Nutrient Potential of *Lumbricus Terristries* (Earthworm) as Food for the Polyculture *Heteroclarias and Tilapia (Oreochromis niloticus)*

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Abstract: An eight weeks experiment was conducted in the botanical garden of the Department of Biological Science, University of Abuja to asses nutrient potential of *Lumbriscus terrestrial* for *Heteroclarias* and *Tilapia (Oreochromis Niloticus)* at different stocking ratio of 8 *Heteroclarias and 8 Orechromis Niloticus* (A), 8 *Heteroclarias and16 Orechromis Niloticus* (B) and 8 *Heteroclarias and 24 Orechromis Niloticus* (C), were fed formulated diet of earth worm of 12% crude proteins, 60 crude moisture and 10 ash. The result of the present studies showed, that there was no significant different among the fishes (P>5%) ONE WAY ANOVA for *Heteroclarias*, and *Tilapia*. The study proved that fingerlings of *Heteroclarias and Orechromis Niloticus* should be stocked at ratio of *1: 1, Heteroclarias to Oreochromis Niloticus.*

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1. Introduction

Fish is one of the cheapest and important source of protein. It contains lipid minerals and vitamins C*larias gariepiuns* (Teugels 1986). In Africa especially in Nigeria the species mostly cultured are *Clarias Geriepiuns, Heterobranchus* species and their *hybrid.* The reason for their culture are base on their fast growth rate, fish farming has become a worldwide practice and has been for year. This is the growing and cultivation of different species of fish which include other aquatic animals for various purposes such as feeding decoration ornamental and for advanced research. This branch of agriculture's has become very impotent being that they are good source of protein (Bard et al 1976).The palatability of diet to fish is of primary important. the high cost of fish dietary requirement may be attributable to haggy cost of diet ingredients and dependents upon the market availability of agricultural and fishery products for the provision of dietary nutrients (Eyo,1990).If aquaculture production is to be sustained at its present growth rate of 7.5% per annum in the coming decade. The equivalent amount of fertilizer and feeding input will have to be (Tacon,1994).The aquaculture sector has been almost successful in the past competing with livestock, confectionery brewery industries and humans for food resources, this situation is unlike to continue and be sustained as farming system intensifies and demand for infinite pool of agricultural and fishery products increase, aquaculture has to assist in recycling farm by products from agricultural into quality fish protein.Protein is taken by men to meet his physiological needs. It is for maintenance and repair of tissues of organisms for optimum growth and development but there is insufficient intake of protein especially in developing countries due to poverty. Protein deficiency could lead to malnutrition in pregnant women, nursing mother and young growing babies and children malnutrition could course retardation in the development of the central nervous systems reduce mental and physical efficiency. It makes these group of people vulnerable to infection disease and continues to course high mortality among infants and young children in developing countries(Aylward and mogen,1975).Fish contains about 60% protein is very good source of protein meat it also rich in protein but very expensive and many families in developing countries could not afford. Plant protein also lack at least one of the essential amino acids needed by the body fish therefore be the cheapest and aid best from of protein source (Spinellin,1978).There is high competition for the same foodstuffs between man aid domestic animals this has increase the price of meal in the sole protein source in fish feeds. It is therefore very crucial that an alternatives is found(Jauncy and Ross,1982).To reduce feeding cost and to make aquaculture available and attractive venture, Earthworm has been found to be a good source of protein (Guererro,1981;Tacon 1982,Hilton,1983).It used as fish bait is well know in fishing. Earthworm meal has high protein contents and the high crude lipid could act as protein utilization of growth (Janucy and Ross,1982,oti Boateny,1988, Sackeg1989) Because of the crude protein of the earthworm it is now known as excellent food for aquaculture for fish species.

Taxonomy

More than 100 different species of the genus *Clarias* have been described in Africa a recent systematic revision based on morphological, anatomical and biographical studies has been carried out by Teugels(1982,1984,)Who recognized 32 valid species. The large Africa species which are of interest for aquaculture belong to the subgenus *Clarias*. Boulanger 1911 as well David (1935) recognized five species of within subgenus both authors used morphological criteria such as form of vomerine teeth. ratio of vomerine to premaxillary teeth band and the number gill rakes. The five species were *Clarias anguilaris,Clarias sengalensis*, *Clarias lazera, Clarias mossambicus, Clarias gariepiuns*.in (1982). Teugels revised the subgenus C*laria*s and found only two *C,gariepiuns, C anguillaris* if the number of gill rakes on the first bronchial arch was considered *C,anguillaris* the number of gill rakes was rather low(14 to 40).While for *C,gariepiuns* was relatively high (20 to 100).

Taxonomic hierarch of species

Kingdom-----------------Animalia
Phylum------------------Chordata
Subphylum------------vertebrata
Superclass-------------Osteichthyes
Class--------------------Actinopteygii
Subclass---------------Neoptergii
Infraclass-------------Teleostei
Superorder-----------Osteriophysi
Order------------------Silurformes
Family----------------*Clariidae* (Bonaparte.1846.)
Genus----------------*Clarias* (Scopoli.1777.)
Species--------------*Clarias gariepiuns*(Burchell.1822)

Description of C*larias* species

The catfish can be defined as displaying an eel shape having an elongated cylindrical body with dorsal and anal fins being extremely long nearly reaching the caudal fin both fins containing only soft fin rays. The outer pectoral ray is in the form of a spine and the pelvic fin normally has six soft rays, the head is fluttered, highly ossified, the bones above and on, The sides forming a casqued and the body is covered with a smooth scale less skin. The skin is generally dark pigment on the dorsal and lateral part of the body. The color is uniform marbled and changes from grayish olive to blackish according to the substrate. On exposure to light skin the color generally becomes light. They have four pars of unbranched barbless, one nasal. one maxilla longest and most mobile on the vomer are of two mandibles, i.e inner and outer on the jaw tooth plates are present on the jaws as well as the vomer the major function of the barbless spray detection.the surpra-branchial or accessory respiratory organ, composed of a paired pear-shaped air chamber containing two arbores cent structures is generally present.

