MINERAL ANALYSIS OF *Clarias Gariepinus* MUSCLE FROM NATURAL AND ARTIFICIAL HABITAT

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BY

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CERTIFICATION

We certified that this project was carried out by OLANREWAJU OLUWASEUN. M. under the supervision in the Department of Science Laboratory Technology, Abraham Adesanya Polytechnic Ijebu – Igbo, Ogun – State.

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DEDICATION

This project is dedicated to God Almighty, the author and finisher of all things.

It is also dedicated to my loving parents CHIEF M.O. and L.O OLARENWAJU (MRS).

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Despite the odds, and thorns that came my way God's promise still manifested. "A thousand of miles start with a single step". Here, the first schedule ends, Glory be to God. It is expendient on my part to give glory, honour and adoration to Almighty God for his care, protection and provision throughout the duration of my studies.

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ABSTRACT

Mineral analysis was carried out on *clarias gariepinus* from natural and artificial habitat. The result showed that the natural clarias gariepinus contain Cu (1.245 ± 0.01g/kg), Mg (1.50 + 0.03Mg/kg) Fe (0.90 ± 0.00Mg/Kg) and Mn (0.029 ± 0.00mg/kg) Co was not detected in natural *clarias gariepinus* Zn (0.049 ± 0.00mg/kg) Pb (0.17 ± 0.02mg/kg). While artificial clarias gariepinus contain Cu (3.76 + 0.01mg/kg) Mg (2.49 ± 0.01mg/kg) Ca (31.75 ± 0.03mg/kg), Na (38.23 ± 0.02mg/kg), K (41.41 ± 0.01 mg/kg), Fe (2.77 ± 0.01mg/kg) and Zn (0.45 ± 0.01mg/kg) Co was not detected in artificial *clarias gariepinus*.

Generally the result obtained showed that artificial clarias gariepinus has higher nutritional values than natural clarias gariepinus which makes it more beneficial for bone formation, body and blood building.

CHAPTER ONE

1.0 INTRODUCTION

Catfish has the scientific name Clarias gariepinus. It is related to the Sucker and the minnow, and like them has a complex set of bones forming a sensitive hearing apparatus. Clarias gariepinus are named for the barbels (whiskers) around their mouths and have scaleless skins, fleshy, rayless posterior fins, and sharp defensive spines in the shoulder and dorsal fins. They are able to use the swim bladder to produce sounds.

Some species, such as the stone and tadpole claria gariepinus and the madtom, can inflict stings by means of poison glands in the pectoral spines. Clarias gariepinus are usually dull-coloured, though the madloms of E North American streams are brightly patterned. Members of most madtom species are no more than 5m (12.7cm) long; some are less than 2in (5cm) long. Danube clarias gariepinus called wells, or sheatfish, reach a length of 13ft (4m) and a weight of 4001b (180kg), while the Mekong giant clarias gariepinus can reach 10ft (3m) and 5501b (250kg). Clarias gariepinus are omnivorous feeders and are valuable scavengers.

Clarias ganepinus are of considerable commercial importance; many of the larger species are farmed or fished for food. Many of the smaller species, particularly the genus corydoras are important in the aquarium hobby. The majority of clarias gariepinus in today's market are farmed, the channel clarias gariepinus weighing from 1-10 pounds, is considered the best eating. The bull head is smaller and usually weight no more than a pound. Clarias gariepinus have a tough, inedible skin that must be removed before cooking. The flesh is firm, low in fat and mud in flavour. Clarias gariepinus can be fried, poached, steamed, baked or grilled. They are also well suited to soups and stews.

1.1 Types of Claria Gariepinus

African species include the electric claria gariepinus and the nile claria gariepinus which swims upside down to feed at the water's surface and has a white back and a dark belly, the reverse of the normal coloration.

Of the 30 American species the largest and most important is blue, or Mississipi, clarias gariepinus, an excellent food fish weighing up to 1501b (70kg). Best known is the smaller channel clarias gariepinus which reaches 201b (9kg) and was a deeper forked tail and slender body. The stonecat, 10in (25.4cm) long, is found in clear water under logs and stones. The bull heads, or horned pouts, are clarias gariepinus of muddy ponds and streams, feed up on bottom plants and animals. Bullhead have square or slightly rounded tails and may reach 1ft (30cm) in length and 21b (0.9kg) in weight. The black, yellow and brown bullhead species are common in water of the central and eastern states.

