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Pollution status and parasite load of *Clarias gariepinus* in Digil dam, Mubi-north, Adamawa state, Nigeria

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Abstract
Pollution status of water and parasite load of *Clarias gariepinus* in Digil Dam, Mubi, Adamawa State was conducted from October to December, 2019. Water samples were collected from three sites of the Dam for physico-chemical analysis, and some of the parameters were measured on site. Water temperature fluctuated between 23.90ºC to 24.70ºC which was moderate for supporting aquatic life. Dissolved oxygen was lowest at site A and highest at site C in the month of October. Conductivity of the water body ranged between 12.60 µS/cm at site B in the month of October and 15.00 ± 0.00^{a} µS/cm at site C in the month of December, turbidity ranged from 3.65 at site A to 43.00 cm at site B in the month of October. pH was near the normal range for aquatic organisms. The concentrations of heavy metals ranged during the period of the research were Copper (0.062 to 0.086 mg/L), Zinc (0.011 to 0.016 mg/L), Lead (0.00 to 0.114 mg/L), Cadmium (0.00 mg/L) and Iron (0.00 to 2.14 mg/L). The result of this study also revealed that different parasites belonging to different parasitic groups are protozoa (*Trichodina sp*, *Coccidia sp*, *Chilodonella sp*, *Ichthophthirius sp*, and *Ichthyoboda* sp.), one species of Leech (*Pisciolo gemetra* sp,) respectively were observed to be present in *C. gariepinus* used for this research work and at both sites samples. The result revealed that *Clarias gariepinus* are infected with ectoparasites. Therefore, it was recommended that prevention of water contamination by raising public awareness of the dangers of misuse water bodies and avoiding eating half cooked freshwater fish and cooking fish enough will prevent infection with the fish parasite.

Keywords: Pollution, *Clarias gariepinus*, Mubi-north, *Pisciolo gemetra*

Introduction
Pollution is the introduction of a contamination into the environment. Water is considered polluted if some substances or condition is present to such a degree that the water cannot be used for a specific purpose. Water is one of the renewable resources essential for sustaining all forms of life, food production, economic development, and for general wellbeing. Water is a vital resource for fish. It is the medium in which the fish lives; therefore the growth of any fish is directly related to the water quality (Ajana *et al*., 2006). Okram *et al*. (2003) [3, 14] maintained that physico-chemical features of water and sediment play important role in the structure and functioning of lake and Dams ecosystem. Water pollution is the biggest challenge for all developing countries, undermining economic growth as well as the physical and environmental damage to billions of people (Mateo-sagasta *et al*., 2017) [12]**.** Physical and chemical properties of water are one of the most important determinants of the use of water for different purposes and the organisms present in the water show a great sensitivity to any change in the physical and chemical properties of the aquatic environment in which they live. Parasite is an important group of pathogen causing infection and diseases of fish both in freshwater and marine environments (Chandra, 2006) [8]. Parasitic infection causes production and economic losses through direct fish mortality, reduction in fish growth, fecundity and increase in the susceptibility of fish to diseases (Salawu *et al*., 2013) [20]. Parasitic infestations are therefore becoming threats for fish health management and aquatic crop production. Helminthes are among the most important parasites and include nematodes, trematodes, cestodes and acanthocephalans affecting both wild and cultured fishes (Hussen *et al*., 2012) [10]. These diseases are closely linked to environmental pollution and stress. Pollution remains a major problem worldwide caused by both natural process and anthropogenic activities of human in all life processes. Digil dam is the only dam in Mubi. It receives a wide variety of waste as a result of agricultural activities and also uncontrolled direct or indirect dumping of domestic waste, sewage and agricultural waste.

This waste generated flow into the dam and contaminated the water with various pollutants.

Materials and Methods

Study area

This study was carried out in Digil Dam Mubi North, Adamawa State. Digil Dam is located in Mubi North Local Government Area of Adamawa State within the North-Easthern Nigeria. Digil Dam is found between Longitude 13º 20´ East and Latitude 10º 35´ North (Adebayo, 2004) [2].

