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A review of the parasites of catfishes and tilapias in the wild and homestead ponds in Nigeria

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Abstract
Several investigations have been carried out on fish parasites in many Nigerian aquatic ecosystems such as River Benue, Calabar River, Ebony River, Ponds and Homestead Ponds. Catfishes (*Clarias gariepinus, Chrysichthys nigrodigitatus, Malapterurus electricus*) and Tilapias (*Oreochromis niloticus; Tilapia zillii*) were subjected to test and some Ecto and Endo- parasites were found on and in the fish products, such as Leech, *Ichthyobodo multifiliis, Cryptobia iubilans, Tricodina acuta, Ichthyophthirius multifiliis, Procanmallanus laevioncus, Flavobacterium columnare, Alloglosidium corti, Polyonchobothrium clariae, Ichthyobodo necatar, Eimeria chysichthyii, Piscinoodinium pillulare, Chloromyxum auratum, Chilodonella uncinata, Hexamita intestinalis, Encephalitozoon intestinalis; Macrogyrodactylus clarii*. Most of these fish parasites are opportunistic and zoonotic in nature.

Keywords: Aquaculture, fish, freshwater, zoonotic, homestead ponds

1. Introduction
Fish like any other valuable natural resources, require careful management. The growing interest in fish culture has increased the awareness of the importance of disease as one of the major detrimental factors in culturing fish. In spite of the interest in the freshwater ichthyofauna of Nigeria, the parasitic fungal and microbial diseases of fish receive very little attention. Little or no attempt is made to remove the parasites from the fish when they are being introduced to new habitats [3].

The importance of parasitological studies in the development of fisheries potential of ponds and other fish enclosures cannot be over-emphasized. Some work had been done on a number of Nigerian freshwater systems as regards fish parasitofauna and attention was focused on metazoan parasites which include trematode, cestodes, nematodes, acanthocephalans and their encysted larval forms, hirudinean and crustacean parasites [3]. The susceptibility of fish to parasitic infection differs and depends on various factors, including the morphology, immunological characteristics and physiology of digestion in the host. The composition of endoparasitic fauna of a host is dependent on the hosts' feeding and other habits as well as host's specificity and distribution of the parasite [3].

Parasites may harm their host causing mechanical injury such as irritation, injury or atrophy of tissues and occlusion of the alimentary canal, blood vessels or other dusts, introducing toxic metabolic by-products able to produce changes in the blood, enzyme, vitamin and/or hormone activity of the host, depriving the host of food, providing a point of entry for other pathogens through mechanical damage, and acting as carrier or vectors of other pathogens.

Fish is susceptible to illness like humans and other animals, fish suffer from diseases and parasites. Fish defenses against disease are specific and non-specific. Non-specific defenses include skin and scales, as well as the mucus layer secreted by the epidermis that traps microorganisms and inhibits their growth. If pathogens breach these defenses, fish can develop inflammatory responses that increase the flow of blood to infected areas and deliver white blood cells that attempt to destroy the pathogens.

Specific defenses are specialized responses to particular pathogens recognized by the fish's body that is adaptative immune responses [19]. In recent years, vaccines have become widely used in aquaculture and ornamental fish, farmed salmon and koi [6, 17].

Fish is important to human populace in trade and economy; it is important in the diet of different countries especially in the tropics and subtropics where malnutrition is a major

Problem [4]. As the human population inevitably increases, the demand for fish as source of protein also grows. In recent times, there has been tremendous increase in the development of fish farming and culture attributable to the increased need for affordable animal protein especially in the tropics [8]; therefore, catfishes of the family Clariidae are increasingly being used for freshwater aquaculture in Africa owing to several favourable cultural characteristics [27]. Parasitic infection and diseases are some of the factors hindering high productivity in fish farming [11, 22].

According [24] protozoa are a vast assemblage of eukaryotic organisms and that most of the commonly encountered fish parasites are protozoa, which with practice, are the easiest to identify and easiest to control. In general protozoa are one of the major sectors of fish parasites that have been long neglected because of its inherent difficulty in studying compared to other larger parasites. Among protozoa, ecto- and endoparasitic protozoa occupy a very important sector as one of the hazardous threats to fish health. These parasites attack the fish, causing massive destruction of skin and gill epithelium. Even moderate infection of these organisms on small fish may prove a fatal disease, since the infection may cause the fish to stop feeding [13].

There has not been much work done on the effects of parasites on homestead ponds in Nigeria. Parasites have been said to have little consequences on small scale fish farming in sub-Saharan Africa [18]. However, there is current increase in fish farming in sub-Saharan Africa especially Nigeria. Most of the increase, in fish farming is due to increase in small scale homestead fish farming. Homestead fish farming is profitable [26, 28], and has been posited to have potential of increasing fish production in Nigeria by 500,000 tons26. The increase in homestead fish farming leads to increase in number of untrained farmers. There is need to train fish farmers on better farming techniques [20].