Natural geographical distribution

Clarias gariepinus which is widely considered to be the most important. Catfish species in aquculture. has an almost pan-Africa distribution, from the Nile to west Africa and from Algeria to southern. They also occur in minor Asia, in most West Africa basins and in the nile in generally C*larias gariepinus* live in most river basins sympatric ally *with Clarias angullaris.*

Habitat for C*larias*

Habitat clam waste from lakes stream, river swamps to floodplains, some for which are sub sects to seasonal drying most common habitats frequented are floodplains' swamp and pools which the catfish can survive during the dry season due to presence of the accessory air breathing organs (Brutun,1979, and clay 1979).they feed on living as well dead animal matter because of they wide mouth they are be able to relatively larger prey whole.they are able to crawl on dry ground to escape drying pools. They are able to survive in shallow mud for long period of time between rainy seasons.

Natural reproduction

Clarias species show seasonal gonadal maturation which is usually associated with the rainy season. The maturation processes of C*larias gariepinus* are influenced by annual changer in water term premature and photoperiodicity and the final triggering of spawning is caused by a raise in water level due to rain fall (De Graaf et al 1995). Spawning mostly takes place at night in shallow areas of the river lakes and streams courtship is preceded by highly aggressive between males. Courtship and mating take place in shallow water between isolated pars of males and females. The males has U shape coved around the head of the females is held for several seconds. A batch of milt and eggs is released followed by a vigorous swish of the females' tail to distribute the egg over a wide area. The pair usually rest after mating from second up to several minutes and resume mating.

Economic important of C*larias* species

The economic importance of fish is greater today than ever before and is steadily growing statisticians predict that much of the vital protein food necessary to nourish our ever increasing human population of which perhaps half is under feed even today will come from marine salt water fisheries, they server as protein to human body. they serve as nutrient potential to living organisms, and as marketing products.

Taxonomy of earthworm

Earthworm belongs to haplotaxide of the phylum Annilda. There are five major families of earthworm. Earthworm play a major roles in proper functioning of the soil ecosystem it acts as scavenger and helps in recycling of dead and decayed plant materials by feeding on them, Earthworm increases the soil fertility and is often referred to as a farmers friend. It burrows the soil and ingest soil particle, earthworm help in mixing the soil particles between the upper underlying layer although all species of earthworm are classified in the same class and order. They do not belong to the same family. The five earthworm families are, *Lumbricdae, Moniligastridae, megascodae, Gossocolecidae and Eudridae* that are within America, Europe, Asia and Australia.

Taxonomic hierarchy of earthworm

Kindom-----------------Animalia
Phylum-----------------Annelida
Class--------------------clitellata
Subclass---------------Oligocheasta
Order------------------Haplotaxida
Family-----------------lumbricidae
Genus-----------------lumbricus
Species---------------terrestris

Economic importance of earthworm

Earthworm are supposed to be friend of farmers, Because they make the soil soft also turn the soil upside due to which land becomes more fertile, along with this earthworms canny organic matter in the burrows, Which acts as manure, Earthworms also die in burrows and turn into manure. Excretory products of earthworm also make soil fertile. Beside their economic importance are

- They are used in laboratories
- They are used as bait for fishing.
- They are used as medicines for the treatment of gout pile, bladder stone.