Study Sites and Duration

This study was conducted in Digil dam Mubi North Local Government Area of Adamawa State. The study site was divided in to three: inlet (Site A), middle (Site B), outlet (Site C). The study was conducted for the period of three months (October, November and December).

Sample Collection

Water physicochemical parameters such as temperature, pH, Dissolved oxygen, conductivity and transparency were analyzed at the sites while those that cannot be analyzed at the site were brought to the laboratories. Surface water was collected Bi-monthly using a sampling procedure as guided by Radojevic and Bashkin (2006) [18].

Physicochemical Parameters

Temperature was determined directly at the sampling site (insitu) using a mercury bulb thermometer (Glaswekwer tein model). The pH of the water body was determined at the site (insitu) using pH meter (model: Pen type pH meter). Conductivity was determined at the site using conductivity meter (model: Large).

Determination of Heavy Metals in Water

Heavy metals (Cu, Ni, Pb and Zinc) in the water samples were determined using Atomic Absorption Spectroscopy (AAS) as described by (APHA 1998; Radojevic and Bashkin, 2006) [18].

Fish sample collection, identification and isolation of ecto-parasite: A total of 18 samples (*Clarias gariepinus*) were collected from Digil Dam Mubi North, Adamawa State Nigeria. Fish was taken to the Department of Fisheries and Aquaculture laboratory for analysis. In the laboratory, preliminary data was recorded such as fish identification (Olaosebikan and Raji, 1998) [15]. The procedure for examining the ecto-parasites on skin of *C. gariepinus* was adapted from Arthur and Albert (1994) [5]. All the Samples collected were examined and processed by a method prepared by Marcogliese (2002) [11]. The ecto-parasites were isolated following the procedures recommended by Omeji *et al.*, 2011) [16].

Statistical Analysis

Data obtained in this study were analyzed using one way analysis of variance (ANOVA) (Statistix 9.0 (2012) to determine the mean significant variation (at 0.05) in physicochemical parameters and heavy metals in the sampling stations.

Results

Physicochemical Parameters, Heavy metals, Parasite load of *C. gariepinus* og Digil

Physicochemical Parameters, Heavy metals, Parasite load of *C. gariepinus* of Digil is presented on table 1, 2 and 3 respectively.

Table 1: Some physicochemical Parameters of Digil Dam

Month	Parameters	Sampling stations		
		A	B	C
October	Temp (˚C)	23.90 ± 0.00^{b}	24.05 ± 0.00^{a}	24.15 ± 0.01^{a}
	DO (mg/l)	5.82 ± 0.05^{c}	6.46 ± 0.05^{b}	6.81 ± 0.05^{b}
	Cond (µscm^{-1})	14.15 ± 0.00^{a}	12.60 ± 0.00^{b}	14.46 ± 0.00^{a}
	Trans (cm)	3.65 ± 0.00^{c}	43.00 ± 0.00^{a}	22.50 ± 0.00^{b}
	pH	7.70 ± 0.00^{a}	7.50 ± 0.01^{c}	7.64 ± 0.00^{b}
November	Temp (˚C)	23.97 ± 0.00^{a}	23.98 ± 0.00^{a}	23.92 ± 0.00^{a}
	DO (mg/l)	6.12 ± 0.05^{a}	6.69 ± 0.00^{a}	6.71 ± 0.05^{a}
	Cond (µscm^{-1})	13.70 ± 0.07^{b}	14.09 ± 0.04^{a}	13.82 ± 0.05^{a}
	Turb (cm)	23.00 ± 0.00	33.00 ± 0.00^{a}	26.50 ± 0.00^{b}
	pH	7.65 ± 0.05^{a}	7.30 ± 0.00^{b}	7.60 ± 0.00^{a}
December	Temp (˚C)	24.72 ± 0.00^{a}	24.50 ± 0.00^{a}	24.25 ± 0.01^{a}
	DO (mg/l)	6.03 ± 0.05^{a}	6.25 ± 0.00^{a}	6.72 ± 0.05^{a}
	Cond (µscm^{-1})	14.18 ± 0.00^{b}	14.95 ± 0.05^{b}	15.00 ± 0.00^{a}
	Turb (cm)	27.00 ± 0.00^{b}	37.00 ± 0.00^{a}	37.00 ± 0.00^{a}
	pH	7.40 ± 0.00^{a}	7.65 ± 0.00^{a}	7.40 ± 0.00^{a}