1.2 Classification

Clarias gariepinus are classified in the phylum CHORDATA, subphylum vertebrata, class ostelchthyes, order cyriniformes, suborder nematognathe.

1.3 Taxonomy

The clarias gariepinus are a monophyleftic group. This is supported by molecular evidence.

Clarias gariepinus belong to a super-order called the OSTARIOPHYSI, which also include the CYPRINIFORMS, CHARACIFORMES, GENORYNCHIFORM'S and GYMOTIFORMS a super-order characterized by the WEBERIAN APPARATUS. Some places Gymotiformes as a sub-order of siluriforms, however this is not as widely accepted.

Currently, the siluriformes are said to be the sister group of the Gymoriformes, though this has been debated due to more recent molecular evidence.

According to morphological data, diplomystidae is usually considered to be the most primitive of clarias gariepinus and the sister group to the remaining clarias gariepinus, grouped in a CLADE called SILUROIDEI. Recent molecular evidence contrasts the prevailing hypothesis, where the suborder bricarioidic are the sister group to all clarias gariepinus including diplomystidac (diplomystoidie) and siluwidei.

1.4 Distribution and Habitat

Extant clarias gariepinus species live in inland or coastal waters of every continent except Antarctica. Claria gariepinus have inhabited all continents at one time or another. Clarias gariepinus are most diverse in tropical south, American African and Ashia. More than half of all clarias gariepinus species live in the Americans, they are the only ostariophysans that have entered fresh water habitats in Australia, madagas car, new guinea.

They are found primarily in fresh water environment of all kinds though most inhabit shallow, running water habitats. Representative of at least eight families are hypogen (live underground) with three families that are also hoglobitic (inhabiting caves). Numerous species from the families ARIIDAE and PHOTOSIDAE, and a few species from amount the ASPREDINIDAE and BAGRIDAE, are also found in marine environment.

1.5 Physical Characteristics

1.5.1 External Anatomy

- Most c clarias gariepinus are adapted for a benthic lifestyle.

In generally, they are negatively buoyant, which means that they will usually sink rather then float due to a reduced gas bladder and a heavy, bony head. Clarias gariepinus have a variety of body shapes, though most have a cylindrical body which a flattened ventrum to allow for benthic feeding.

Most have a mouth that can expand to a large size and contains no incisiform teeth; clarias gariepinus generally fed through suction or gulping rather than biting and culting prey.

Clarias gariepinus may have up to four pairs of barbels: nasal, maxillary (on each side of mouth), and two pairs of chin barbels, although pairs of barbels may be absent depending on the species because the barbels are more important detecting food. The eyes of a catfish are generally small.

Clarias gariepinus has no scale, their body are often naked. In some species, the mucus-covered skin is used in cutaneous respiration, where the fish breath through the skin.

1.5.2 Size

Clarias gariepinus have one of the greatest range in size within a single order of bony fish. Many clarias gariepinus have a maximum length of under 12cm. Some of the smallest species of ASIPREDINIDAE and TRICHOMYCTERIDAE reach sexual maturity at only 1 centimetre (0.39in).

1.5.3 Internal Anatomy

In many clarias gariepinus, the humeral process is a bony process extending backward from the pectoral girdle immediately above the base of the pectoral fin. It lies beneath the skin where its outline may be determined by dissecting the skin or probing with a needle.

The retina of clarias gariepinus, are composed of single cones and large rods. Many clarias gariepinus have a tapetum lucidum which may help enhance photon capture and increase low-light sensitivity.

The anatomical organization of the testis in clarias gariepinus is variable among the families of clarias gariepinus, but the majority of them present fringed tejhs: Ictaluidae, claridae, doradidae, auchenipteridae, pimelodidae and pseudopimelodidae.

Spermatocytes are formed from cytoplasmic extensions of sertoli cells; the release of spermatozoa is allowed by breaking of the cyst walls.

Fish ovarys are of two types: gymnovarian or cystovarian in the first type, the oxyte are released directly into the codomic cavity and then eliminated. In the second type, the oxytes are conveyed to the extensor through the oviduct.