The major *Clarias* species and *Tilapia* species are the most preferred farmed fish species in the Africa. because of the fast growth and higher acceptability of the consumer (Sogbensan et al 2003). The pound culture of major *Clarias gariepinus* and Tilapia (*Oreochromis niloticus)* has been practiced in Africa. These fish feed were selected for polyculture on the base for their ease of culture,rapid growth, attainment of large size,compatibility keeping quality of flash consumer preference and hardiness that makes it easy to handle transport its seed under the stocking density /ha/year was a little on the marketable weight of one kilogram. A density of 5,000 fingerlings *C,gariepinus* and Tilapia species gave the best yield (Chakrabarty et al, 1976). Feeding of fish can be done in two ways, direct and indirect feeding. In case of direct feeding the food nutrients are supplied to the fish in a farm which becomes easily available to the fish. Indirect feeding involves measuring of water by organic and inorganic which result in the productivity of aquatic plank tonic life flora and fauna which is consumer by the fish (Mork 1982) Tilapia *Orechromis niloticus* feed on algae, plant, rotifers, insect, however they prefers earthworm for food. *Clarias gariepinus* feed on crustaceans and insect larva in the early stages while changing to mud and vegetation when adult, *Heteroclarias* feed on decayed plant and animal matter algae, detritus mud. The major *Clarias* species also tolerate a wide range of temperature while tilapia cannot.all organisms, including fish posses' well defined limits of temperature tolerance. All metabolic and physiological activities and process, such as feeding reproduction,movements and distribution of aquatic organisms are greatly influenced by water temperature (Jhingran,1982)The manure which have been analyzed for most of their efficiencies in producing useful foods for fish are liquid and earthworm. length, weight relationship in fish play an important roles in fisheries investigation.(Black and Mohboob 1992)A significant and positive correlation between water temperature and anabolic rate of *Clairas* species and Tilapia (Orechromis niloticus) has been reported by (Sogbensan 1990). The seasonal flections in the condition factor of freshwater fish could be brought about by their feeding rhythms (Kartha and Rao,1990). Love (1980) reported progressive reduction in fat reserves fish due to starvation. During starvation, the fish at first consumer's lipids from the liver and start to mobilize muscle proteins only when this sources of energy has been nearly used up. Feeding of catfishes in grow out are perhaps the most documented in literature, the survival rate for *Heteroclarias,* hybrid was low in the entire stocking ratio. This common in low and high polycultured densities (Tyinla, and Mims, 1988) Experimental studies showed that fingerlings of different species of *Clarias* catfish have different growth performance and different feed utilization efficiency under different culture system(Adewolu etal; 2008).It was observed that hybrid exhibited a high degree of cannibalism and a resulting high individual rate growth with a corresponding low production yield due to high mortality rate(Van der waal,1978). The feeding of *Heteroclarias,* fingerlings on earthworm diets resulted in high survival rate (Sogbsensan et al; 2006). Earthworm is readily available free from man's completion and has been accredited for its high quality protein with amino acid profile showing its biological value to be superior to soybean and groundnut cake (Adejinmi,2000). Earthworm are easily digested by fish (Jhringram, 1983). Examples of these are *Oreochromis niloticus* which are of great importance to subsistence fish farmers in Africa Asia (Bardach et al 1999). The *Clarias* fish species, carps and *Heterotis niloticus*. Tilapia is a good candidate of aquaculture because of its growth rate and productivity ability. According to Teshima et al 1986,*Orechromis niloticus* is one of the fastest growing member of the Tilapia family and thrives well under culture condition throughout most farm in Nigeria. Nile Tilapia (*Orechromis niloticus)* is the most predominantly culture species among the cichlid family(Roderick,1997). It exhibits qualities that include fast growth, efficient use of feed and resistance to disease (Lovell,1989). Nutrient itilization, digestibility and helps to somatic index of Nile Tilapia (*Orechromis niloticus*) fingerlings. The protein requirement for fish has show to vary not only with species of fish but also with life stages. The determination of protein requirement for maximum growth of any species is a logical first step to development of a cost effective feed for the fish. There are several work on the determination of optima protein requirements for Tilapia. Win free and Stickney (1981);Recommended 34% protein for tilapia a urea of 7.7g body weight while Jauncey (1882) found 40% crude protein to be optimal for *Clarias* and *Heteroclarias* species of 2g body weight in aquaria. Shead and Huang (1989), Solomon et al.(1996) found that the best growth performance and food utilization parameters for mud fish were attained at 40% crude protein level when the fishes were feed with different level of protein. Balogun et al.(1992) and summarized the gross protein requirement of *Clarias gariepinus* as follow: fingerlings to juveniles require 37.5% protein, juvenile to adult require 35.5% protein. Changes in food composition and feeding habits of fish in relation to the size and age of the fish and season are biological phenomena which are common to many species of fish in the tropics and temperate areas of the world. The success of *Heteroclarias* can be attributed to its ability to colonize the verity of habitués created by formation of the lake (Olatunde, 1991), Edwards et al, (1989) stated that food plays a very important role in the husbandry of animal, including fish. The fish under culture receive their nutrient and energy require for the maintenance of life and growth from food eaten. Olvera (1990) stated that typical herbivores such as Tilapia required dietary protein between 30-53% in contrast carnivores require 40-45% dietary protein. Stickney(1990) and Watanabe (1988)noted that nutrient digestibility in fish is linear relationship to the increasing level of dietary protein consumed. Ofejukwu et al(2003) showed that 20% sesame cake can used with 30% fishmeal in the juvenile *Orechromis niloticus*. The blue catfish *lutalurus furcatus* has been shown to use diet containing high percentages of earthworm meal, initial investigation indicated complete replacement of fish meal with earthworm meal caused reduced growth of juvenile fish(Webster et al;1992)The most common habitats frequented are flood pain swamp and pools which the catfish can survive during the dry season due to the presence of the accessory air breathing organs(Bruton and clay 1979)poor fish feed lead to a slow growth rate high feed conservation ratio, low survival, disease and poor harvest (Eyo2001).In Nigeria fish constitutes 40% 0f animal protein intake (Olatunde,1989)In polyculture setting shrimp and Nile tilapia can utilize different niches. Intensive culture of Tilapia can filter feed on phytoplankton and zooplankton in the upper water column, while shrimp spend most of the bottom substrate and on the detritus setting from above. In intensive culture receiving pelleted feed, tilapia may monopolize the feed especially for floating feed (fast and menasueta2000). Shephard (1988) stated that different in growth increments between monoculture of one species and polyculture of several species within the same period, however one species may affect the environment to improve the growth condition for other species. *Clarias* species show seasonal gonadal maturation which is usually associated with rainy season. Dietary energy and vitamins is essential. Earthworm which availability from natural habitat is seasonal but with prolific reproductive.

2. Materials and Methods

Three transparent rectangular plastic aquarium for 30L capacity length 48cm, height 24cm and base 30cm were used for the trials base on the laboratory subjection. The aquarium were obtained from Gwagwalada market and transported to the Biological Science garden University of Abuja. There were 3 treatment having different ratio and stocking densities designated A,B and C, each of their aquaria was stocked at ratio of 8 HeteroClarias and 8 Tilapia (*orechromis niloticus)* fingerlings, at different ratios of A (1:1), B (1:2) and C (1:3). The catfish, Tilapia fingerlings stocked in each aquarium were of the same size this is to investigate cannibalism. The fingerlings of *Heteroclarias,* and Tilapia (*orechromis niloticus)* were obtained from Jeremiah fish farm Gwagwalada Abuja. The fish were acclimatized for seven days in the Biological Science garden. The initial individual weight, length, means, length and mean, weight were recorded. The fishes were assigned to their respective ratios and densities. The fishes were starved for 24 hours to empty the gut content and prepare them for experimental formulated diet. The exercises help in making the fishes hungry and thus adapted to the new formulated feed. The fishes were fed 4% of their body weight and the aquaria were aerated. The aquaria were coved with mosquito net to prevent fingerlings from jumping out, intrusion of insect and other predator.

