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Comparative analysis of Zooplankton in Diet of Two Ornamental Fishes (*Hemichromis Bimaculatus and Poecilia Reticulata)* in Limca Reservoir, Jos, Nigeria

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ABSTRACT

The cultivation of zooplankton as live feed offers a cost-effective solution to the high expenses associated with fish feeding. This study investigated the feeding habits of two ornamental fish species—*Hemichromis bimaculatus* and *Poecilia reticulata*—through gut content analysis of specimens collected from Limca Reservoir in Jos, Plateau State. The aim was to identify the specific planktonic organisms selectively ingested by these fish. A qualitative analysis of their stomach contents was conducted, and plankton components were identified to the genus level. T-test was used for the analysis and descriptive analysis. Fourteen zooplankton taxa were identified in the gut of *Hemichromis bimaculatus*, while eleven were found in *Poecilia reticulata*. Rotifers were the most dominant group, followed by cladocerans. The high frequency of occurrence of species such as *Conochilus* sp., *Brachionus angularis*, and *Daphnia* sp. suggests a dietary preference for these organisms. Based on these findings, these zooplankton species are recommended for mass culture and use as live feed by aquarium hobbyists and ornamental fish breeders.

Keywords: Zooplankton, Ornamental Fishes, *Hemichromis bimaculatus*, *Poecilia reticulata*, Limca Reservoir

INTRODUCTION

Zooplankton, which include groups such as Rotifera and Cladocera, are essential components of freshwater food webs, serving as primary consumers that transfer energy from phytoplankton to higher trophic levels, including fish (Imoobe & Adeyinka, 2010). The composition and abundance of zooplankton in the diets of these fishes is important for assessing their ecological roles and for managing fishery resources effectively. Previous studies in Nigerian waters have documented diverse zooplankton assemblages, highlighting their significance in aquatic productivity and fish nutrition (Ezekiel *et al.*, 2011).

Reservoirs in Jos Plateau harbour many choice cichlids among which are the ornamental fish (*Hemichromis bimaculatus)* is also known as Jewelfish or Jewel cichlid is from the Cichilidae family. it is a small ornamental fish that can grow up to 6in or 15cm. *Poecilia reticulata* are popular ornamental fish that are also called Guppies, million fish or Mosquito fish. They are popular aquarium fish and well known to be hardy and survive on plankton. They are omnivores. They can survive on concentrate feed as well as live food such as plankton (Arimoro and Ofojekwu, 2005). Laboratory examination of stomach content of fish and other aquatic organisms had been considered as the technique to provide information concerning feeding habit of fish, the kinds of organisms that are eaten, the mechanisms that have developed for digestion as well as the trophic relationships of fishes and the ability of the environment support to the growth of the fish. This is very important for fish because they require adequate nutrition in order to grow and survive. There is no baseline information of this type of work in the study area. This research aimed at analyzing the composition of the stomach content for zooplankton in the Limca Reservoir in Jos, Plateau state, Nigeria.

MATERIALS AND METHODS

This study was carried out in Limca reservoir, Tolemache Village Jos Noth Local Government Area Plateau, The X/Y coordinates for Tolemache sampling areas respectively are as follows 496650.1/1093889. The sampling was done bi-weekly in the rainy months of April to September, 2024. Fish net was set over night and checked as early as 5 am in the morning

Zooplankton Enumeration Procedure:

The guts of the fishes were slit open and emptied into a five ml sample container and preserved with 10%formalin to form 10 ml solution. This was done using Sedgewick-Rafter counting cell, compound microscope, Sedgewick-Rafter counting slide, pipette or syringe, coverslip as described by Zacharia and Abdurahiman (2004). Sample was stirred gently to avoid damage to the zooplankton appendages. 1ml of sample was drawn from the 10 ml concentrate by using the wide mouth pipette or medicine dropper. This 1ml sample was set on the Sedgewick-Rafter counting cell made of glass or plexiglass rectangle of 50×20×1 sq.mm This cell holds exactly1ml of the sample. A glass overslip was used to cover the cells which prevent the sample from drying out and disturbances by air currents. The is the viewed under the microscope and zooplankton are counted. The procedure was repeated by taking another drop of sample and counted. The plankton was calculated by following formulae: The total number of planktons in a liter of sampled was calculated using the formula:

Number of orgasm per ml= Number of organism counted/

number of replicates

RESULTS

Table 1 shows Zooplankton found in the gut of two Ornamental Fish Species. The analysis of gut contents shows that *Poecilia reticulata* consumed a higher quantity and greater variety of zooplankton species compared to *Hemichromis bimaculatus*. Specifically, *P. reticulata* had significantly higher counts of *Centrophixis* sp., *Trichocerca* sp., *Brachionus angularis*, *Polyarthra* sp., *Daphnia* sp., *Chydorus* sp., and *Ceriodaphnia* sp. In contrast, *H. bimaculatus* showed greater consumption of *Anuraeopsis fissa*, *Moina* sp., *Diaphanosoma* sp., and *Bosmina* sp. Both species had equal amounts of *Nauplii* in their guts.

