Infections of *Oreochromis Niloticus* from an Impoundment in Kano Metropolis

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Abstract

Infections of Oreochromis niloticus was studied in an impoundment in the Kano Metropolis in 2012 for period of 3 months to better understand the parasite fauna occurrence, distribution and diversity. A total of 165 fish species of Oreochromis niloticus were collected at the site, using routine bacteriological and parasitological techniques. Histopathological change in fish tissue was investigated due to bacteria and parasite. The survey yielded 72 (43.63%) Flavobacterium spp., & 19 (11.52%) comprising of ecto and endo parasites trematodes (Digenean); Clinostomum both adult and encysted (metacercariae) in the body cavity and leeches. The Bacteria isolated from gills showed typical necrosis and the presence of brown to yellowish-brown colour on the gills' filament. The isolated Bacterium is suspected to be opportunistic causing secondary infection. It could be finally concluded that about 91 (55.15%) Oreochromis niloticus of Dan Agundi impoundment were infected by trematodes, leeches and Flavobacterium. This calls for raising awareness in fish health management among potential farmers/fishers, consumers, service providers and researchers.

Keywords: *Infections, parasites, bacteria, Oreochromis niloticus , impoundments.*

1. Introduction

Tilapia is the common name for nearly a hundred species of cichlid fish from the *tilapiine cichlid* tribe. *Tilapia* inhabits a variety of fresh water habitats, including shallow streams, ponds, rivers and lakes. *Tilapia* is able to survive in tropical region because they require warm water, live at a temperature of 42^{o}c but preferably between 31^{o}c to 36^{o}c. The pure strain of the blue Tilapia; *Oreochromis aureus*, has the greatest cold tolerance and dies at 45 °F (7 °C) while all other species of *Tilapia* will die at a range of 52 to 62 °F (11 to 17 °C). As a result, they cannot invade temperate habitats and disrupt native ecologies; however, they have spread widely beyond their points of introduction in many fresh and brackish tropical and subtropical habitats, often disrupting native species significantly.

Oreochromis niloticus (Nile Tilapia) is one of the largest Cichlid species reaching a considerable length of 50cm.The body is elongated and is easily identified by the characteristic pattern of dark and light bands crossing the caudal fin inhabiting rivers and lakes. The female is a mouth brooder guarding and rearing its young (Reed *et al;* 1967;Arrignon, 1998; Froese and Pauly,

2011).

Due to the importance of fish as one of the major source of obtaining protein and other vital nutrient, studies on this aspect of biology, morphology, and disease of fish is very important

Several researches were done in Nigeria on the diseases and infection of *Oreochromis niloticus*; most of the results show that *Oreochromis niloticus* could be infected by several parasites which include viruses, bacteria, fungi, ectoparasites and endoparasites (Americulture, 2011).

Infections of *Oreochromis niloticus*: Several researches were done in Nigeria on the diseases and infection of *Tilapia*; most of the results show that *Tilapia* could be infected by the following:

Bacterial infection: *Flexibacter, myxobacteria*, *F. Columnare,* Streptococcosis, *Aeromonas hydrophila*

Fungal infection; Saprolegniasis

Protozoan parasite

Ichthyophthirius multifilis, Trichodina sp, Ichthyobodo sp, Hexamita sp, Chilodonella sp

Platyhelminthes

Monogenetic Trematodes

Gyrodactylus sp, Dactylogyrus sp

Digenetic Trematodes

Diplostomum spathaceum, *Posthodiplostomum minimum*

Cestodes.and Nematodes

Leeches and Copepods

2. Aim and Objectives

The aim of this project is

- To detect and identify the parasitic macro and micro organisms infecting *Oreochromis niloticus*

And the objectives are

- To know the pathogenic organisms present in *Oreochromis niloticus* that may likely cause disease to consumers.
- To highlight public on the effect of taking raw or undercooked fish
- To enlighten community on the ways of control and prevention of infection due to taking the contaminated fish

3. Materials and Methods

3.1 Study area

There are landmarks in the ancient city of Kano which includes walls with a 14km radius earth structure. The wall has other associated sites; the city gates, completed in 14th Century to provide security to the growing population of the old Kano city in the wake of any external aggression. Although most are dilapidated, the surviving city walls are surrounded by water at these sites forming impoundments that provide fishing ground for the local inhabitants.

This research was carried out at the impoundment of Kofar Dan Agundi quarters, situated along BUK road, Kano Municipal local government.

3.2 Physical parameters

Temperature was measured by using digital thermometer while pH was measured using digital pH metre. The measurements were carried out at the site.