Mean in the same Row with the same Superscript do not differ significantly (P< 0.05)

Table 2: Some Heavy Metals of water from Digil Dam

Month	Heavy metals	Sampling stations		
	(mg/ml)	A	B	C
October	Copper (Cu)	0.064 ± 0.01^{a}	0.063 ± 0.00^{b}	0.062 ± 0.01^{c}
	Zinc (Zn)	0.012 ± 0.00^{c}	0.011 ± 0.05^{c}	0.014 ± 0.05^{b}
	Lead (Pb)	0.00 ± 0.00^{a}	0.00 ± 0.00^{a}	0.00 ± 0.00^{a}
	Cadmium (Cd)	0.00 ± 0.00^{a}	0.00 ± 0.00^{a}	0.00 ± 0.00^{a}
	Iron (Fe)	0.00 ± 0.00^{a}	0.00 ± 0.00^{a}	0.00 ± 0.00^{a}
November	Copper (Cu)	0.086 ± 0.05^{a}	0.086 ± 0.05^{a}	0.083 ± 0.03^{b}
	Zinc (Zn)	0.014 ± 0.00^{b}	0.016 ± 0.05^{a}	0.016 ± 0.05^{a}
	Lead (Pb)	0.114 ± 0.05^{a}	0.110 ± 0.00^{b}	0.105 ± 0.05^{b}

	Cadmium (Cd)	0.00 ± 0.00 [a]	0.00 ± 0.00 [a]	0.00 ± 0.00 [a]
	Iron (Fe)	2.11 ± 0.05 [c]	2.12 ± 0.00 [b]	2.14 ± 0.05 [a]
December	Copper (Cu)	0.065 ± 0.05 [a]	0.065 ± 0.00 [a]	0.063 ± 0.05 [b]
	Zinc (Zn)	0.014 ± 0.05 [b]	0.016 ± 0.00 [a]	0.014 ± 0.05 [b]
	Lead (Pb)	0.053 ± 0.05 [b]	0.056 ± 0.00 [a]	0.054 ± 0.05 [b]
	Cadmium (Cd)	0.00 ± 0.00 [b]	0.00 ± 0.00 [a]	0.00 ± 0.00 [a]
	Iron (Fe)	1.87 ± 0.06 [a]	1.87 ± 0.03 [a]	1.86 ± 0.05 [a]

Mean in the same Row with the same Superscript do not differ significantly ($P< 0.05$)

Table 3: Parasite load of *C. gariepinus* from Digil Dam

Month	Parasite load	Sampling Site		
		A	B	C
October	*Trichodina sp.*	--	--	--
	Coccidia sp.	--	--	*
	Chilodonella sp.	--	--	******
	Ichthophthirius sp.	--	--	--
	Pisciolo gemetra sp.	--	**	--
	Ichthyoboda sp.	--	**	--
November	*Trichodina sp.*	--	--	--
	Coccidia sp.	--	--	*
	Chilodonella sp.	**	***	--
	Ichthophthirius sp.	*	*	--
	Pisciolo gemetra sp.	--	--	--
	Ichthyoboda sp.	--	--	*
December	*Trichodina sp.*	--	***	**
	Coccidia sp.	**	--	**
	Chilodonella sp.	--	--	--
	Ichthophthirius sp.	--	--	--
	Pisciolo gemetra sp.	--	--	--
	Ichthyoboda sp.	--	**	--

Key: * indicate species of parasite isolated, -- No Parasite Isolated

Discussion

Physicochemical Parameters

The water temperature fluctuations observed throughout the period of the study are within the normal range of 8-30ºC that fish adapt in the tropics (Abubakar *et al*., 2006) [1]. The high conductivity values recorded in December may be due to the monthly fluctuation of monthly mean values of pH around the neutral point of 7 recorded in the Dam and low transparency. The monthly mean turbidity of Digil Dam was lowest at site A in the month of October and highest at site B in the month of October. The low turbidity observed at site A of the Dam may be due to suspended matter created by inflow of water. Ufodike and Garba (1992) [21] observed that decrease in water transparency reduces production of natural food in water. The mean pH recorded at the two sites in the months of November and October could be as a result of complete dry season. Abubakar (2006) [1] reported that pH is an important parameter in many ecological studies because there is a strong relationship between pH and the physiology of most aquatic organisms.

