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EFFECTS OF PARASITES ON GROWTH PATTERN OF AFRICAN CATFISH (*Clarias gariepinus*) IN OMI DAM, OMI, YAGBA WEST LOCAL GOVERNMENT AREA, KOGI STATE

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ABSTRACT
The study was carried out using 506 Clarias gariepinus specimens over a period of one year, from Omi Dam (Latitudes 8º34'N – 8º38'N, Longitudes 6º37'E – 6º42'E) Omi, Kogi State, Nigeria. Standard methods were used to determine length-weight relationship, condition factor, and parasitic infestation of the fish in the dam. Generally, fish growth for non-parasitized fishes was positively allometric and condition factor is >1.5, while parasitized fishes had negative allometric growth and condition factor is <1.The negative allometry for parasitized shows the fish weight decreases less quickly than the length while positive allometry for non-parasitized fish mean the fish weight increases than the length of the fish. The effect of parasites in the life of parasitized C. gariepinus was found to probably be a major factor responsible for the loss of weight in parasitized fishes and this affected morphometric values(b) in which body weight was an index.

Keywords: Length-weight relationship, Condition Factor, Parasitized and non-parasitized, Fish

INTRODUCTION

Length-weight relationship and condition factor of a fish provide information on the growth pattern and health of a fish (Nazek *et al*., 2018). The length-weight relationship (LWR) is a useful tool in fishery assessment, which helps in predicting weight from length required in yield assessment (Garcia *et al*., 1996). In sampling programs, it is usually easier to measure length only while weight cannot be measured simply. The LWR of a particular species allows the inter-conversion of these parameters. Also, morphometric comparisons can be made between species and populations (King, 1996). Furthermore, the LWR allows fish condition to expressed by the equation $W = aL^b$. Where *a* is the intercept and *b* is the slope of regression line, regression coefficient or allometry coefficient. Values of the exponent *b* provide information on fish growth. When $b = 3$, increase in weight is isometric. When the value of *b* is other than 3, weight increase is allometric (positive if $b > 3$, negative if $b < 3$). This is a useful tool that provides important information concerning the structure and function of fish populations

(Anderson and Neuman, 1996). The condition factor is an index reflecting interactions between biotic and abiotic factors in the physiological condition of fish. It shows the population's welfare during the various stages of the life cycle (Blackwell *et al*., 2000). The analysis of fish condition has become a standard practice in the management of fish populations, as a measure of both individual and cohort (e.g. age or size group) fitness or well-being. Condition factor has been generically described as the well-being or robustness of an individual fish and has typically been estimated by comparing individual fish weight of a given length to a standard weight. Condition factor has also been estimated by directly measuring physiological parameters related to the energy stores such as tissue lipid content and reproductive status (Fechhelm *et al*., 1995).

MATERIALS AND METHODS

Description of Study Area

The study will be carried out at Omi Dam in Yagba West LGA, Kogi State. Omi lies between latitude 8 ^{0} 34' and 8 ^{0} 38'N of the...

Equator and longitudes 6 ^{0} 37' and 6 ^{0} 42'E of Greenwich Meridian through the aid of GPS Receiver. It is about 146km from Ilorin the capital of Kwara State. The project was first conceived in 1979 while the constructive work started in 1983. It involves the construction of 42 metre-dam with a reservoir capacity of about 250 million cubic metres of water. Omi is in the Guinea savannah in Nigeria. According to NPC 2006, it has population of 1,026 people, the relative humidity is high. Rainy season is from March-October and dry season is from November –February. The major occupation is farming and fishing. Omi is along Kabba –Ilorin road through Ejiba.