3.3 Sample collection

3.3.1 Collection of fish sample

165 samples were collected and observed for Bacterial, parasitic and fungal infection. Samples were collected from fishermen of Dan Agundi impoundment. The samples were caught with fishnet. Collections of samples were done weekly between February to April. The fish sample was collected and placed in a plastic bag containing impoundment's water and transported to the school's laboratory.

3.4 Methods

3.4.1 Species identification

One *fish* was placed at a time, on a tray and physically examined, to identify the species to which it belongs. The identification was done based on number of Anal fins, Dorsal fins, Body colouration, and colour and shape of caudal fin, as described by Froese, and Pauly, (2011):

3.4.2 Sex Differentiation

Sex was identified by observing genital papilla, internal reproductive organ (ovaries and testis) and structure of the mouth. Some of the fish were unable to be differentiated because they were too small.

3.4.3 Parasitic detection

The external surface (Skin and Fins) of each fish was rinsed, and the body was grossly examined with the aid of a hand lens for presence of parasites. Fins (pectoral, caudal, dorsal, pelvic and anal) were also carefully examined under the light microscope. The 2 opercula of each fish were removed and the inner side was examined. Each gill was examined individually for presence of parasites.

The external abdominal surface of the fish was washed with distilled water to reduce potential contamination of the intestinal contents with skin bacteria. An incision was made over the peritoneal cavity and the abdominal organs were removed and physically analyzed with the aid of powerful hand lens; some contents of the intestine were placed on a clean glass slide for microscopic observation of intestinal parasite (Bichi and Ibrahim, 2009).

3.4.4 Parasitic identification

The parasites detected were placed on a slide, and few drops of a cleaning agent (Lacto Phenol) were added and the parasite was observed under the microscope with the x 40 objective. Parasite recovered was identified using chart of parasite that attack fish (Paperna, 1980; 1996;Markevich, 196).

3.4.5 Bacterial detection and identification

The *fish* that showed sign of abnormality on its body or organ were diagnosed and then followed by the detection of Bacteria.

Small part of the organ that shows the sign of infection was cut using a sterile knife. The cut sample was crushed into small pieces in a sterile mortar containing sterile water. Sterile wire loop was used to streak the sample on to the surface of MacConkey media and the media was incubated

at 37^0C for 24hr. The isolates were culturally identified and gram-staining was carried out. Identification of isolates was carried out based on the method described by Collins *et al.*, (1989); Shoemaker, (2010). The gram staining was aimed at differentiating gram reactions, sizes, shapes and arrangement of cells of the isolates. For the gram-staining of the various isolates, glass slides were washed and air dried. A drop of normal saline was placed on the slide. Using a flame inoculation wire loop, a small amount of inoculum was taken and smeared on the drop of normal saline on the slide. The smear was allowed to air dry and heat fixed by passing over flame three times. The fixed smear was flooded with crystal violet for a minute and then rinsed with clean water. Lugol's iodine was added for another one minute and this served as a mordant. This was later rinsed and cleaned with distilled water. Acetone-alcohol was added as decolorizer and rinsed immediately with clean water. A counter stain, safranin, was added and allowed to stand for a minute before being rinsed with clean water. This was allowed to dry. It was then observed under oil immersion objective microscope (Baker, 1985).

Biochemical identification was also carried out. But only catalase test was done as follows. A loopful of bacterial growth was removed (by using sterile wire loop) from the cultured plate and smeared on to a glass slide. A drop of 30% hydrogen peroxide was placed on to the bacterial cells. It was then observed and recorded.

4. Result

A total of 165 fish were examined, 87 (52.72%) were Females, 76 (46.06%) were Males and 2 (1.21%) Unsex. Standard length of Males ranged from 6.5 to 14.4 cm and Females from 7.8 to 14.5 cm, and Male weight from 21.6g to 35.2g, and that of Females from 21.8g to 47.5g. Number of Dorsal fin (hard and soft) ranged from Dxv 11 – Dxvii 12, while anal fin (hard and soft) also ranged from A_{III} 9 - A_{III} 10. The colour of the caudal fin was light ash with black stripes (rectangular dots) and body coloration was black/dark ash. The average temperature of the water was 34.3^0c, while the pH was 7.95. The number of *O. niloticus* found to be infected by Bacteria was 72 (43.6364%), and those infected by Parasite were 19 (11.52%), and those that were not infected were 74 (44.85%).

The bacteria has the following characters on Mackonkey media, grams stain (microscopy) and biochemical reaction (catalase test).