Poor management of homestead fish farming and water quality results in stress, diseases and eventually death of fish. Aeromonas and Pseudomonas infections have been noted to be most serious bacterial infection on African fish farms [18]. African catfish have been noted to be *Ichthyophthirius multifiliis, Cryptobia iubillans* and *Ichthyobodo sp.* [30]. Fin and gill rot disease caused by myxobacteria infection has been reported on African catfish (*Clarias gariepinus*) [33, 32]. Platyhelminths like *Diplostomum spathaceum* (eye fluke) cause blindness when fish is infected.

Cercariae penetrate the fish and metacecariae forms in the eyes causing blindness. Parasites of catfish are affected by pollution. Prevalence of catfish parasites have been used as indicator of pollution [25, 5]. There was reduced prevalence of nematode *Paracamallanus cyathopharynx* and also *Procanmallanus laevionchus* as pollutants increased [25]. There was prevalence of *Diplostomum* sp. And *Polyonchobothrium clarias* in both polluted and unpolluted waters. Among the parasites of freshwater fish is the *Flavobacterium columnare* [12]. Nevertheless, the absence of parasites in polluted water may be due to effects of pollutants on the fish and parasite as well. Pollution will reduce food availability to the parasite therefore causing mortality.

Microbial parasites can affect fish and can be very dangerous, mortality and damaging aesthetic values example *Flavobacterium columnare*. The infections of *F. columnare* could be causes of acute to chronic. It mainly affects the gills, fins and skin. The pathology of *F. columnaris* disease is dependent on the particular strain and its virulence [9]. Parasitic infections are also affected by temperature [10]. Prevalence and epizootics of *F. columnare* are associated with rising water temperature, high water turbidity as a result of uneaten food, poor rearing conditions and high stocking density or poor conditions [39, 23, 10]. Homestead fish farms do not require heavy investment and are operated by the owner and members of his household [16, 29, 20].

Consequently, homestead fish pond maybe subject to enabling environments in favour of parasitic infection, for instance, poor water management and rearing conditions. Tilapias are now one of the most widely cultured and distributed exotic fish in the world, second only to common carp, as their introduced range now stretches to nearly every continent and include 90 different countries. Tilapias are widespread in the tropics and sub-tropics [21]. They are highly adaptable and easily cultured. The fish are reared in ponds, cages, or pens and they grow well in freshwater and brackish waters. The high fecundity of the fish; its few disease problems, and the availability of its fry have resulted in intensification of production [36]. Under the original extensive or semi- intensive culture systems, tilapias were more resistant to disease than many other fish species [33, 35, 34]. However, the intensification of culture systems and resultant deterioration in the environment has been associated with an increase in parasitic and Infections disease problems. Infectious diseases are caused by parasites, but host and environmental factors also play a role in their occurrence [37].

Parasite infections in fish causes low production, economic losses through direct fish dead and reduction in fish growth. It also leads to poor reproduction and energy loss; increase in the susceptibility of fish to disease and predation; through high cost of treatment [7]. Information about the mode of transmission and potential intermediate hosts is often very important to select the most appropriate management action to reduce or eliminate the problem [2].

1.1 Prevalences of Parasites of Catfishes and Tilapias in the Wild and Homestead Ponds

[31] investigated on the ecto and intestinal parasites of *Malapterurus electricus* from the Upper River Benue and reported a total of 304 parasites belonging to five species of nematode (*Camallanus* sp., *Capilaria* sp., *Contracaecum* sp., *Eustrongylides* sp., and *Caenorhabditis briggsae*), two species of cestode (*Diphilobothrium lactum* and *B. aengypticus*), one species each of protozoa and trematode (*Henneguya* sp. and *Clinostomum* sp.) [38]. analysed a total of 300 Chrysichthys nigrodigitatus on the examination of protozoan parasites of *Chrysichthys nigrodigitatus* in the Mid-Cross River Flood System, South Eastern Nigeria and observed that *Ichthyobodo necatar* was the most abundant protozoan parasites, followed by *Cryptobia iubilans* and *Eimeria chrysichthyii* and *Piscinoodinium pillullare* and *Chloromyxum auratum* and *Chilodonella uncinata* and *Hexamita intestinalis* and finally *Encephalitozoon intestinalis*.

[15] Carried out a study on the Monogenean parasites of the African catfish (*Clarias gariepinus*) from two fish farms in Calabar, Cross River State, Nigeria with a total of 80 adult of *Clarias gariepinus* and reported 90 monogenean parasites (23 *Dactylogyrus* sp., 46 *Gyrodactylus* sp., and 21 *Macrogyrodactylus clarii*).