Formulation of fish feed

A fully grown earthworms of about 70gm were collected and brought to the laboratory, washed and cleaned using blotting paper. There were sacrificed by introducing them to boiling water and squashed using motar and pistol. Ingredient such as groundnut cake 20g,cornflour 20g,rice bran 20g, eggs 70g and brewer's yeast 30g were added to the earthworm and mixed together with other ingredient for 30min to ensure homogeneity of the ingredients. Pap was used as a binding agent pelleted wet using hang pelleted machine. The pellets were collected in flat trays and sun dried to constant weight. The fingerlings were feed 4%body weight twice daily morning (7.00am-8.00am) and evening (6.00pm-7.00pm).water was first reduced for sampling of fish for weight and length measurement. The was done with a scope net. Fish weigh in grams was taking using a sensitive weighing balance OHAUS 2000 Model. The fingers were weighed in group. In each Tilapia fingerlings is first weighed because of their fragility. The standard length of fish was taken to nearest cm with the aid of measuring rural.

Table 1: Composition of formulated feeds

	Earthworm	Percentage %
Fish meal	400g	28.6
Earthworm	400g	28.6
Corn	280g	28.6
Rice bran	200g	14.3
Groundnut cake	120g	8.6

Growth Parameters

1 Mean weight gain % this was calculated as

$$MWG\ \% = \frac{\text{Final mean weight}}{\text{Initial mean weight}} \times 100$$

2. Mean length gain % this was calculated as

$$MLG\ \% = \frac{\text{Final mean length}}{\text{Initial mean length}} \times 100$$

3. Specific growth rate (SGR) this was calculated from data on the changes of body weight over a given time

$$\frac{\text{Ln WT Ln Wt}}{\text{T- t}} \times 100$$

Where WT =Final weight
T = Final Time
t = Initial time
Ln =Natural logarithm

4. Food conversion efficiency (FCE).The food conversion efficiency was calculated as

$$\frac{\text{Weight gain}}{\text{Feed Intake}} \times \frac{100}{1}$$

5. Mean growth rate (MGR).This was computed using the standard equation

$$MGR = \frac{W2\text{-}W1}{0.5\ (W1W2)\ 1} \times 100/t$$

Where WL =Initial weight
W2 = Final weight
t = period experiment in days
0.5 = constant.

6. Survival rate (SR).The survival rate, SR was calculated at total fish number harvested total number stocked expressed in percentage

$$SR = \frac{\text{total fish number harvest}}{\text{Total fish number stocked}} \times 100$$

Data generated from the experiment were subjected to One-way and two-way ANOVA using the SPSS (statistical package computer software 2003 version), Duncan multiple range Test. Fisher least significant

Proximate Analysis of fish Meal, Earthworm

Methology for Proximate Analysis

Proximate analysis also known as nut rite valve is applied to investigate if the sample could be formulated into a diet as source protein or energy.

-**MOISTURE.** This is essential in monitoring the moisture % in powered food and sample to avoid the risk of contamination by fungi and bacteria during storage.

-**CRUDE LIPIDS.** This method involved extraction of fats and oil from the sample using the appropriate organic solvent.

CRUDE PROTEIN. For the amount of protein present in the food.

ASH.These consist of oxidizing organic matter in the sample of the ash remaining. It is also considered as total mineral or organic content

Proximate Composition of Earthworm

	Earthworm
Moisture	60
Crude protein	12
Crude lipid	-
Ash	10

Physiochemical Parameters

Some physiochemical parameters and environmental factors like temperature and oxygen that could affect growth were also taken care of surface and bottom temperatures of the water were measure with thermometer, oxygen with oxygen meter P^H with P^H meter, water conductivity with conductivity meter, dissolved oxygen was determined once a week by titration with 0.1 sodium hydroxide and azide modification of wrinkler method (public health association,(1976) different were used to compare differences individual mean at (p<.5%$)

3. Result

The results of the production parameters for the three treatments A,B and C are presented in different tables, while the physiological parameters are ranged between their tolerable range.

All values of the measurement of various production parameter in the three treatment showed that treatment A had the highest mea weight (g) and length (cm) with the values (7.4g,9.86cm *Orechromis niloticus*, 5.54g,91cm *Heteroclarias* and 4.17g,12.07cm *Clarias gariepinus* and the survival rate of treatment A 68%(87,5 *Orechromis niloticus,* treatment B 100% *Heteroclarias* and treatment C had the lowest 56% (75% *Clarias gariepinus).* The final mean weight gain % in all the three treatment was highest in treatment A (0.98 *Orechromis niloticus*, treatment B (9.1 *Heteroclarias* and lowest in treatment C (0.25 *Clarias gariepinus).*

Physiochemical parameters

Atmospheric temperature throughout the study period varied between 26 c and 32 ^{0} C, while water temperature occurred between 25 ^{0} C and 28 ^{0} C.The highest water temperature occurred at the week 12 because of increased in atmosphere temperature.

The highest concentration of dissolved oxygen for all the three treatment was recorded in treatment A which varied between 3.1 mg/l and 6.50mg/l while an increase in dissolved oxygen 2.2mg/l to 6.01mg/l was recorded in treatment C. P^{H} values in all the three treatment has more or less similar reading ranged between 7.1 and 8.6 ppm. Whereas Biological oxygen demand showed similar concentration throughout the study period for the three treatments ranged between 2.0 and 4.0mg/l.

