' 10.15"N and longitude, S025'55"- 5029'36.20"E. It flows through Unuame in the south-westerly direction to Ite, Ikoro, Gelegele and the Ughoton (Gwato) creeks; into the Benin, River, which empties into the Atlantic Ocean at the Bight of Benin.

3.2 Climate:

Ovia River which is within the tropical belt of Nigeria has two distinct regions: wet and dry season, which starts from April to October and November to March respectively. The mean temperature for the hottest months (February/March) is 34°C while that of the coolest month (August) is 28°C. It possesses a climate that is more typical to the humid tropics.

3.3 Vegetation:

The dominant vegetation around Ovia River are trees, a few shrubs and grasses. It is a lotic freshwater body with a thick vegetation canopy. There are economic trees such as palm trees (*Elaeis guineensis*) and Raphia palms (*Raphia hookeri*), and also floating macrophytes namely,

water moss (Salvinia nymphellula), duckweed (*Lemna pausicostata*) and water hyacinth

(*Eichorrnia crassipes*).

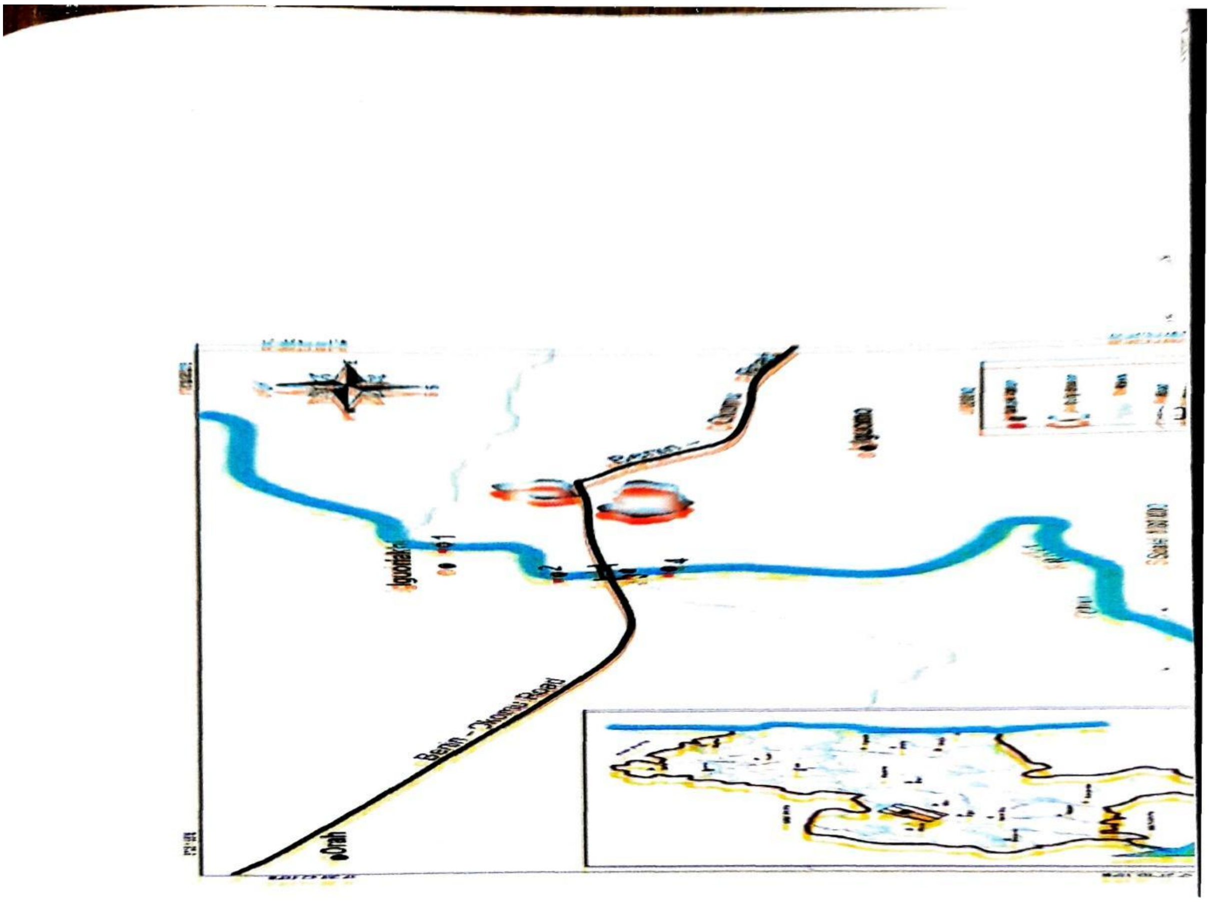


Figure 3.1: Map of Ovia River.

3.4 Human activities:

Ovia River serves as a source of water for frequent domestic purposes such as drinking, bathing and washing. Also, some land use practices such as deforestation, alteration of natural vegetation for forestry, livestock grazing, fishing, have the potential to influence freshwater ecosystem and biota (Collier and Quinn, 2003; Thompson and Townsend 2003; Allan 2004; Jones et al. 2011; Virbickas et al., 2011). They influence the fauna and flora of the environment and leads to increased nutrient content, increased sediment loads, even altered temperature of the water body.

3.5 Sampling station:

There were no sampling stations. Fishes were caught randomly along the stretch of the river.