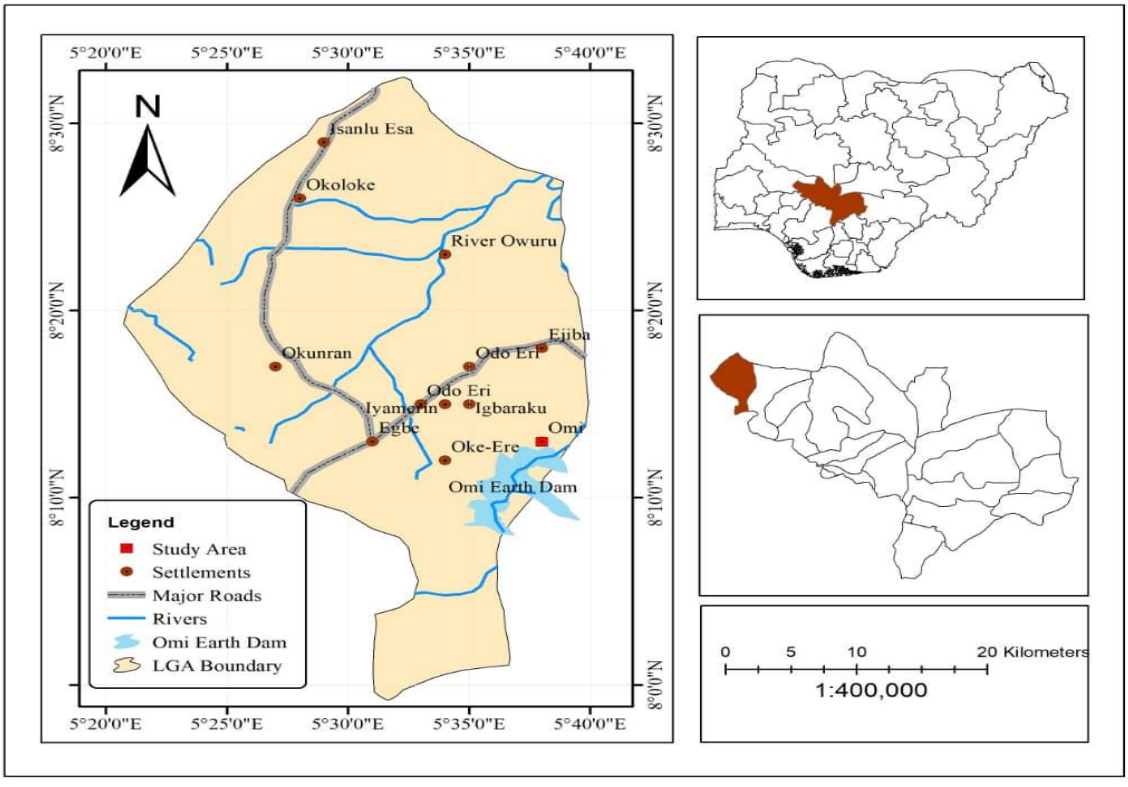

Figure 1: Map of Yagba West LGA Showing Omi Dam
Source: Department of Geography Federal University, Lokoja

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Fish sampling

A total of 506 fishes was collected by fishermen, using fishing net from the month of January – December, 2022 and transported in perforated jerican to Federal University Lokoja, laboratory and frozen at 15^0c for preservation. Sample size was determined using determined using Yamane formula $n=N/1 + N (e)^2$. After catching, the fishes was frozen at 15°C with the use of a digital refrigerator and transported to the laboratory where total length (snout to end of tail fin) standard length (snout to the tip of a tail fin) was measured using a measuring tape and body weight (BW) with a digital fishing scale. The condition factor (k) was calculated as follows $k = 100*BW*TL^{-3}$ (LeCren, 1951). The fish was subsequently dissected and analysed for parasites using standard parasitological techniques such as parasites were look ot for on the skin, gills, fin and operculum using a binocular lens and subsequently dissected using a scalpel, forceps and scissor of simple dissecting kit, organs (stomach, intestine, gall bladder, liver) were excised into a petri-dish and view under the microscope and parasites were identified.