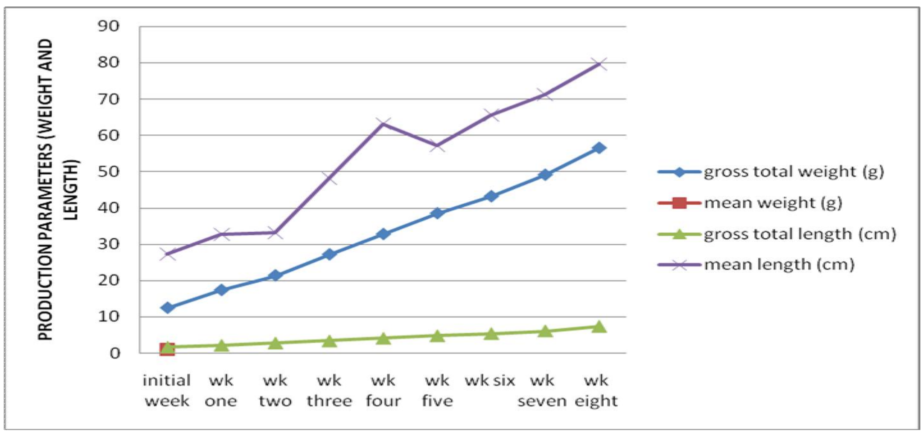
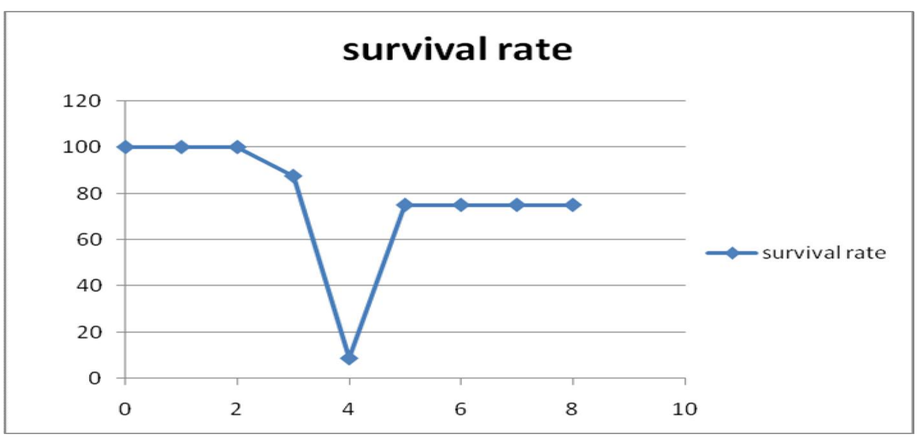


Figure 1. PRODUCTION PARAMETER FOR TREATMENT A (1)



Initial week Week wk one wk two wk three wk four wk five wk six wk seven wk eight

Figure 2: Survival rate (%) for treatment A.

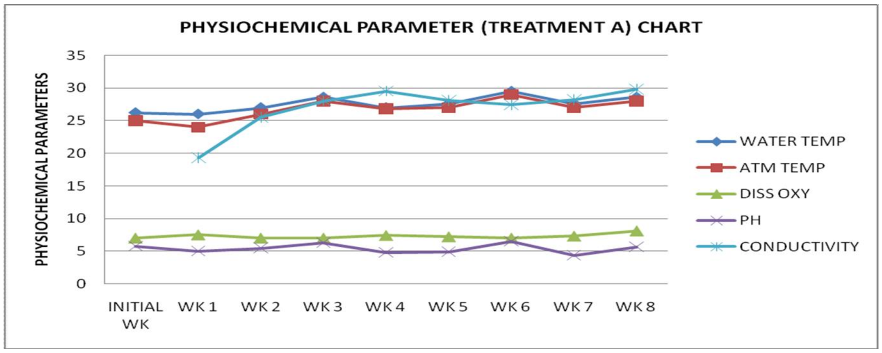


Figure 3: Physiochemical parameters for treatment A.

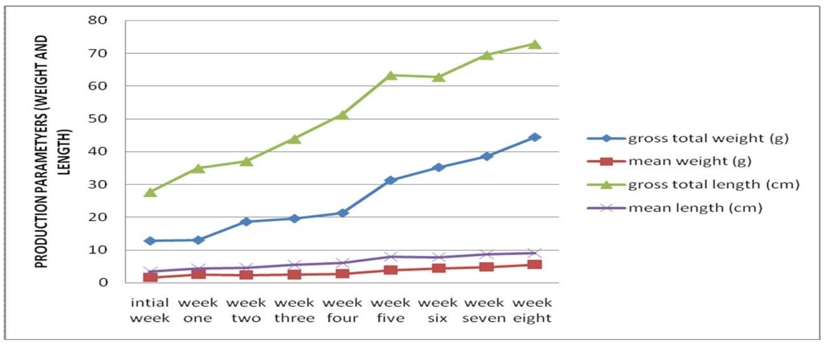
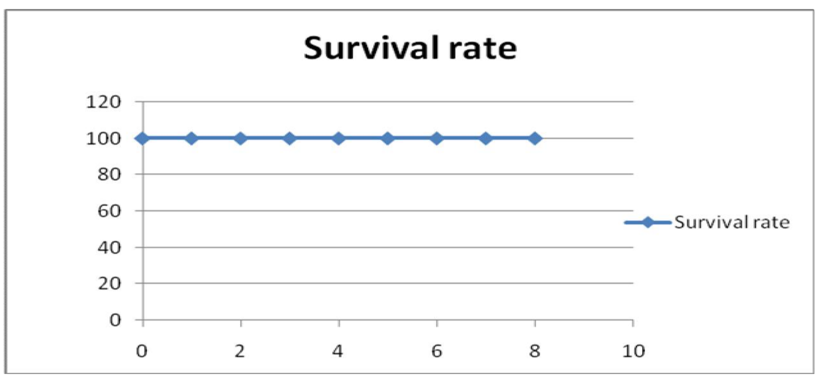


Figure 4: Production parameters for treatment B.