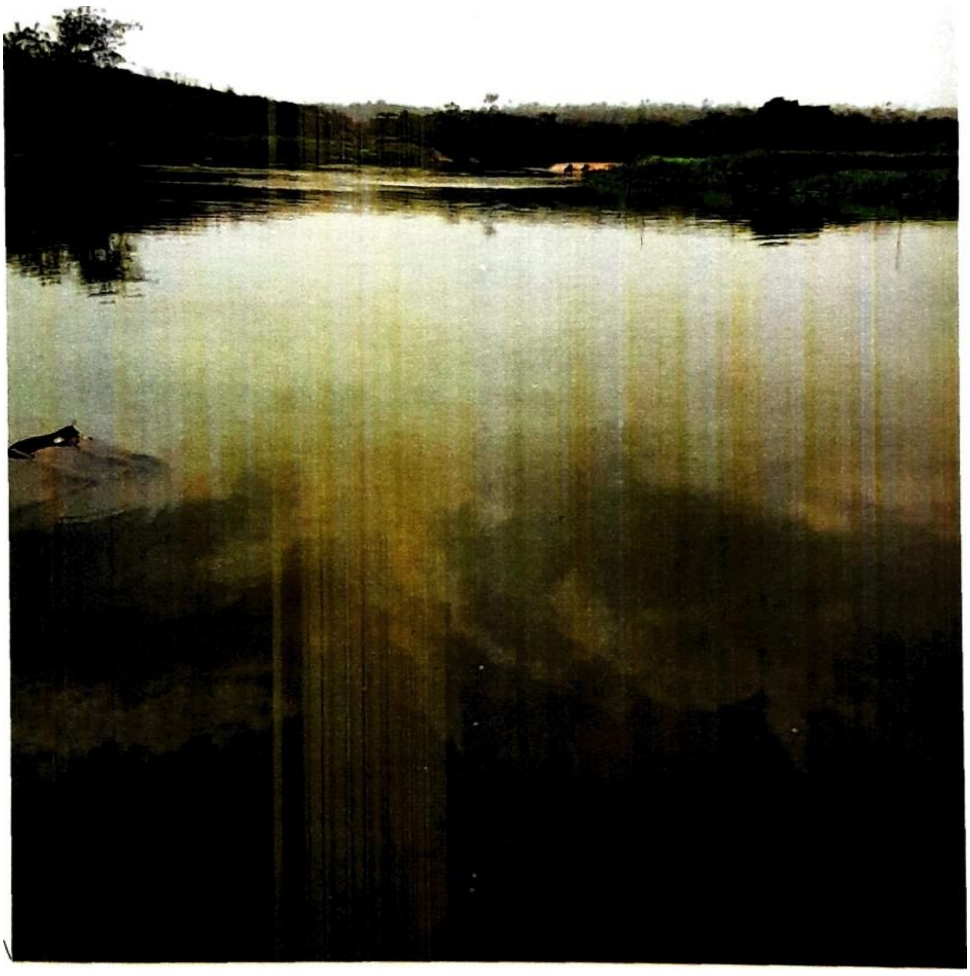


Plate 1: Section of Ovia River.

3.6 Fish collection

The fish samples were collected twice a month for a period of four months from January – April 2021. The fish samples were collected with the help of a local fisherwoman throughout the sampling period using a cast nets and hooks and lines. The fish samples were collected in a bucket, preserved with ice and transported to the University of Benin, Laboratory.

3.7 Fish identification

At the laboratory, the fish samples were identified to species level using the morphometric and meristic features as described by Idodo Umeh (2003).

3.8 Fish measurement

In the laboratory, measurement of total length (TL) standard length (SL), head length (HL) body depth (BD), and the intestinal length (IL) were taken using a meter rule to nearest 0.1cm. The weight of the fish was taken individually using a weighing balance to the nearest 0.1g.

3.8.1 Total Length (TL)

This was taken from the head to the end of the caudal fin.

3.8.2 Standard Length (SL)

This was measured from the head to the base of the caudal fin.

3.8.3 Head Length (HL)

This was taken from the tip of the nose o the posterior margin of the operculum of the fish.

3.8.4 Body Depth (BD)

This was taken from the point of insertion of dorsal fin to the ventral part t of the fish

3.8.5 Body Weight

This was taken using a weighing balance and recorded to the nearest 0.1g.

3.9 Sex Ratio

The chi-square () was used to verify the existence of significant differences between the sex ratio of the study species and commonly expected 1:1 sex ratio. This was taken by dissecting the fish 2nd searching for eggs. The fishes were dissected and a microscopic examination of the gonad was made. In adult female eggs were observed in the ovaries of the sample, while in adult males the testis were flattened and elongated, flattened and non-granular in appearance.

In immature samples the shape of the gonads were used to identify the sexes.

4.0 Proximate analysis