1.6 Clarias Gariepinus as Food

Clarias gariepinus have been widely caught and farmed for food for hundreds of years in Africa, Asia, Europe, and North America, judgements as to the quality and flavour vary, with some food critics considering clarias gariepinus as the excellent food. In the southern united states clarias gariepinus is an extremely popular food. Farm- raised clarias gariepinus became such a staple of the diet of the united states that's on June 25, 1987, President Ronald Reagan established National clarias gariepinus day to recognize "the value of farm-raised clarias gariepinus.

In Malaysia clarias gariepinus called "Ikan kele" is fried with species and is often eaten with steamed rice. Clarias gariepinus is high in vitamin D. Farm-raised clarias gariepinus contains low level of Omega-3 fatty acids and a much higher proportion of Omega-6 fatty acid.

1.7 Aquaculture

Clarias gariepinus are easy to farm in warm climate 5, leading to inexpensive and safe food at local groceis. Channel clarias gariepinus (ictalurus punctatus) supports a $450 miilion 1yr aquaculture industry. In central Louisiana, morgan w. walker, Jr, an Alexandria business man, in 1970 converted a 1,100-acrecattle ranch into clarias gariepinus pond to raise fish on a mass scale for sale and consumption.

Clarias gariepinus raised in inland tanks and channels are considered safe for the environment, since their waste and disease should be contained and not spread to the wild.

In Asia, many claria gariepinus species are important as food.

Several walking clarias gariepinus (clarudae) and shark clarias gariepinus (pangasudae) species are heavily culture in Africa and Asia.

1.8 Clarias Gariepinus as Invasive Species

Walking clarias gariepinus is an invasive species in Florida. However the European stock of American clarias gariepinus has not achieved the dimension of these fished in their native water, and have only increased the ecological florida, with the voracious clarias gariepinus becoming a major alien pest there.

1.8.1 Dangers to Humans

While the vast majority of clarias gariepinus are harmless to humans, a handful of species are known to present some risk. Perhaps the most notorious of these is the candiru, due to the way it is reputed to parasitise the uretha, though there is only one well-documented case of a candiru attack on a human. The well clarias gariepinus has also been reputed to kill humans (especially young children). In addition, other species are reputed to be dangerous to human as well, but with less definitive evidence.

1.8.2 Clarias Gariepinus Breeding Characteristics

Clarias gariepinus are generally produced by allowing brooder clarias gariepinus to spawn in shallow open ponds, then collecting the egg masses and incubating them in indoor hatcheries or in (deep) outdoors ponds.

Pond for clarias gariepinus production generally run from 2 to 10 acres. Standard (well managed) pond production of clarias gariepinus is 25,000 – 40,000 1blacre. (11 to 18kg/acre).

Channel clarias gariepinus ictalurus punctatus (Rafinesque), is the most important species of aquatic animal commercially cultured in the would and particularly in the united states. It belongs to the family ictaluridar, order siluriforms. Member of the order siluriformes are found in fresh water and salted water world wide.

In North America, there is a thriving clarias gariepinus industry that relies on 6 of the 39 species available: the blue claria- gariepinus , ictalunis furcatus (lesueur); the white clarias gariepinus, ictalunis catus (Linnaeus); the black bull head, ictalunis nebuloses (lesuer); the yellow bull head, ictalurus natalis (lesueur); and the flat head clarias gariepinus pylodichs ohvaris (Rafinesque).

In natural waters channel clarias gariepinus live in moderate to swiftly flowing streams, but they are also abundant in large reservoirs, lake, pond and some sluggish streams. They are usually found where boltoms are sand, gravel or rubble, in preference to mud boltoms. Channel clarias gariepinus are fresh water fish but they can thrive in brackish water. Channel clarias gariepinus generally prefer clear water streams, but are common and do well in muddy water-particularly in Africa.

1.9 Mode of Feeding

Feeding can occur during day or night, and they eat a wide variety of both plant and animal material, channal clarias gariepinus usually feed near the boltom in natural waters but will take some food from the surface.

Based on stomach analysis, young clarias gariepinus feed primarily on aquatic insects, adult have a much varied diet which includes insects, snails, crawfish, green algae, aquatic plants, seeds and small fish. When available they will feed avidly on terrestrial insect, and there are even records of birds being eaten.