Statistical Analysis

Data was analyzed using Statistical package for Social Science, pearson correlation to determine relationship between Length-weight Relationship and condition factor and regression analysis to determine the length-weight relationship of the parasitized and non-parasitized fishes.

RESULTS

Table 1: Overall prevalence of Parasites in *Clarias gariepinus*

Examined No	No. of Infected	Prev. of Parasites recovered (%)
506	102	20.16

Correlation of Length-Weight relationship and Condition factor of *Clarias gariepinus*

Correlation of length-weight relationship and Condition factor of *Clarias gariepinus* is significant at the 0.05 level (2-tailed). There is observable relationship between length – weight and condition factor. There is high positive correlation between weight and standard length (.952) total length (.917), there is high positive correlation between standard length and weight (.952) total length (.952). Also a high positive correlation between total and weight (.917), standard length (.952). There is a low negative correlation between condition factor and weight (-0.60), standard length (-2.50), total length (-2.87).

Table 2: Correlation of Length-Weight relationship and Condition factor of *Clarias gariepinus*

Correlations		Weight (g)	Standard length (cm)	Total length (cm)	Condition factor (k)
Weight (g)	Pearson Correlation	1	.952**	.917**	-.060
	Sig. (2-tailed)		.000	.000	.546

	N	506	506	506	506
Standard length (cm)	Pearson Correlation	.952**	1	.952**	-.250*
	Sig. (2-tailed)	.000		.000	.011
	N	506	506	506	506
Total length (cm)	Pearson Correlation	.917**	.952**	1	-.287**
	Sig. (2-tailed)	.000	.000		.003
	N	506	506	506	506
Condition factor (k)	Pearson Correlation	-.060	-.250*	-.287**	1
	Sig. (2-tailed)	.546	.011	.003	
	N	506	506	506	506

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Length-Weight Relationship and Condition Factor of *Clarias gariepinus*

Length –Weight relationship shows b=2.54, a=1.26, r^2=0.845 and condition factor of parasite infested fish is 0.06-1.00 and b=3.24, a=1.30, r^2=0.949 and condition factor of non-parasite infested fish is > 1.5. The length–weight relationship b(2.54) observed in parasitized fishes in this current study shows negative allometry which means length increases while the body weight or mass reduces or body becomes slimmer compared to length, while non-parasitized shows positive allometry (b=3.24)the length of the fishes reduces and weight increases which means fish becomes robust. When b of regression is 3 it means weight changes proportionally with the cube of the length this is a perfect isometry when b is < or >, it means growth is allometry, when b< 3 it means the weight increases less quickly than the cube of the length and b>3 it means weight increases faster than the cube of the length and allometry is positive.