Proximate analysis is done to determine the moisture, protein, lipids, fibre, ash and carbohydrate content was carried out on fish sample. Samples were subjected to analysis dig the standard procedure method described by Association official Analytical Chemist (AOAC), 2000 The moisture, protein, fat and ash contents of the fishes were determined using loss in weight, micro-Kjedahl, dry-ashing and solvent extraction methods. The fishes were washed thoroughly with tap water and homogenised by taking only meat portions (filet) used in human consumption excluding the head and innards, Samples were then oven dried in an electric oven between 70’C 80'C until the sample has a constant waste, The dried samples were ground with mortar and pestle into fine powder and stored in labelled foil papers until required for analysis. The assessment of proximate composition of each sample was performed in triplicate and reported as mean proximate content. Proximate and mineral analyses. were carried out using the services of Owinna laboratory, Benin-city.

4.1 Moisture content determination

The fish samples recorded as W; were weighed before drying and the weights recorded. After drying in an oven at 105°c to obtain a constant weight. The dried sample W2 obtained is reweighed.

4.2 Fibre determination

The fibre content of a sample is the residue left when acidic and basic soluble nutrient- has been removed from the sample. The weight of the crucible was taken as W2. 2g of each sample was measured into the crucible and weighed as W2. 20ml of H;SO, was added to each sample and heated for 30 minutes. The hot solutions were quickly filtered through a filter paper. The

residues were thoroughly washed with hot water until acid free. Each residue was transferred into the round bottom flask and 20ml at 1.25% of NaOH was added to the residue and the mixtures were boiled again for 30 minutes and filtered quickly. Each insoluble residue was washed with distilled water until it was base free. They were placed in an oven and dried to a constant weight 100°C and cooled. The samples were then reweighed (W3).

