

Occurrence of *Diplostomum Spp.* in the Eye of Farm Raised African Catfish (*Clarias Gariepinus*) in Oyo State

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Abstract: *Diplostomum* species are the parasites responsible for diplostomiasis in fish which may cause ocular diseases such as blindness, eyefluke, severe ocular disease and opacity of the lens. The parasites use many organisms including fish as host. African catfish is one of the widely distributed fish species in tropical Africa and has become one of the most important culturable fish species in Africa especially in Nigeria. This study examined the occurrence of *Diplostomum* species in farm raised African catfish in Oyo state. The study was carried out in Oyo State, Nigeria. A total of 216 eye samples were collected from 108 fishes in 36 farms. The eye lens and vitreous were examined for the presence of *Diplostomum* species. The data obtained were analysed using descriptive statistics and regression analysis to the relationship between the eye size and parasite occurrence. The result shows that 16.20% of the samples had *Diplostomum* species. Males had higher occurrence (23.53%) than the females (9.65%). A positive correlation ($R^2 = 0.125$) between eye diameter and occurrence of the parasites was observed. The study revealed that *Diplostomum* species was present at a low incidence in African catfish raised in Oyo state and there was positive relationship between the eye diameter and occurrence of the parasite.

Keywords: *Diplostomum spp.*, Eye, Fish, Infection, Parasites

Çiftlik Şartlarında Oyo Eyaletinde Yetiştirilen Yayın Balıklarının (*Clarias gariepinus*) Gözlerinde *Diplostomum Spp.*'nin Görülme Oranı

Özet: *Diplostomum* türü parazitler, balıklarda körlük, şiddetli göz hastalığı, göz nezlesi ve lensin matlaşması gibi göz problemlerinden sorumlu parazitlerdir. Afrika yayın balığı, Afrika'da özellikle Nijerya'da kültür balıkçılığında yaygın bir şekilde yetiştirilen en önemli tropikal balık türü olup *Diplostomum* türü parazitler bu balıkları konakçı olarak kullanırlar. Bu çalışma Nijerya'nın Oyo Eyaletinde çiftlik şartlarında yetiştirilen yayın balıklarında (*Clarias gariepinus*) *Diplostomum* türü parazitinin varlığını araştırmak amacıyla yapılmıştır. Toplam olarak 36 balık çiftliğinden temin edilen 108 balığa ait 216 adet göz araştırma materyali olarak kullanılmıştır. Araştırma materyali olarak kullanılan gözlerden elde edilen lensler ve vitreous'lar *Diplostomum* türleri varlığı açısından incelendi. Elde edilen verilerden göz boyutu ve parazit görülme oranı arasındaki ilişki regresyon analizi ile istatistiksel olarak analiz edildi. Sonuç olarak araştırmada kullanılan örneklerin %16.20'sinde *Diplostomum* türü parazit rastlandı. Cinsiyet olarak erkeklerde görülme oranı (%23.53), dişilerden (%9.65) fazla bulunmuştur. Göz çapı ve parazit görülme oranı arasında pozitif bir ilişki bulunmuştur ($R^2=0.125$). Çalışmanın bulguları Oyo eyaletinde yetiştirilen Afrika yayın balıklarında *Diplostomum* türü parazitlerin düşük düzeyde bulunduğu ve göz çapı ile parazit yoğunluğu arasında pozitif bir ilişkinin bulunduğunu göstermiştir.

Anahtar Kelimeler: Göz, Parazit, Enfeksiyon, Balık, *Diplostomum spp.*

Introduction

Diplostomum species are the parasites responsible for diplostomiasis in fish. It is caused by the attack of *Diplostomum* species which result into blindness, eye fluke, severe ocular disease, opacity of the lens and brain-inversion among others. It is a widely distributed parasite and has ability to survive without becoming enclosed in a capsule (encystations) as seen in most freshwater fishes. The parasite has become an organism of concern because

it uses many organisms including fish as host and predatory birds as carrier. Esc (1993) reported that genus of *Diplostomum* are widely distributed and are common parasites in aquatic environments. Fish eye lens, retina, spinal cord, nasal spaces, as well as the brain are major areas where *Diplostomum* dominate (Chappell et al., 1994). African catfish is one of the widely distributed fish species in tropical Africa. Over the years it has become one of the most important

culturable fish species in Africa especially in Nigeria. Its wide acceptance might be associated with some importance characteristics such as high quality flesh, hardy in nature, high tolerance level of water characteristics and production performance among others. It also attracts significant market values. *Clarias gariepinus* belongs to the family Clariidae. It has a specific organ used for air breathing which allows the fish to survive in wide range of water and environmental parameters such as low dissolved oxygen levels which is usually harmful or lethal to other species. It has ability to consume varieties of conventional and non-conventional feed including kitchen waste (Sule, 2003; Omitoyin, 2007; Bello, 2014). It has been cultured singly and/with other species in form of polyculture in Nigeria.

Since some of the physiological activities of the fish such as feeding, swimming, mating etc are vision dependent, it is important that fish has clear vision ability to enable it compete well in the system. Fish with impaired vision will rely on feed that come it way thereby affecting its growth and consequently affecting fish farming business as a profitable business. It could also expose the fish to predation (when fish could not sight the predators easily) and therefore increase mortality. The objective of this study is to report the occurrence of *Diplostomum* species in farm raised African catfish in Oyo state.