Initial week Week | wk one | wk two | wk three | wk four | wk five | wk six | wk seven | wk eight

Figure 5 : Survival rate (%) for treatment B.

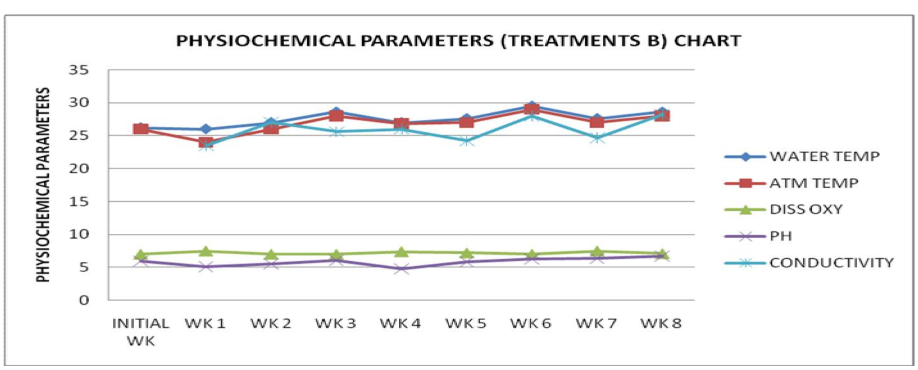


FIGURE 6: PHYSIOCHEMICAL PARAMETER FOR TREATMENT B

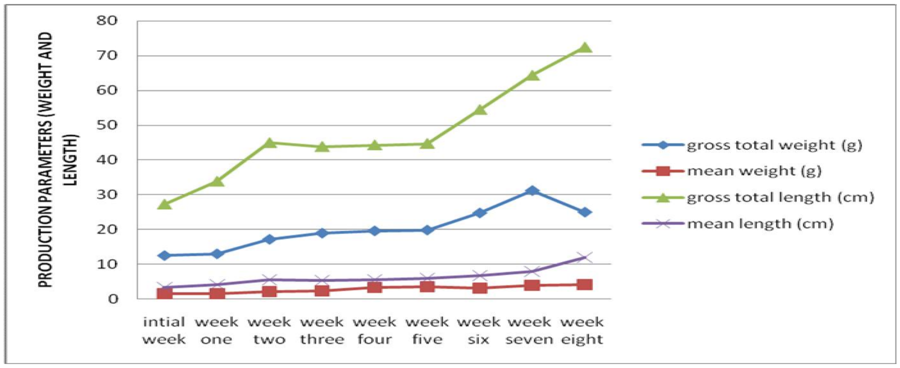
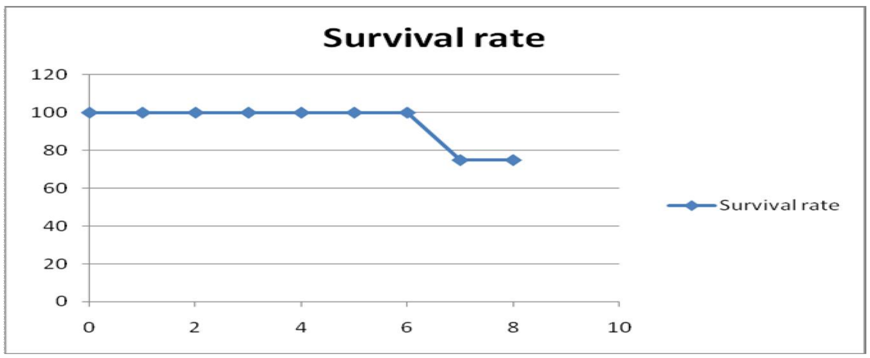


FIGURE7: PRODUCTION PARAMETERS FOR TREATMENT C (3)



Initial week wk wk wk wk wk wk wk wk
Week one two three four five six seven eight

FIGURE 8: Survival rate (%) for treatment C.

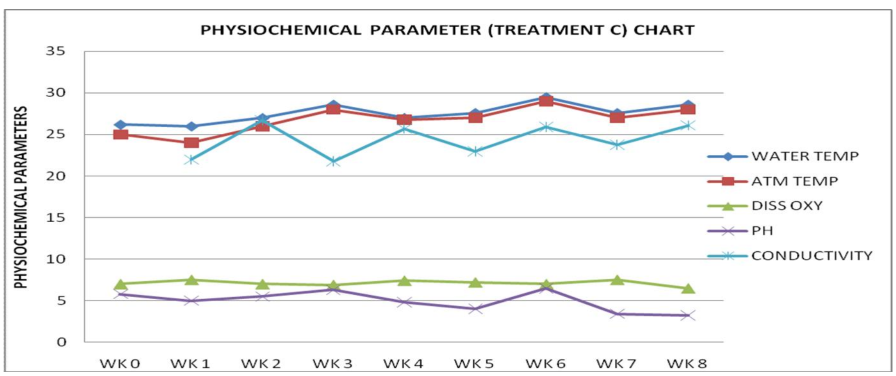


FIGURE 9: Physiochemical parameters for treatment C.

4. DISCUSSION

Physiochemical parameter such as atmospheric temperature, water temperature, P^H, Dissolved oxygen and biological oxygen (mg/I/ were Determined for abnormal concentration of any of these physiochemical parameters may have been the cause of the fish death. However, numeration and density stress are additional parameters for fish death thus high survival rate and cannibalism were observed in treatments with higher stocking densities.

The atmospheric and water temperature recorded during the study period ranged between 26% to 32^0 and 25% to 28% respectively, water and atmospheric temperature readings in all the treatment (A, B and C) was within a permissible between range thus shows that the readings lose within a required or tolerable ranged for the culture of fish. Swann et al, 1990, recorded the normal range of temperature for culture of catfish and *Tilapia., Heteroclarias* and *Oreochromis Niloticus* culture were between 23^0-32^0C.