Heavy metals

The levels of Cu in the water sampled fluctuated between 0.062 ± 0.01[c] mg/L to 0.086 ± 0.05[a] mg/L. The Copper concentrations in the water samples in Digil Dam were found to be higher than the permissible limit of 0.05 mg/L set by WHO (2004) [22] and within the permissible limit of 1mg/L set by NIS (2007) [13] for the survival of aquatic organisms. The concentrations of Zn in Digil Dam were observed to be within the permissible limits of 0.3 mg/L and 3 mg/L in water set by WHO (2004) [22] and NIS (2007) [13] respectively. Zn plays a biochemical role in the life processes of all aquatic plants and animals; therefore, they are essential in the aquatic environment in trace amounts. The concentration of Pb in water samples from Digil Dam exceeds the permissible limit of 0.01 mg/L set by WHO (2004) [22] and NIS (2007) [13] respectively. The higher level of lead observed in the water samples from Digil Dam might be attributed to run off from agricultural land which contains agrochemicals (pesticides, fertilizers etc.) (Banat *et al*., 1998) [6]. The concentration of Cd in the water samples was observed to be 0.00 mg/l. The dam is observed not to be affected by pollution sources from cadmium or it compounds. The monthly mean concentration of iron in mg/l level varied from 0.00 ± 0.00[a] to 2.14 ± 0.05[a] during the period of the study. The result is contrary to WHO (2004) [22] and NIS (2007) [13] guideline value of 0.3 mg/l.

Parasite Load

Different parasites belonging to different parasite groups were identified in this study. The recovery of these parasites from different body parts of the fish species in this investigation is not a thing of surprise as they have been recorded previously from other related species elsewhere by Omeji *et al*. (2011) [16]. *Trichodina sp.* was obtained attached to skin, *Coccidia sp*., *Chilodonella sp*., *Ichthophthirius sp.* and *Pisciola geometra sp.* were observed in the skin of infected fish and *Ichthyoboda sp.* was observed in the skin of infected fish. The rate of infection of fish parasite was high in some species at some sites. This is in contrast to the report of by Oniye, (2000) and Haladu, (2003) [17, 9] from Tiga dam. Infection of the different body parts of *C. gariepinus* by parasites had been reported by Omeji *et al*. (2011) [16] from River Benue, Bichi and Yelwa, (2010) [7] from River Kaduna. The rate of infection was high for *Trichodina sp.* in the month of December at site B and

for *Chilodonella sp.* in the month of October at site C. The parasitic infestation of *C. gariepinus* may be due to some of the water physicochemical parameters and heavy metal that are not within the required level.

Conclusion

Results of this study showed that the values of physicochemical parameters obtained were not all within the recommended ranges, some were higher than the recommended safety limits while others are low. They vary between sites and months. The heavy metals revealed that the levels of (Pb and Cu) in the water samples exceeded the WHO and NIS, Fe is below the permissible limit, Zn is within the limit while Cd is completely absent. The result also revealed that *C. gariepinus* are infected by the ecto parasites. *C. gariepinus* have higher *Chilodonella sp*. infection in the month of October at site C. this study showed that there is relationship between water physicochemical parameters and parasite load of *C. gariepinus* in Digil Dam.