4.3 Protein determination

Crude protein was obtained by using the Kjeldahl method where nitrogen gas obtained was used to multiply a constant of 6.25. To 0.2g of each sample, mL of H2SO4 was added and heated till a choking smell is perceived.

4.4 Lipid determination

Lipid was extracted using Soxhlet Extraction unit where petroleum ether was used as the solvent. to 5mg of sample in a conical flask. 10mL of N-Hexane was added. Cotton wool was used to cover the conical flask to prevent evaporation. The mixture was allowed to boil for 1 min and was filtered. The filtrate was boiled again to get the oil. The conical flask was weighed

empty initially and when the oil was got. The difference in weight is percentage of lipid.

4.5 Ash determination

Ash was by incineration of each sample using a muffle furnace at 550 -600°C until a white residue was obtained. The dry sample (W;) from fibre was crushed and oven dried at 350-500°C and left for an hour to turn to Ash.

4.6 Carbohydrate determination

Carbohydrate was obtained by subtracting earlier calculated parameters; moisture, fibre, ash, protein, lipid from 100.

5.0 Data Analysis

Analysis of variance (ANOVA) to determine whether the calculated regression lines were significantly different was used. Chi-square was also used to determine whether the calculated

sex ratios were significantly different.

5.1 Length-Weight Relationship

The relationship between the length (L) and the weight (W) of the fish species was expressed

$$W = aL^b$$

by the exponential equation (Pauly, 1983):

Through a logarithmic transformation, the equation becomes

Log W =log a + blog L

Where: W= weight of the fish in grammes and

L= standard length of fish in centimetre.

a= intercept of the Regression line

b= regression coefficient

The "a" and "b" values were obtained from a linear regression of the length and weight of fish.

5.2 Condition factor:

From the standard length and weight of each fish obtained, condition factor (k), was determined using the equation

K=100W

L^b

Where, W= weight of the fish in grammes and L= standard length of fish in centimetre.

The condition factor (K) is used to express fatness, well-being or plumpness of -fish and is based on the hypothesis thát a heavier fish of a given length is in better condition than the lighter fish of the same length.

$$K = \frac{W \times 100}{L^3}$$

Where K = the condition factor

W = weight of fish in grams

L=Total length of fish in cm.

5.3 Sex ratio:

The number of each sex was summed up every month and the ratio of males to females was calculated using the formula:

$$\text{Sex ratio} = \frac{\text{number of males}}{\text{number of females}}$$

5.4 Proximate analysis:

5.4.1 Moisture:

Moisture content is calculated by using the formula below:

$$\%\ \text{Moisture} = \frac{W1 - W2}{W1} \times 100$$

W1= Initial weight before drying and W2= Final weight after drying

5.4.2 Ash:

After taking the weight of the crucible and ash, it is then calculated using:

% Ash = Weight of fibre before Ashing (W2) x 100

Weight of Ash (W3)

5.4.3 Fibre:

After samples are reweighed fibre is calculated as;

% Fibre= W1- W2 X 100

W2-W3

5.4.4 Lipid:

Lipid is gotten using the formula below:

%Lipid=Weight of beaker and lipid - weight of beaker X 100

Weight of sample extracted

CHAPTER FOUR

4.0 RESULTS

A total number of nineteen (19) were collected during the sampling period (January 2021- April

2021).

SPECIMEN 1 (Mormyrus Rume)

KINGDOM - Animalia

PHYLUM - Chordata

CLASS- Actinopterygii

ORDER -Mormyriformes

Plate 2: *Mormyrus rume*

4,1 Morphometric Characteristics of *Mormyrus Rume* across the sampling duration from January to April 2021.