Channal clarias gariepinus grow best in warm water with optimum occurring at temp of about 85^0f (29.4°c). With each 18°f (10°c) change in temp there is a doubling or having of their metabolic rate. This means that within limits, their appetite increases with increasing water temperature or decreases with water temperatures.

The size and age that channel clarias gariepinus reach in natural water depends on many factors.

Age and growth studies have shown that in many natural waters channel clarias gariepinus do not reach 1 pound in size until they are 2 – 4 years old.

Bagrus bajad, (common name Black Nile Clarias Gariepinus, common name) Types: forskals clarias gariepinus, lam, silver clarias gariepinus commonly found in lakes, swaps and rivers, they avoid salt water spend nearly the whole of the day light hours in crevices of rock and is therefore seldom seen.

Mode of Feeding

They live and feeds on or near the bottom. Adult exclusively piscivorus. Preys on small fish, particularly Alestes spp, or chrysichthys auratus as in lake kainji, also feeds on insect, crustacean, mollusks, vegetable matter.

Efficiency of catching prey clarias gariepinus is maximized by face to face attack, avoiding damage by dorsal and pectoral spine of the pray. There is an indication that the species comes to shallow water to breed. Spawing season extends from April to July. Their parent build and guard the nest, which is like a flat disc with a central hole where the egg are dropped. The size of the nest and the central hole depends on the fish size. Males become up to 7 years old, female 8years. The main size and weight of male are less than those of female from the same age. It is an important food fish, the flesh is good eating and of economic importance. It is commonly sold as food.

Habitat

Biome: fresh water, Demersal

Ecology

Occurs in water less than 12m deep, prey on small fish but also on insects, crustaces, molluses, vegetable malter and dercitus. Breeding Ecology unknown.

List of Habitat: 5.1 wetland (inland) – permanent rivers/ streams/ creeks (includes waterfalls) 5.5 wetlands (inland) permanent fresh water lakes (over sha).

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Chemical Composition

Principal Constituent: The chemical composition of fish varies greatly from one species and one individual to another dependent on age, sex, environment and season.

The principal constituent of fish and mammals may be divided into the same categories, and examples of the variation between the constituents in fish are showned below. The composition of beef muscle has been included for comparison.

Table 2.1: Principal constituent (percentage) of fish and beef muscle.

Constituent	Fish (fillet)			Beef (isolated muscle)
	Min.	Normal variation	Max.	
Protein	6	16-21	28	20
Lipid	0.1	0.2 – 25	67	3
Carbohydrate		< 0.5		1
Ash	0.4	1.2 – 1.5	105	1
Water	28	66.81	96	75

As you can seen from the table above, a substantial normal variation is observed for the constituent of fish muscle. The minimum values are rather extreme and encountered more rarely.

The variation in the chemical composition of fish is closely related to feed intake, migratory swimming and sexual changes in connection with spawing.

During periods of heavy feeding, at least the protein content of the muscle tissue will increase to an extent depending upon how much it has been depleted, e.g. in relation to spawning migration. Then the lipid content will show a marked and rapid increase.

Some tropical fish also show a marked seasonal variation in chemical composition. West African shad (Ethmalosa dorsalis) shows a range in fat content of 2 – 7% (wet weight) over the year with a maximum in July (walts, 1957). Coruma Brazilian coast had a fat content range of 0.2-87% and 0.1 – 54% respectively. It has been observed that oil content of these species varies with size, lager fish containing about 1% more oil than smaller ones.

Whether a fish is lean or fatty the actual fat content has consequences for the technological characteristics postmortem. The changes taking place in fresh lean fish may be predicted from knowledge of biochemical reaction in the protein fraction, whereas in fatty species changes in the lipid fraction have to be included the variation in water lipid and protein contents in various species are shown below.