The pH (hydrogen ion concentration) record for the thus treatments ranged from between 6.7 and 7.3

(A) (1:1) had highest ranging from 7.3 to 8.1

(B) (1:2) had then values ranging from 7.0 t0 7.5

(C) 1.3 had the lowest ranging from 6.4 to 67.

This may have resulted to the different stocking densities the results demonstrated that concentration of dissolved oxygen in all the three treatments were alkaline and within the permissible between ranges (6.0-9.0) for culture of catfish/Tilapia. High level can be influence by the election of some of the water qualities parameter (Akinwole and Fatirotic 2006)

At the early weeks at he present study, concentration of oxygen were high but gradually lowed as the growth of fishes (Fingerlings) were achieved in treatment A and dissolved oxygen decreased, this could be considered frequently below the permissible level for good growth of catfish and tilapia (Oyewole and Faturti, 2006; Young et al; 2006). The low level resulted due to metabolic activities of the fishes and of bacterial decaying organic material such as under utilized feed were the major contributors to this demand. However, the survival of *Heteroclarias*, depended upon oxygen in the water since it is equipped to obtain energy by gulping air, and means that inadequate dissolve oxygen is not lethal to catfish growth (Brown, 1957) while the survival of tilapia *(Orechromis niloticus*) is Solely dependent upon dissolved oxygen this may be the cause why *Tilapia* fishes could not survival in treatment A and C it may have seriously affected the heath of the fish *(Tilapia*) and the facilitate the spread of disease Mayer, (1970), reported that the role of low dissolved oxygen level promotes bacterial infections. Whatever conditions occurred in the Aquarians was minimal during he last two weeks and may have affected the survival /growth of the fishes.

At the end of Eight-weeks of study values of the measurement of various production parameter in all the three different stocking ratios, HxC /*Orcochromis niloticus* (8;8) HXC/ O*reochromis* (8:16) and HXC / O*rechromis niloticus* (8:24) i.e. 1:1, 1:2 and 1:3 showed that final mean length (cm)and weight-gain(%) 59.13 *Oreochromis niloticus*) exceeded that of treatment B *57.59* cm *Heteroclarias* and treatment C (57.39cm) and treatment A mean weight gain (%) 7.4 % O*reochromis niloticus* 5.5 (%) *Heteroclarias* and 4.17% *Clarias gariepinus*.The single fact in both the final length (cm) and weight gain percentage for the three treatments may be related to the availability of food and space, as such decreased in competition among fished in the aquarium. Alon (1994) state that increase in stocking density will increase interspecific and interspecific competition and fish production will slow down the body weight at harvest catfish/*tilapia*.

The specific growth rate of treatment A (1.17) tilapia (O*rechromis niloticus*) and 1.07 *Heteroclarias*) exceeded treatment C (0.53 *Heteroclarias*) the food conversion efficiency was higher in treatment C (100.16%) exceeded treatment B (65.6 %) and treatment A 43.42%).

Also the survival rate varies between treatments; with treatment B 85% (100% *Heteroclarias* exceeded treatment A 87.5% O*rechromis niloticus* and treatment C 75% *Heteroclarias*. The result is in relation with Tang et al, (1997), which states that survival decreases as stocking density increase. Treatment A observed the highest mortalities especially O*rechromis niloticus* which may be due to handling stress and probably over crowding during weekly samplings. It as also observed that catfish *Clarias Gariepinus* feed on one another and on *Tilapia (Orechromis Niloticus)*. Tidwell and Mims (1990) yield decreased due to the presence hybrid which heads to competition for good (Lazerd, 1980).

The survival rate on the productivity of catfish *Clarias Gariepinus / Heteroclarias* and *Tilapia (Oreochomis Niloticus)* was statistically analyzed using a one way ANOVA.

One-way ANOVA of *Tilapia* treatment A, showed a significant AT different P= 0.19 3: P- value 0.991; d*f* =89; f crit 1.94; p 45% Appendix 4. Treatment B no significant different (*df-89; F= 0 228; p*-value = 0. 985 *Crit = 1-94, p> 0.5%* Appendix 5 treatment C had no significant different (*df 89; =f* – 0.193; p-value=0.193 f crit =1. 94 P> 0.05 Appendix 6.

5. CONCLUSION AND RECOMMENDATION

The final mean body weight of stocking rations 1:1 1:2 and 1:3 *Clarias gariepinus, Heteroclarias and Oreochromis niloticus)* fed fish meal and earthworm was different though the mean weight (g) mean length cm and survival rate was highest in ration (1:1) and (1:2) the survival rate of *Heteroclarias* was significantly different P. <. 5% while that of *Oreochromis niloticus* was not –P->. 5%.

The present study proved that hybrids catfish can stand stress and survive at high stocking density while *tilapia* cannot. *Heteroclarias*, should be encouraged because it performed better and indigenous Zooplankton should be promoted because it will drastically reduce the cost at production (Osutiku, 2008). The present study also advice that fingerlings of catfish *(Heteroclarias) and tilapia (Oreochromis niloticus)* of the same size/length should not be stocked at the sametime, if they are to be stocked together, fingerlings of *Tilapia* are to be stocked two to three month before *Heteroclarias*, thus is to enhance the feeding of *Heteroclarias* on *Tilapia,* The pond culture of catfish/*Tilapia* in Nigeria has potential profit to boost economic success. Thus fish farmers are there by advice to improve productivity.