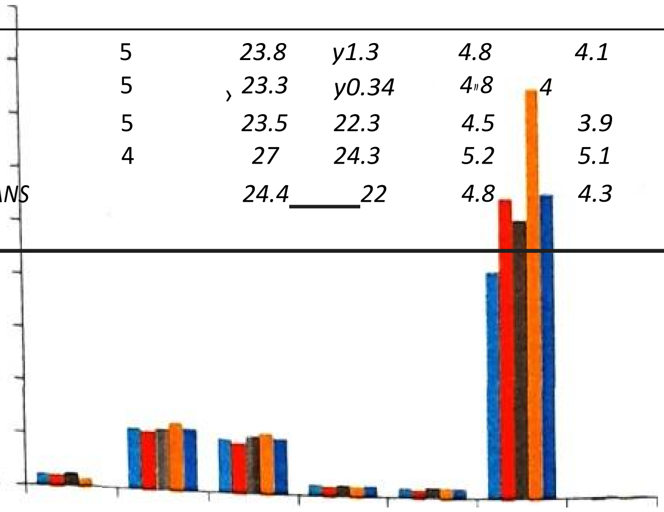
Table 4.l shows the value of specimen collected, sex, total length (TL), standard length (SL) head length (HL), body depth (BD), weight(W) and Fulton's condition factor (K) of *Mormyrus rume* across the sampling duration from January to April, while table 5 shows the means of the species' morphometric characteristics across the sampling period.

Across the sampling duration, a total of 19 specimens of *Mormyrus rume* were collected (Table 4.1; Fig 4.1). The lowest K-factor of 0.66was recorded in January, and a mean value of

1.23 across the entire specimens during the period. Mean TL and Wt was 24.4cmn and 119g respectively.

Table 4.1: Summary of Means of Morphometric Characteristics of *Mormyrus rume* From Jan-April.

MONTH	SPECIMENS	TL (cm)	SL (cm)	HL (cm)	BD (cm)	Weight(g)	K-FACTOR
JAN	5	23.8	y1.3	4.8	4.1	.88.9 '	0.66
FEB	5	› 23.3	y0.34	4»8	4	117«8	1
MARCH	5	23.5	22.3	4.5	3.9	108.6	0.81
APRIL	4	27	24.3	5.2	5.1	160	0.B
MEAn/ OF MEANS		24.4	22	4.8	4.3	119	0.82



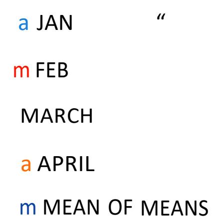


Fig 4.1: Bar chart showing Mean of Morphometric Characteristics of *Mormyrus rume* from January- April.

Appendix 1 shows the mean total length. weight and k-factor were 23.8cm, 88,9g and 0.66 respectively. Five (5) specimens were randomly caught in January, comprising 3 male and female *Mormyrus rume.*

Appendix 2 shows the mean total length, weight and k-factor was 23.2 cm, 117-5g and respectively. Similarly, five (5) specimens were also randomly caught in February, comprising

2 male and 3 female *Mormyrus rume*.

Appendix 3 shows the mnean total length, weight and k-factor was 23.5cm, 108g and 0.31

respectively. Similarly, five (5) specimens were also randomly caught in March, comprising 2

male and 3 female *Mornyrus rume*.

Appendix 4 shows the mean total length, weight and k-factor was 27cm, 160g and 0.8 respectively. Similarly, four (4) specimens were also randomly caught in April, comprising 1 male and 3 female *Mornmyrus rume*.

4.2 Length-Weight relationship of *Mormyrus rume*

The relationship between the length as the independent variable and weight as the dependent variable of the growth characteristics of *Mormyrus rume* recorded from January to April is indicated in the Table 4.2 and Fig 4.2 below.