Table 2.2: Chemical composition of the fillets of various fish species

Species	Scientific name	water%	Lipid%	Protein%	Energy value (kg/100g)
Blue whiting a)	Micromesistius Poutassou	79-80	1.3-3.0	13.8 – 15.9	314 - 388
Cod a)	Gadus Morphua	78.83	0.1 – 0.9	15.0 – 19.0	295 - 332
Eel a)	Anguilla anguilla	60.71	8.0 – 31.0	14.4	
Heiring a)	Clupea harengus	60 – 80	0.4 – 22.0	16.0 – 19.0	
Plaice a)	pleuwneetes platessa	81	1.1 – 3.6	15.7 – 17.8	332 – 452
Salmon a)	Salmosalar	67.77	0.3 – 14.0	21. 5	
Trout a)	Salmo trutta	70.79	1.2 – 10.8	18.8 – 19.1	
Tuna a)	Thunnus spp	71	4.1	25.2	581
Norway Lobster a)	Hephrops Morvejicus	77	0.6 – 2.0	19.5	369
Pejeirey b)	Basilichthys Bornariensis	80	0.7 – 3.6	17.3 – 17.9	
Carp b)	Cyprinus carpio	81.6	2.1	16.6	
Sabalo c)	Prochilodus Platensis	67.0	4.3	73.4	
Pacu c)	Colossoma Macropomum	67.1	18.0	14.1	
Tambaqui c)	Colossama Brachypomum	69.3	15.6	15.8	
Chincuina c)	Pseudoplatysloma Rigrinum	70.8	8.9	15.8	

(Murray and Burt, 1969)

2.1.1 Carbohydrate

The carbohydrate content in fish is very low, usually below 0.5%. this is typical for striated muscle, where carbohydrate occurs in glycogen and as part of the chemical constituent of nucleotides.

2.1.2 Lipids

The lipids present in teleost fish species may be divided into two major groups: the phospholipids and the triglycerides. The phospholipids make up the integral structure of the unit membrane in the cells; thus they are often called structural lipid. The triglycerides are lipids used for storage of energy in fat depots, usually within special fat cells surrounded by a phospholipids membrane and a rather weak collagen network. The triglycerides are often termed depot fat. A few fish have wax esters as part of their depot fats. In addition to phospholipids the membrane also contain cholesterol.

2.1.3 Protein

The protein in fish muscle tissue can be divided into the following three groups.

1. Structural Protein (action, myosin, tropormyosin and actomyosm), which constitute 70 – 80% of the total protein content (compared with 40% in mammals). These protein are

soluble in neutral salt solution of fairly high conic strength (^{3}0.5m).

2. Sarcoplasmic Proteins (myoalbumim, globulen and Enzymes) which are soluble in neutral salt solution of low ionic strength (<0.15m). this fraction constitutes 25- 30% of the protein.
3. Connective tissue proteins (collagen) which constitute approximately 3% of the – protein in teleostei and about 10% in elasmobranchil (compared with 17% in mammals). Fish protein contain all the essential amino acid and, like milk, eggs and mammalian mat protein, have a very high biological value.

2.1.4 Vitamins and Minerals

The amount of vitamins and minerals is species specific and can furthermore vary with season. In generally, fish meat is a good source of the B vitamins and, in the case of fatty specific also of the A and D vitamius.

As for minerals, fish meat is regarded as a valuable source of calcium and phosphorus in particular nut also of iron, copper and selenium. Salt water fish have a high content of iodines. In the table below some of the vitamins and minerals content are listed.

Table 2.3: **Vitamin Content of Some Fish Muscles**

Fish	A(1µ1g)	D(1µ1g)	B_1 (thiamine) (µ1g)	B2 (riboflavin) (µ1g)	Niacin (µ1g)	Panthothenic acid (µ1g)	B6 (µ1g)
Cod fillet	0 – 50	0	0.7	0.8	2.0	1.7	1.7
Herring fillet	20 – 400	300-1000	0.4	3.0	40	10	45
Cod-liver oil	200–10.000	20 – 300	-	3.4	1) 15	1) 4.3	-

1) Whole lever

(Murray and Burt, 1969)

2.2 Classification of Element

2.2.1 ESSENTIAL NUTRITIVE ELEMENT=> They are minerals that are very essential for the metabolic process darken place in the body, they may be warmful in taking an excess amounts. The examples includes Na, k, ca, fe, cu, mg and Zn.

2.2.2 NON-NUTRITIVE, NON TOXIC MINERALS:- They have no harmful effect except when present in an amount exceeding 100ppm. Examples of these are Ti, cr, N, B and S

2.2.3 NON-NUTRITIVE TOXIC MINERALS:- They have deletrious effect even though the diet contains less than 100pp. Sb, cd, pb and hg are the examples.