References

1. AKINWOLE, A.O and Faturoti, E.O (2006). Biological Performance of African Catfish (claias Ganiepiums) cultured in recruiting system in Ibadan. *Advacultural Engineering 36:18-23*
2. Bard, J. Dekimpe P. Lazard, J. Lemusson J. and Lessent P. (1976). Hand Books of *Tropical Fish Culture C.T.PT, Franch 165pp*
3. Bacongun, A.M, Bello-Uusoji and Fasakin, E.A. (1992). Protein and Amino acid requirement of Worm wats Fishes: A tool to efficient and low cost fish fed in Nigeria. *Avoc fish, Soc. Nigeria 10:95-104*
4. Burchell, (1822). Hetsiobranchus Longi skills valenciennes, 1840 and their reciprocal hybrids (Pisces Clanidele). *Journal of Fish Biology (1992), 40,59-79.*
5. Edwards P. Pullin R.S.V and Getner J.A (1989). Research and Education for the development of integrated crop-livestock-fish family systems in the tropics KLARAM studies and review 16. Internation center for living Aquatic resources management manika Phillipines.
6. Eyo, A. A (1995).Dietary Protein requirement of Heter Obranchus hanyifilis niff. *Annual report. Pp 118-125*
7. Eyo, A.A Olufeagbu, S.O. Aluko, P. and Adelowo, E. (1998). Dietary protein requirement of genetically improved Heterohranchus Longi Silis Niggr *Annual report pp.35-36*
8. Eyo, A.A Odukudu, G. and Adelowo, E. (2000). Optimum dietary protein requirement of fingenings of tilapia hybrid (Exotic Oreochromis avreus). *Nigeria Journals of Biotechnology, vol. 11 (1) 47-54*
9. Eyo, A.A Aluko P.O, Okoye, F.C and Mboko, H. (2003). Optimum protein improved Triploid Hybrid Fingerhugs, *Nigerian Jounal of fisheries p 1:11-21.*
10. Fa turoti,E. O, Belogun, A.M, and Ugwu L.L.C. (1998). Nutrient utilization and growth responses of claias Lazera fed different diatary protein Levels, *Nigerian Journal Applied fisheries and hydrobidogy 1:41-45*
11. Guererro, R.D and Guerreri, L.A (1979). Culture of tilapia niloticus and machrobrachium Species separated and in combination in ferticized fresh water fish ponds, *Phillip. J. fish 14(2), 232-235*
12. Jauncey, K. (1981). The efficiencies of varying dietary protein level on the growth, food conversion, protein utilization and body composition of juvenile tilapia (saro mossambiscus). *Aqaucutture, 27:43-54.*
13. Jauncey, K. and Ross, B, (1982). Aquideto tilapia feeds and feeding institute of aquaculture university of staicuy Scotland U.K pp10-46
14. Lovell, G.M, (1979). Formulating diets for Aduaculture Species. Food stuff. P 29-32
15. Lovell, R.T (1989). Nutrient and feeding fish van Nostr and Rein Hold: Published New York USA pp 449.
16. Mork, O.J (1982). Growth of three salmon Species in mono and double culture (Salmon Salard). L. Strutta and S. Gairdneri Rice. *Aquaculture p 27:141-147.*
17. Ofosekwu, P.C, Onuocha, P.C and Ayuba, V.O (2003). Substitution of cotton seed cake with palm Kernel meal indiets for Nile tilapia. *Jounal of aquatic Science 18(11): 59-63 (2003).*
18. Olatunde, A.A (1989). Approaches to the study of fisheries biology in Nigeria inland waters proc. Nal. Con 9-two Decades.
19. Olvara, N.M A. Compos, G. S. Sabido, G.M and Martinez, P.C.A (1990). The use of Afalfaleaf protein concentrate as protein source in diet Tilapia coreochomis hosam bicuss. *Aquaculture 90:291-302*
20. Okoye, P.C (1996). Species Combination and stockeing Density in ponds. *Polyculture of fish vol 2 (3) 49.*
21. Shepard, B. (1988). The development of polyculture in Isreal: a model of intensification. *Aquaculture p 42-46*
22. Stickney (1981). Growth responses of Tilapia aureas to dietery protein quality and quantity. *Trans American fish soc.107(3)479-483*
23. Solomon. R, J,(2006). Polyculture of *Heterobranchus / Clarias* hybrid with Tilapia niloticus using extensive and semi intensive feeding regime *Best journal 3(4)88-94*
24. Solomon J.R.(20060). Polyculture of *Heterobranchus /clarias* Hybrid with *Tilapia niloticus* using Extensive semi- intensive feeding regime. *Biology and Enviromental science journal for the tropic 5(1)pp 66*
25. Sogbensan (2006). Feeding of the *Heteroclarias* fingerlings on earth worm diets resulted in high survival rate. Aquaculture pp 35-43.
26. Tacon A, G. and De Silva, S,S. (1983). Mineral composition of some commericial fish Feeds available in Europe. *Aquaculture 31(1983)*
27. Teshima S, Kanazawa, A and Uchiyama (1986). Effects of several protein sources and other factors on the growth of *Oreichronis niloticus*. *Bull. Jap. Soc. Sci 52 (3): 523-530*
28. Tidwell, J.H and Moms, S.D (1990). Winter Poyevl to ture of rain bow drout's fingeling. *Journal of Aquaculture 3 (2) pp39-40.*
29. Van der waal. (1978). Some breeding and production experiment with *Clarias gariepinus*. Burchell pp 74.
30. Watanabe T and Ogino C (1979). Studies on nutritive value of detery lipids in fish XVI availability of carbohydrates and lipid dietary energy source for carp. *Bulletin of the japaneses society for fisheries. 23-34.*
31. Webster, C.O. Yancey, D.H and Tidwell, J.H (1992). Effect of partially or totally replacing of blue catfish (Ictalurus forcatus). *Aquaculture 103:141-152.*

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