From Fig 4.2, the exponential relationship between the log weight and log length for the specimens across the sampling duration is expressed' by the linear equation on logarithm transformed data:

LogW =-0.2804 + 1.6783 log L (n 19, a =-0.2804, b =1.6783, = 0.3351, r=0.5789); with a representing the intercept and B the slope of the relationship: r the coefficient of determination (the closer r is to 1, the nearer weight is regressed on length, ie better prediction
of linearity) while 'r' is spearman's correlation coefficient.

From the study, regression coefficient b<3 (b = 1.6783), indicating a negative allometric growth (fish become slimmer/ less weighty with increasing length). Both r and r were both distant from 1, indicating a poor linearity and regression of weight on length, and the regression coefficient P-value (p>0.05) obtained suggested that this species weight gain does not significantly regress on length as the fish grows longer.

TABLE 4.2: Length-Weight Relationship of *Mormyrus rume*

SPECIES	L-W RELATIONSHIP	a	B	R2	GROWTH .PATTERN	P-value	SIG.
Mormyrus rune	LogW =-0.2804 + 1.6783log	-0.2804	1.6783	0.3351	-ve ALILOMETRY	P>0.05	Not Sig. Different

4.3 K-Factor of *Mormyrus rume*

The Fulton's K-factors recorded for the 19 Specimens sampled between Jan and April 202 presented in table 4.3 below. From the table. the lowest' mean monthly K-factor (0.60) was recorded in January and the highest (1.0) in February respectively. The mean K-factors across the sampling period are all close to 1.0 to the nearest whole number, indicating a healthy fish population and good growth conditions across the duration. The mean differences were further

compared using Single Factor ANOVA to test for significant differences. There was no significant difference (P = 0.12) in k-factor of the specimens sampled across the duration of the study (P>0.05).

TABLE 4.3: Summary of K-factor of *Mormyus rume* across the sampling duration.

	MONTH		
JAN	FEB	MAR	APRIL
0.65104167	1.S08974	1.033058	0.g47596
0.62720975	0.30300	0.88434	0.896
0.6575	1.187777	0.598033	0.59S632
0.628829	1.2821S7	0.787485	0.910332
0.69561021	0!904225’	0.7S	
SPECIMENS 5	5	5	4
MEAN 0.66	1	0.81	0.8

4.4 Sex Ratio of *Mormyrus rume*

Table 4.4and Fig. 2 below represents the summary of sex ratios of *Mormyrus rume* collected across the sampling duration. From the table, 9 male and 10 female specimens were randomly

sampled. Mean sex ratio was 1:1.1 indicating a higher number of Females in the *Mormyrus rume* population during the sampling duration, with highest value in January (1:1.5) and equal
value in March (1:1.5).

Table 4.4: Sex ratio of *Mormyus rume*

MONTH	MALE	FEMALE	SEX RATIO	
JAN	3	2	1:1.5	
FEB	2	3	1:0.7	
MARCH	3	2	1:1.5	•
APRIL	1	3	1:0.3	•
TOTAL	*9*	*10*	4:4	
MEAN			1:1.1	

4.5 Proximate composition of Mornyrus rume

The summary of the proximate analysis of *M. rume* across the four months sampling ue is represented in table 4.5 and Fig 4.4 below, From Table 4.5., the mean nutrient compos was 61.1%, 5.0%, 0.95%, 1.8% and 22.95% for moisture. lipid, ash, protein and carbohydrate respectively, with moisture having the highest value, accompanied by carbohydrate. Single factor ANOVA of the nutrient composition suggests there is no significant difference (P >0.05) in the means of nutrient composition of *M. rume* sampled across the study duration.