[14] Investigated on parasites of African Catfish (*Clarias gariepinus*) Cultured in Homestead Ponds and reported [4] parasites of C. *gariepinus*, (*Procamallanus laevioncus* had the highest prevalence rate at 47.62%, followed by

Flavobacterium columnare with prevalence rate of 38.10% and *Alloglosidium corti* and *Polyonchobothrium clariae* had lowest prevalence rate of 9.5% and 4.7% respectively.

[30] carried out a Comparative Study of the Common Protozoan Parasites of *Clarias gariepinus* from the Wild and Cultured Environments in Benue State, Nigeria with a total of one hundred and twenty C. *gariepinus* comprising [30] dead and [30] live fishes were examined for protozoan parasites infestation, sixty each from the wild and a pond (cultured environment). They reported that I. *multifiliis* was the most abundant (32.56%), followed by *Ichthyobodo* sp. (20.93%), *Trichodina* sp. (20.93%), *Cryptobia iubilans* (17.44%), and lastly *Chilodonella* sp. (8.14%) as shown in table 1.

[1] Carried out a Comparative Assessment of Parasite Infestation of Tilapias in Natural and Cultured Environments. They reported *Camallanus* sp., *Tricodina acuta*, *Dactylogyrus* sp., *Gyrodactylus* sp., *Echthyophithrius multifilies*, Leech and parasite cysts (table 2).

Table 1: Protozoa parasites in dead and live *C. gariepinus* from a pond and Benue River (wild)

Protozoa Parasites	Dead Pond Wild		Live Pond Wild		Location of Parasites
Ichthyobodo sp.	6	7	7	7	Gill
Ichthyophithrius multifiliis	6	6	6	8	Gill
Ichthyophthirius multifiliis	5	6	9	10	Skin
Chilodonella sp.	3	3	2	2	Skin
Trichodina sp.	4	0	3	0	Skin
Trichodina sp.	3	4	6	6	Fin
Cryptobia iubilans	2	4	4	6	Stomach
Cryptobia iubilans	4	5	5	5	Intestine
Total	33	35	42	44	

***Source*:** [30]

Table 2: Parasites Prevalence and Intensity on Wild and Cultured Tilapias (Oreochromis niloticus and Tilapia Zilii)

Parasites	Wild Tilapias	Cultured Tilapias
Tricodina acuta	20	33
Ichthyophithrius multifilies 12	41	
Dactylogyrus sp.	29	37
Gyrodactylus sp.	32	34
Camallanus sp.	50	98
Leech	0	7
Total	143	250

***Source*:** [1]

Among the wild species of O. *niloticus* and *T. zilii* collected (96 fish samples, 40 (42%) were infested, while 33 (67%) were infested from a total of 49 fishes from the different cultured sites. 35% of *T. zilii* were parasitized while 48% of *O. niloticus* were infested, resulting that *O. niloticus* were highly infested than *T. zilii*.

2. Conclusion

A lot of fish farmers in Nigeria have been misinformed that diseases and parasites do not affect the production of fish in fish farming. Fish parasites result in economic losses not only mortality, but morbidity and also from treatment expenses, growth reduction during and after outbreak of disease and this militate against expansion of aquaculture. Protozoan parasites cause serious losses in fish ponds and wild in Nigeria, and their lesions render the fish unmarketable. Fish carrying protozoa (zoonotic) parasites are capable of passing on the infective disease to man after its consumption.

Some fish parasites would develop in humans if the fish is eaten raw by individuals, but none would be harmful if the fish is thoroughly cooked before consumption. Incidences of people being infested with fish parasites were because of ingestion of raw fish or not sufficiently cooked fish. Most fish especially in the wild population are likely to be infested with parasites, but in the great majority of cases, no significant harm to the host may be ensued or identified; thus, there are only few incidences of parasites causing dead or serious damage to the fish populations, but this may be largely because such effects go unnoticed. Fisher folks or consumers often observe parasites in wild fish only when they are so obvious as to lead to rejection of fish. In culture fish population, on the other hand, parasites often cause serious outbreak of disease. The presence of dense populations of fish kept in particular environmental conditions may favour certain parasites so that the parasite population increases to a very high level. Parasites are the most diverse and common pathogens, the fish farmer may likely encounter, and parasitic diseases are very common in first all over the world and are of particular importance in the tropics.

The growth of aquaculture calls for greater concerns on fish farming and fish health. Parasites can be source of the downwards trend in growth of fish business in the wild and at home if not checked.

2.1 Recommendations

The proliferation of parasites can easily be stopped by proper farm hygiene, good feeding and water quality management. Homestead ponds operators should constantly resort for training to ensure updating their knowledge in fish culture.

The activities of homestead farmers should be monitored by concerned organizations. This would reduce incidence(s) of parasitic infection and possible financial loss and poor aesthetic value of parasitized in fish, in the aquaculture enterprise.

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