Table 1: Zooplankton found in the gut of two Ornamental Fish Species

Zooplankton Species	Hemichromis bimaculatus	Poecilia reticulata	P-value
Centrophixis sp.	4.00[b]	10.00[a]	0.002
Trichocerca sp.	3.00[b]	10.00[a]	0.001
Anuraeopsis fissa (Gosse)	18.00[a]	0.00[b]	0.000
Conochilus unicornis (Rousselet)	50.00[b]	54.00[a]	0.000
Brachionus angularis (Gosse)	24.00[b]	64.00[a]	0.008
Polyarthra sp.	10.00[b]	20.00[a]	0.000
Alona sp.	2.00[b]	4.00[a]	0.070
Moina sp.	2.00[a]	0.00[b]	0.070
Daphnia sp.	0.00[b]	28.00[a]	0.000
Diaphanosoma sp.	5.00[a]	0.00[b]	0.004
Bosmina sp.	10.00[a]	4.00[b]	0.002
Chydorus sp.	2.00[b]	16.00[a]	0.000
Ceriodaphnia sp.	4.00[b]	45.00[b]	0.000
Nauplii	11.00	11.00	1.000

The result illustrated by Figure 1 shows that 13 zooplankton were found in the gut of *Hemichromis bimaculatus* (Jewelfish) most of which were rotifers. The result showed that *Conochilus* sp had the highest occourrence followed by, *Brachionus angularis and Anuraeopsis fissa.* The result of gut content analysis of *Poecilia reticulata* (Million or Mosquito fish) for zooplankton is shown in Figure 2. The zooplankton mostly seen in the gut is *Conochilus* sp, followed by *Brachionus angularis*, *Ceriodaphnia* sp and *Dapnia* sp. Daphnia sp is absent in the gut of *Hemichromis bimaculatus* but has high occurrence in *Poecilia reticulata.* Copepods were notably absent except for the few nauplii which is a stage of their metamorphosis.

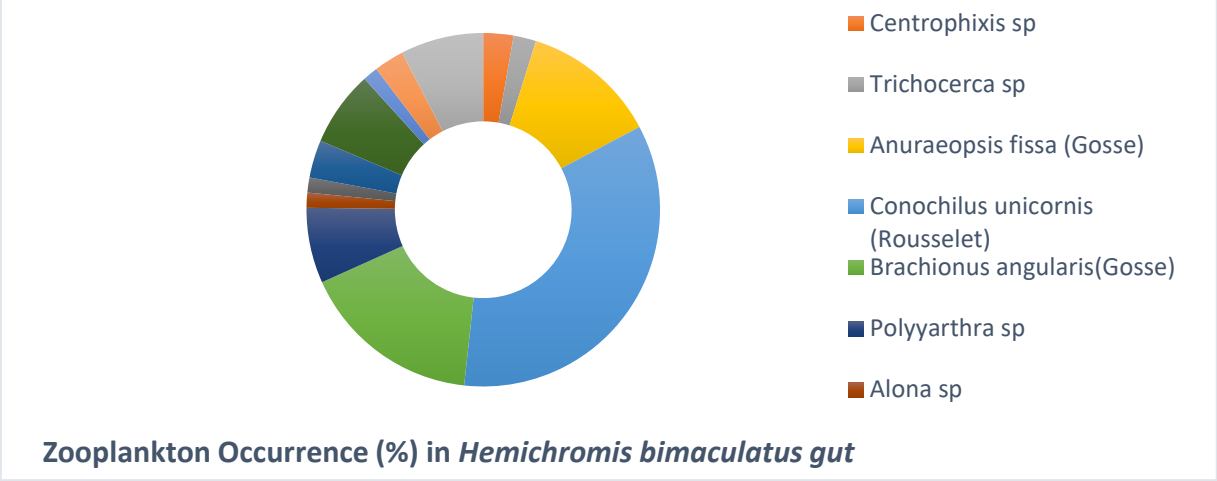

Figure 1: Zooplankton percentage occurrence in the gut of *Hemichromis bimaculatus*