Table 4.5: Proximate Composition of *Mormyrus rume*

NUTRIENTS	*REPLICATE 1*	*REPLICATE 2*	*REPLICATE 3*		*REPLICATE 4*	*MEAN*
MOISTURE	60.43	61	62		60.95	61.1
LIPID	5.8	4.4	4		5.7	, 5
ASH	0.98	Q.92	0.89	•	0.96	g.95
PROTEIN	1.87	1.7S	1.9		1.68	1.8
CARBOHYDRATE	22	22.8	22	.	23	22.9S

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CHAPTER FIVE

5.0 DISCUSSION

5.1 Morphometric characteristics Of *Mormvrus rume* In Ovia River

19 specimens comprising a single selected fish species, were caught from Ovia River, Southern Nigeria. The studied fish. species corresponds to catches from local fishermen fishing in the Ovia River. Artisanal fishing in the region represents a primary economic activity for coastal communities. The collected species are valued table fsh with high commercial value in this area and constitutes a significant fishery resource along the coastal area of the Owan river community. In fact, local fishermen have been using fishing cages that favor fish species within these size ranges. Consequently, LWRs reported in the current study for these fish species should be applied within the observed length ranges.

The occurrence of *Momyrus rume* (Table 4.1) was low (19 catches). Probably, feeding habit and seasonality may have also contributed to their occurrence as at the time of this study. This may also be attributed to food availability, seasonality and changes in fishes regime (Ibrahim *et. al.*. 2009).

5.2 K-factor of *Momyrus rume* in Ovia River

In fisheries science, the condition factor is used in order to compare the condition, fatness or wellbeing of fish (Ahmed et al., 2011), It is based on the hypothesis that heavier fish of a particular length are in a better physiological condition (Bagenal and Tesch, 1978). Condition factor is also a useful index for monitoring of feeding intensity, age and growth rates in fish

(Ndimele *et al.,* 2010). It is strongly influence by both biotic and a biotic environmental conditions and can be used as an index to assess the status of the aquatic ecosystem in which fish live (Anene, 2005).

The condition factors (K) of the species in the present study was similar to what was obtained in other tropical water bodies. For example, in Nigeria, a range of between 0.3 - 1.48 was recorded by Nwadiaro and Okorie (1985) in Oguta Lake. Also, Kumolu-Johnson and Ndimele (2011) obtained a K-value of between 0.91 and 8.46 from Ologe Lagoon in Lagos. But Ibrahim et al. (2012) recorded a mean K-value of 1.98 + 0.35 in Kontagora Reservoir in Niger State. While in Sudan Ahmed et al., (20 11) recorded a K-value range of 0.5 1 and 3.42. The mean K-values of both species sampled in this study had thier values greater than I which was an indication that the fish species were doing well in the Ovja river even though is less than the 2.9 to 4.8 reported by Bagenal and Tesch (1978) for mature fresh water fish fresh body weight which was attributed to variation in weight of individual fish sampled.

In this study, both species studies had a negative allometric growth with poor linearity of weight on length (Table 4.1, Fig 4.1): This is an indication that changes in the fish weight are relatively slow as length changes, they tend towards becoming less fattened as their length increases. This is similar to the observations of Ude et al. (2011) and Ibrahim et al., (2009).

5.3 Sex ratio

Sex is an important factor to consider because some species vary in size, weight and length according to their sex (Mouine et al. 2007). Table 4.4 showed that males were lower in number than females among the 19 specimens caught during the study period. Another factor that might influence LWRs is the maturity stage of the analyzed fish. Included in this study were both mature and immature individuals.

5.4 Proximate composition of *Mormyrus rume*

The nutrient contents of the fish species are shown in Table 4.5 and Fig 4.4. Like other fish species, the moisture and carbohydrate content were higher in *Mormyrus rume* than protein, lipid and ash. The ecological nature of the fish habitat; including the geographical locality of catch and types of food presence could be a factor in explaining the higher carbohydrate and protein content after moisture recorded in the for the fish species. The lipid contents recorded in the present study is within the range of low-fat category of Abdullahi et al., (200 1). It could be inferred from the higher percentage of protein and lipid in the tissues of the fish species that the water body from which the fishes were collected is rich in these nutrient elements.

5.5 CONCLUSION

Mormyrus rume from this river can be categorized as a fish of commercial value and good source of carbohydrate and protein food for human consumption.

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