2.3 Essential Nutritive Minerals

These minerals are very essential for the body metabolic process. In organic matter remains usually represent mineral elements after the destruction of organic matter present in a plant or animal tissue.

2.3.1 Sodium

Sodium maintains osmotic pressure of the body fluid which protects the body from excessive fluid loss, it involves in the contraction of muscles cells. It regulate the acid-base balance in the body fluid. The weight present in the body is about 1.8g and the deficiency of sodium in the body are heart, fatique and muscular weakness. Sodium is know as the chief cation in the extra-cellular fluid.

2.3.2 Magnesium

Magnesium is a component of chlorophyll and is absolutely essential for plant to synthesize carbohydrate. It also very important in human body especially in the formation of bone and teeth. It has many essential biological function in plant and animals. The deficiency is an important complication in kwashiorkor.

In alcohols, hypomagnesemia occurs. These seems to be a relationship between the level of senem, magnesium and occurrence of tremor and convulsion in infants and children. Because magnesium occurs widely in foods most particularly in vegetable origin.

The deficiency in magnesium are rare. Processing of food leads to loss of magnesium, Animal product which include meat and milk are poor in magnesium (Shakuntala 1987).

2.3.3 Potassium

Potassium influences osmotic pressure and contributes to the normal pit equilibrium of the body. It has properties similar to sodium and is the principal cation in the intracellular fluid. The human body contains approximately 2.6g of potassium per kilogram of free fat body weight it is nearly constant component in lean body tissue. Therefore, when there is growth and development of lean tissue, an adequate supply of potassium is essential. Whenever muscle is broken down, potassium is lost (shakuntala 1987). The deficiency of potassium are metal, apathy, muscular weakness, which can be associated with attacks of paralysis lasting for 24hours or more. Most common food naturally contain moderate amounts of potassium (Olufofe et al 1992)

2.3.4 Copper

Copper is an essential element for some lower animal species and for all vertebrates, it is usually present in combination with a plasma protein ceroloplasma, which is the transport form of copper. In animal, copper deficiency leads to variety of abnormalities including anaenta, defect in pigmentation, skeletal defects and structure of hair rejoroduct failure (shakuntala 1987) in anaemia, the deficiency of copper results due to the improper mobilization of iron from iron storage sites.

2.3.5 Calcium

The most abundant mineral in the body is calcium most of the body's calcium is in the hand structure of bone and teeth and the body of an adult normally contain about 1200g of calcium. The crystalline form of calcium gives rigidly and hardness to these tissue and also ensures the integrity and permeability of cell membrane to regulate nerve and muscle. Excitability to maintain normal muscular contraction and to assure cordial rhythmicity. Calcium also plays an important role in several of the enzymatic steps involved in blood congulation (FAD, 1968).

The deficiency of calcium in Adult may result in ostemalacia and the deficiency in children leads to rickets. Sometimes, there is a gradual demineralization of bony tissues, thus disease is characterized by forosily thinness and fragility of the bones, known as Osteoporosis, this is due to decrease calcium absorption with age (Shakutala 1987).

2.3.6 Iron

Iron is a component of haemoglobin which plays an important roles in the transport of oxygen from the lungs to the tissue and of carbondioxide from the cell to the lungs. In the conversion of B- carstene to vitamin A, icon also plays a role on it. Iron deficiency result first in the reduction of stored iron and a reduction in haemoglobin concentration and size occurs after it is depleted. The rich source of iron is organ meat such as kidney, heart and liver.

2.3.7 Zinc

Zinc is a constituent of the enzymes involve in most major metabolic path ways and also essential for plant animal and man. Large amount of zinc are stored in bone enzymes containing zinc are involved in nucleic acid synthesis and degradation.

Zinc deficiency in man are loss of appetite, fallen to grow, impaired regeneration of wounds and decrease taste activity (Shalantala 1987), dehydration, electrolytic in balance, stomach pain are the symptoms of zinc (Engel, 1993).

2.3.8 Manganese

Manganese increases the continent of sugar, it is building with protein and promotes the efflux of sugar, it intensified respiration.

It belongs to the metal, characterized by high redox potential and becomes easily, it involves in biological oxidation reaction.