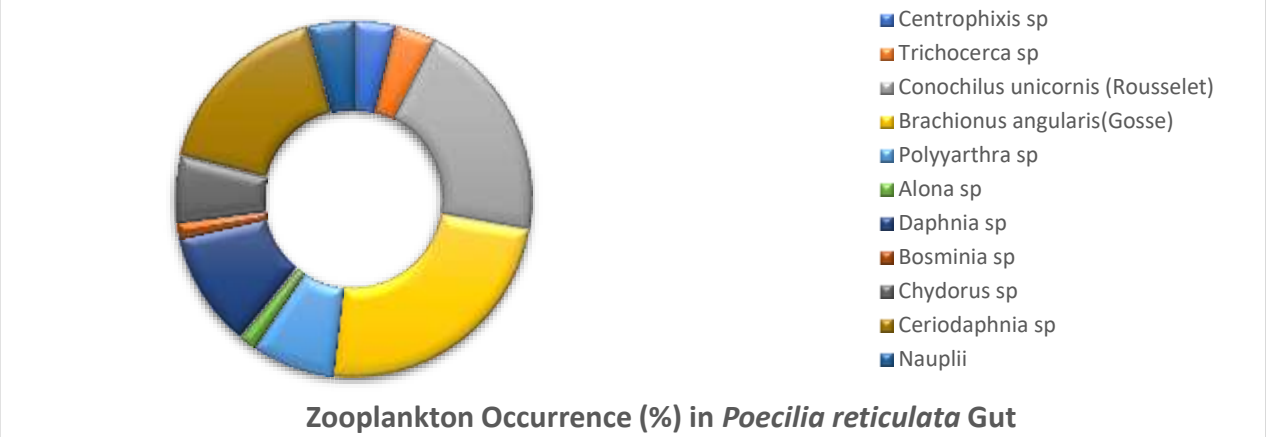

Figure 3: Zooplankton percentage occurrence in the gut of *Poecilia reticulata*

***Hemichromis bimaculus* (Cichlidae)**

Male Guppies (*Poecilia reticulata*)

Female Guppies (*Poecilia reticulata)*

Male Guppies (*Poecilia reticulata*)

The two ornamental fishes fed voraciously on zooplankton

DISCUSSION

The number of zooplankton identified the gut of the two fishes is high when compared with the work of Budihastut (2013) who discovered only seven plankton in the gut of *Oreochromis niloticus*. The high occurrence of some zooplankton in the gut of these fishes more than others show that the practiced selective voracious feeding on their preferred food substrate. This is evident in the consistent higher numbers of rotifers such as *Conochilus* sp, *Brachionus angularis and Anuraeopsis fissa* found in their guts during this study. These experimental fishes are small bodied fishes which explains their preference for rotifers above larger zooplankton such as cladocerans and copepods. *Thermocyclops* sp, *Keratella tecta, K. choclearis, K. valga* and *Brachionus falcatus* species of zooplankton which were reported by Oyedapo *et al*. (2017) and Oyedapo (2025) as abundant in reservoirs on the Jos Plateau were absent in the gut of these ornamental fishes. These fishes may have avoided these particular group of zooplankton due to the large body size or the spiny structure on there bodies which prevents predation to some extent. Low fish predation leads to the dominance of large cladocerans either through competitive superiority of large species (i.e size-efficiency theory) and/or size-selective predation by macro-predators (Cottenie *et al.*, 2001). The absence of some zooplankton in the fish gut may also be that they have been digested beyond recognition before the fishes were caught. These two ornamental fishes selected almost the same kind of zooplankton species as food. This implies that they can be kept together in polyculture.

CONCLUSION

Two ornamental fish species in the reservoirs fed actively and selectively on zooplankton, mainly rotifers. Jewelfish and guppies had 14 and 11 zooplankton species in their guts, respectively, with *Conochilus* sp., *Brachionus angularis*, *Daphnia* sp., and *Anuraeopsis fissa* most common. Adult copepods were absent. Both species shared similar dietary preferences, suggesting they can be reared together. The preferred zooplankton can be mass-cultured as supplementary feed for Jewelfish, guppies, and fish fry to boost production at lower cost.

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