References

1. Abubakar KA. A study of Aspect of Productivity and Stock Status of *Orechromis niloticus* and *Clarias gariepinus* in Lake Geriyo, Yola, Adamawa State, Nig. Ph.D Thesis Federal University of Technology, Yola, Nigeria, 2006, 212.
2. Adebayo AA. Mubi region: A geographical synthesis (1st Edition). Paraclete Publishers, Yola, Nigeria, 2004, 17-25p.
3. Ajana AM, Adekoya BB, Olunuga OA, Ayankanuwo JO. Practical fish farming Alliance for community information, Nigeria, 2006.
4. American Public Health Association (APHA). Standard methods for the elimination of water and waste water.18th edition..American Public Health Association, Washington, D.C., 1998, 55-63.
5. Arthur JR, Albert E. A survey of the Greenland halibut *Reinhardtius hippoglossiodes* caught off Atlantic Canada, with notes on their zoogeography in this fish. Canadian Journal of Zoology. 1994; 72:765-778.
6. Banat IM, Hassan ES, El-Shahawi MS, Abu-Hilal AH. Postgulf-War Assessment of Nutrients, Heavy Metal Ions, Hydrocarbons and Bacterial Pollution Levels in the United Arab Emirates Coastal Waters. Environmental International. 1998; 24(2):109-116.
7. Bichi AH, Yelwa SI. Incidence of Piscine parasites on the gills and gastrointestinal tract of *Clarias gariepinus* (Tuegels) at Bagauda fish farm, Kano. Bayero Journal of Pure and Applied Sciences. 2010; 3(1):104-107.
8. Chandra KJ. Fish parasitological studies in Bangladesh: a review. Journal of Agricultural Rural Development. 2006; 4(1-2):9-18.
9. Haladu SI. Prevalence of gills and gastrointestinal tract of Mormyrus rume. M.Sc Thesis (unpublished) Bayero University, Kano, 2003.
10. Hussen A, Tefera M, Asrate S. Gastrointestinal helminth parasites of *Clarias gariepinus* (Catfish) in Lake Hawassa Ethiopia. Scientific Journal of Animal Science, 2012.
11. Marcogliese DJ. Parasites of Freshwater Fishes. Ecological Monitoring and Assessment Network (EMAN). Parasitology Module Steering Committee, Parasitology Section, Canadian Society of Zoologists, 2002.
12. Mato - sagasta J, Zadeh SM, Turral H. Water pollution from agriculture. A global review. Published by the food and Agriculture Organization of the United Nations Rome 2017 and the International Water Land and Ecosystem research program, 2017**,** 2.
13. Nigeria Industrial Standard (NIS). Nigerian Standard for Drinking Water Quality Standard Organization of Nigeria, 2007, 1-30.
14. Okram ID, Sharma BM, Singh EJ. Study of some physicochemical Properties of Wathou Lake, Manipur. Environmental and Biological Conservation. 2003; 8:13-17.
15. Olaosebikan BD, Raji A. Field Guide to Nigeria Freshwater Fishes. Federal College of Freshwater Fisheries Technology, New Bussa, 1998.
16. Omeji S, Solomon SG, Idoga ES. A Comparative Study of the Common Protozoan Parasites of *Clarias gariepinus* from the Wild and Cultured Environments in Benue State, Nigeria. Journal of Parasitology Research, 2011, 8p.
17. Oniye SJ, Adebote D, Ayanda OI. Helminthparasites of Clarias gariepus in Zaria, Nigeria. Journal of Agriculture science. 2004; 19(2):71-76
18. Radojevic M, Bashkin VN. Practical Environmental Analysis, Cambridge, U.K. Royal Society of Chemist. 1999; 41:189-204.
19. Statistix 9.0. Statistical Package for Scientists and Engineers. Statistical software U.S.A., 2012.
20. Salawu MT, Morenikeji OA, Sowumi AA, Olaibu AB. Comparative survey of helminthes parasites of *Clarias gariepinus* and *Clarias pachynema* from the Ogun River and Asejire dam in Southwest Nigeria. International Journal of Fisheries and Aquaculture. 2013; 5(1):7-11.
21. Ufodike EBC, Garba AJ. Seasonal Variations in Limnology and Productivity of a Tropical Highland Fish Pond in Jos Plateu, Nigeria. Journal of Aquatic Sciences. 1992; 7:29-34.
22. WHO. World Health World Organization Standard for Drinking Water, Guidelines for Drinking Water Quality. Recommendation, France. 2004; 1:181.