CHAPTER THREE

3.0 MATERIAL AND METHODOLOGY

3.1 Material

Clarias gariepinus was got from Osun river and pond in Ijebu-Igbo, Ogun State. The fishes cut and washed, they were kept in a refrigerator before the analysis.

3.2 Methodology

1grm of clarias gariepinus muscle from both natural and artificial habitat were weighed and then transferred into a digestion flask, the wet digestion was carried out with concentrated nitric acid for several hours until a clear solution was obtained.

The clear solution was transferred into 100ml standard flask and made up to mark with distilled water. Atomic absorption spectrophotometer was used for the analysis of the following metals. Cu, Co, Mn, Zn, Pb, Fe, Na, Ca, Mg, K.

The standard for each metal using suitable salt of each metal was prepared. The instrument was switched on and lamp for each metal was fixed. All the metals analysed for, used hollow cathode lamps and air acetylene flame. The standard for each metal was aspirated into the flame as well as the samples. Their respective concentrations in mg/kg were read for each sample.

CHAPTER FOUR

4.0 RESULT AND DISCUSSION

4.1 Result

Table 4.1: Result of Mineral Analysis (mg/kg) of Clarias gariepinus muscle from a natural and artificial habitat

Mineral Composition	*clarias gariepinus* from Natural habitat Mean ± S.D	*clarias gariepinus* from Artificial habitat Mean ± S.D
Ca	8.61 ± 0.01	31.75 ± 0.03
Mg	1.50 ± 0.03	2.49 ± 0.01
Na	27.65 ± 0.01	38.23 ± 0.02
K	18.50 ± 0.02	41.41 ± 0.01
Fe	0.90 ± 0.00	2.77 ± 0.01
Zn	0.049 ± 0.00	0.45 ± 0.01
Pb	0.17 ± 0.02	0.06 ± 0.01
Co	ND	ND
Cu	1.245 ± 0.01	3.76 ± 0.01
Mn	0.029 ± 0.00	2.49 ± 0.01

ND => Not Detected

4.2 DISCUSSION

Result obtained for mineral analysis of river and pond clarias gariepinus is shown in table 4.1, From the table value obtained for sodium in river and pond clarias gariepinus are (27.65mg/kg and 38.23mg/kg) respectively but these value are lower than (53.1mg/kg) obtained in Tilapia fish by (Jayasunriya 1996). Manganese content of pond clarias gariepinus (2.49mg/kg) is lower than (0.029mg/kg) obtained for river clarias gariepinus. However, these value are lower than (16.744mg/kg) obtained for manganese in Egeria Paradoxa by (Biney et.al 2005).

Mean while, potassium content in river and pond clarias gariepinus are (18.50mg/kg and 41.41mg/kg) which are lower compared to (222.9mg/kg) reported for potassium concentration in stinging fish by (Sri Lanka 1996). But copper content in river is (1.245mg/kg) which is slightly lower than (3.76mg/kg) obtained for pond clarias gariepinus. These values obtained from copper content in river and pond clarias gariepinus are slightly higher than (0.87mg/kg) obtained from parapenaeopis atlantica (Tay et.al 2005). Furthermore zinc content in river (0.049mg/kg) is lower than (0.45mg/kg) obtained in pond clarias gariepinus. However, these values are lower than (1.05mg/kg) obtained for zinc in Trachinotus Ovatus by (Ruby Asmah 2005).

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The result obtained showed that muscle of clarias gariepinus from artificial habitat is richer in essential mineral element like Ca, Mg, Na, K and Fe than that of clarias gariepinus from a natural habitat. The nature of feeding could have contributed to the richness in mineral element of clarias gariepinus from artificial environment since most of these feeds are usually fortified with essential minerals elements.

Whereas clarias gariepinus from natural environment feed on aqua waste which might be deficient of one mineral element or the other.

Moreover, clarias gariepinus from natural habitat are found to contain a higher level of lead than that from a natural habitat. Toxic in organic waste disposed into river might have contributed to this.

5.2 Recommendation

The study has generally shown that clarias gariepinus muscle from artificial environment is richer in mineral elements than that from a natural environment.

It is therefore recommended that clarias gariepinus from artificial environment should be consumed for supply of essential mineral element for bone formation, body and blood building.

It is also recommended that clarias gariepinus from river where industrial and non biodegradable waste are disposed should not be consumed because of presence of heavy metals which are injurious to health.

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