H_0 = The distribution of the intensity of infection is not significantly different across the sex (Males and Females)

Materials and Methods

The study was carried out in Oyo State, located in the South-West geopolitical zone of Nigeria on Latitude $N8^{\circ}0'0''$ and Longitude $E4^{\circ}0'0''$ (OYSG, 2015). The four agro-ecological zones of Oyo State was adopted for this study (OYADEP). The zones are Ibadan/Ibarapa, Oyo, Saki and Ogbomoso zones (Rasheed and Adenike, 2009; Adeola, et al., 2012). Farms in each zones were sub-grouped into Large, Medium and Small scales using stratified methods as described by Oguntade et al. (2005), Fagbenro (2005), Fagbenro and Adebayo (2007) and Ayinla (2007). A total number of thirty-six (36) farms (5 Large, Medium and Small scales farms) were selected.

Sample collection: A total number of one hundred and eight (108) live fish were collected and transferred to the Department of Veterinary Parasitology, University of Ibadan for parasites

examination. The mean body weight and total length were 626.56 ± 136.99 g and 45.42 ± 5.72 cm respectively.

Parasite examination: The skin around the eye was clean with a sterile cotton wool and the eyes were gently pulled with forceps. The optic nerve was cut using scissors and the eyes were placed in a sterile disposable petri dish. A total of two hundred and sixteen eye samples were collected. The eye lens and vitreous were examined for the presence of *Diplostomum* species under microscope and was presented as described by Bush et al. (1997) and Migiroy et al. (2015). Percentage, density, intensity and index of infection were calculated using the following equations

$$\text{Density of infection} = \frac{\text{Number of parasites collected in a sample}}{\text{Total samples examined}}$$

$$\text{Intensity of infection} = \frac{\text{Number of parasites collected in a sample}}{\text{Number of infected samples}}$$

$$\text{Index of infection} = \frac{\text{Number of samples infected} \times \text{Number of parasite collected}}{\text{Total samples examined}}$$

Statistical analysis: The data obtained were analyzed using descriptive statistics and regression analysis to the relationship between the eye size and parasite occurrence. A Chi-square test was performed in order to determine whether the difference in the occurrence of the parasites between males and females was significant. Significance of difference in the intensity of the infection between males and females was analyzed by Mann-Whitney U test ($P < 0.05$) using IBM SPSS version 20.

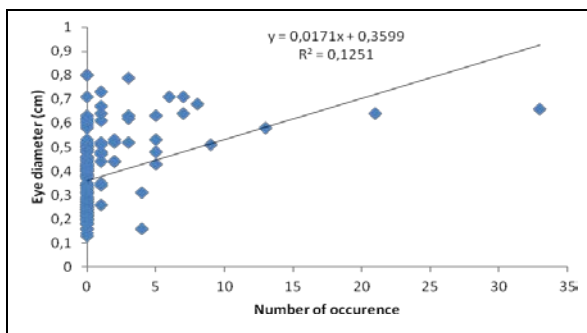
Results

Table 1 show that 16.20% of the samples had *Diplostomum* species. Males had higher occurrence (23.53%) than the females (9.65%) ($\chi^2 = 7.64$, $P < 0.01$). However, intensity of the infection was higher in females than males ($P = 0.003$).

Table 1. Occurrence of *Diplostomum* species in farm raised African catfish.

Parameter	Female	Male	Total
Mean Body Weight (g)	595.59±56.31	626.56±72.32	601.37±51.33
Mean Eye Diameter (mm)	0.36±0.14	0.38±0.15	0.39±0.01
Number of fish examined	57	51	108
Number of eye samples	114	102	216
Number of infected eye samples	11	24	35
Number of parasites	73	91	164
Percentage of infection (%)	9.65	23.53	16.20
Intensity of infection	6.64	3.79	4.69
Index of infection	7.04	21.41	26.57
Density of infection	0.64	0.89	0.76

The model Eye diameter (cm)=0.0017 Number of occurrence +0.359 which implies that for increase in eye diameter, the number of occurrence of *Diplostomum* species tends to increase by 0.017 unit. The Pearson correlation (R^2) (0.125) equivalent to about 12.5% fitness was weak as shown in figure 1.

**Figure 1.** Relationship between number of *Diplostomum* spp. occurrence and eye diameter.

Discussion

The study shows that about 16.20% of the samples had *Diplostomum* spp. The result recorded in this study was lower than values 84% recorded in Chepkoilel farm in Kenya by Migiro et al. (2015), 78% observed in *Acanthobrama marmid* in Turkey by Dörüce et al. (2002), and 52% in pond farm in Kenya by Fioranvanti et al. (2009). The low value observed in this study might be attributed to the uses of net to cover the pond in the farm in Oyo state which might prevent bird from having access to the pond. Predatory birds are one of the major carriers that aid the distribution of the *Diplostomum* species (Chappell et al., 1994). The parasite requires three hosts to complete its life cycle. Fish predatory bird passes it onto snail and fish before it completes its life cycle. Therefore, prevention of fish predatory birds from access to the farm might be responsible for its low

occurrence (Umar, 2014). The presence of *Diplostomum* species may cause blindness and even death of host fish (Shariff et al., 1980), however, there was a positive relationship between eye diameter and occurrence of the *Diplostomum* spp. although the relationship (0.125) in the study was very weak. Its presence is capable of reducing feeding efficiency of the fish (Migiro et al., 2015). The high occurrence in males recorded in this study was in agreement with the work of Mohamed (2005) who reported that males have high prevalence than the females.

Conclusion

The study revealed that *Diplostomum* species was present at a low incidence in African catfish raised in Oyo state and there was positive relationship between the eye diameter and occurrence of the parasite.

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