The bacteria had Rhizoid shape, pink colour, shiny and flat, it is long Gram-negative rod, and biochemical reaction show bubbles of oxygen that confirmed catalase positive, detail of cultural and gram stain appearance.

Table 1: Shows the no of *Tilapia* studied at Kofar Dan Agundi impoundment

S/N	Range (cm)	Frequency
1	5—9	13
2	10—14	135
3	15—19	17
	Total	**165**

Table 2: Shows the no of *Tilapi*a infected by Parasite and Bacteria

S/N	Range (cm)	Frequency	Infected by parasite (ecto & endo)	Infected by Bacteria	Non infected
1	5—9	13	2	6	5
2	10—14	135	11	63	61
3	15—19	17	6	3	8
TOTAL		**165**	**19 (11.51%)**	**72 (43.63%)**	**74 (44.84%)**

5. Discussion

Fish are constantly exposed to bacteria and other parasite, and usually only succumb to an infection after being exposed to prolonged periods of stress. Environmental factors also act as stressors and can predispose a fish to bacterial diseases. The temperature during the research was about 34^0C — 37^0C, which is within the range for the growth of most aquatic bacteria, while leech grow best when the temperature is cold (APHA, 1992).

Most of the *O. niloticus* were found to have bacterial infection caused by *Flavobacterium, Endo* and Ecto parasites namely trematodes and leeches.

In this study, the isolated bacteria shows a little damaged to the infected gills; this might be the reason for less mortality to the infected fish. High percentage of bacterial infection according to Lionel and Mawdeslay, (1972), result in, overcrowding, accumulation of metabolic waste products of house nearby, organic matter in the water, low pH and an increase in water temperature.

The study shows that there is a considerable number of leeches in the impoundment, Leeches, once engorged with the blood of the host, detach and rest on a protected substrate in the water. Heavy leech infections have variable effects on fish hosts. The number of leeches per fish is variable and could reach up to 67. Lesions only partially corresponded to observed infection loads which could result in mortalities (Paperna, 1996; 1980).

Trematodes were identified as *Clinostomum sp*. Both adult and encysted meteacercariae were seen in the gut and body cavity. Prevalence data and host records hint that infestation by metacercariae occurs only or predominantly in shallow waters where most vector snails live. Adult-stage digeneans usually have a dorso-ventrally flattened, oval body with a smooth, spiny or corrugated surface, a sucker around the antero-ventral mouth, and an additional ventral sucker or acetabulum. Both suckers are used for attachment and locomotion (Paperna, 1996; 1980). Adult trematodes, infecting the digestive tract of fish, are considered harmless, even when their numbers are high. Extraintestinal trematode infections, on the other hand, are potentially pathogenic. Clinostomatid cysts and worms are the largest (up to 5 mm in diameter and 10 × 3 mm in size) and the worm's intestine is loaded with a yellow to orange substance. Metacercariae form massive infections in juvenile (O-class) fish and have, therefore, been implicated as an important cause of natural mortalities at this stage of their lives (Yekutiel, 1985; Farstey, 1986; Paperna, 1991).

In the present study, the Standard length for *O. niloticus* has an average length of 10.8cm; Males had a range of 6.5cm-14.5cm, while females ranged from 7.8cm-14.5cm. The weight of the female ranged from 21.8g — 47.5g and that for males ranged from 21.6g — 35.2g. The females were heavier than the males. This difference could be attributed to variation in the ontogenetic development stages, as well as condition and maturity differences between sexes (Marcogiiese, 2002). Although the difference in weight and length between male and females may not be significant statistically but generally infections in males are slightly less than in females for the same reasons stated above.

6. Recommendations

- Infection in O. niloticus can be effectively controlled by chemical means which should be harmless to the fish, consumers and the environment.
- Indiscriminate waste discharge/disporsal should be avoided from houses, industries and other similar sources
- The public should be made to realised the risks/dangers associated with consumption of under cooked/raw fish.

7. Conclusion

The study revealed that *Oreochromis niloticus* at the Dan-Agundi impoundment was infected by

Bacteria and Parasite. The Bacteria that was found, was isolated from gills that show typical necrosis and the presence of brown to yellowish-brown colour on the gills' filament. The isolated Bacterium 72 (43.63%) suspected to cause the infection is *Flavobacterium spp.* And the Parasites 19 (11.51%) isolated from the external surface of the skin is leech and internal parasites notably *Clinostomum sp*. both adult and encysted meteacercariae. It could be finally concluded that about 91 (55.15%) *Oreochromis niloticus* of Dan Agundi impoundment were infected.

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