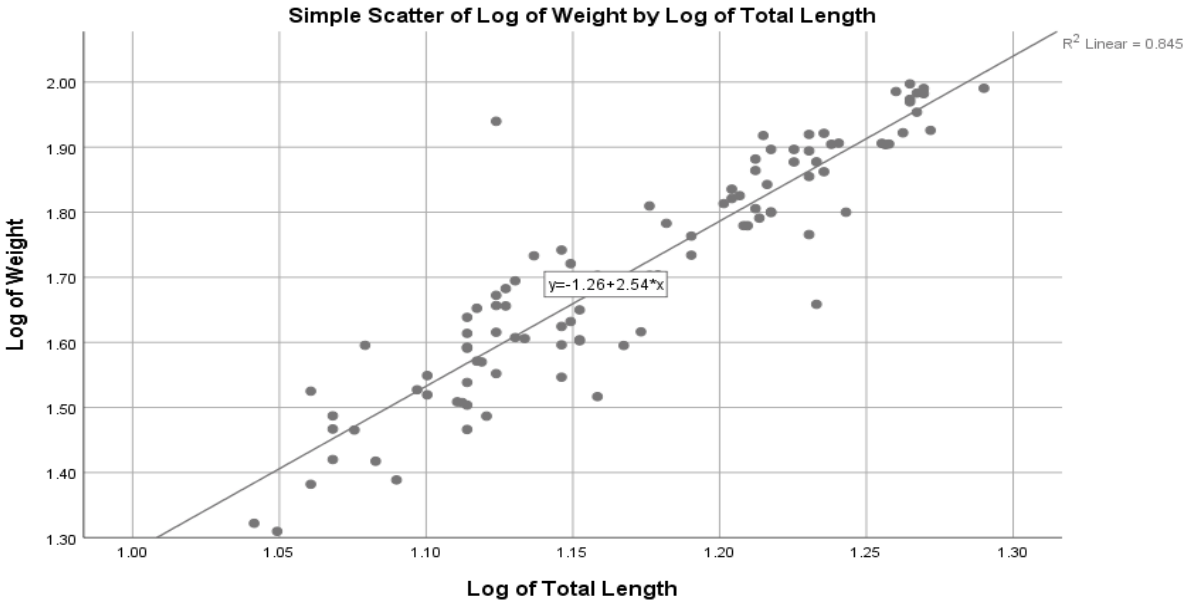

Figure 2: Length-Weight Relationship of Parasitized Fishes

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y=-1.26+2.54
$R^2 = 0.845$

Log W = log a + b log L

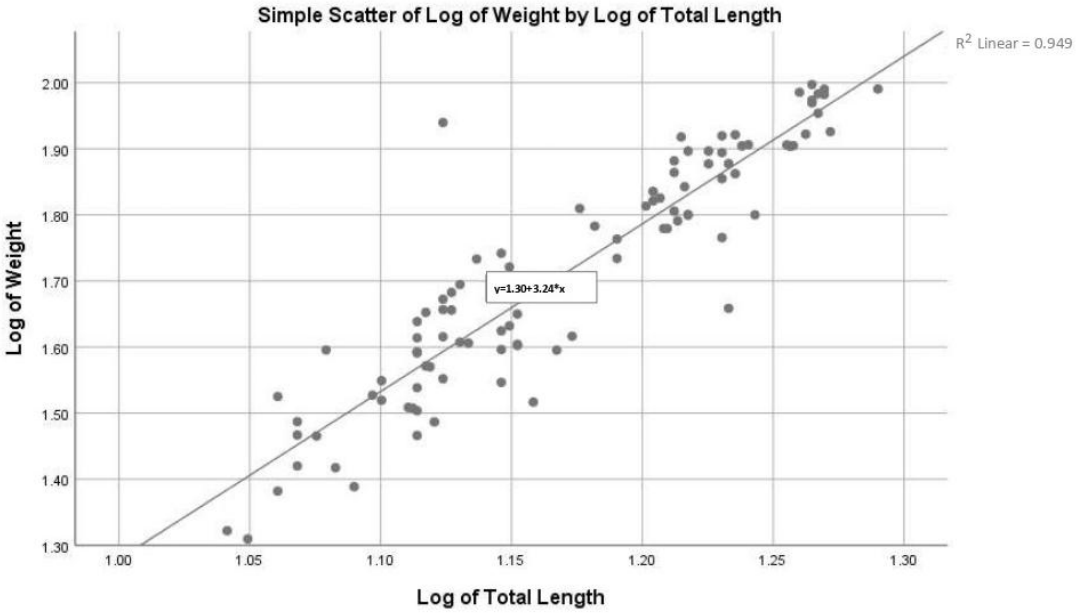

Figure 3: Length-Weight Relationship of Non-parasitized Fishes

y=1.30+3.24
$R^2 = 0.949$

Log W = log a + b log L

DISCUSSION

Length-weight relationship of parasitized fish shows b=2.54, a=1.26, r^2=0.845 and condition factor is between 0.06-1.00 while non infested fish shows b=3.24, a=1.30, r^2=0.949 and condition factor is >1.5. The length–weight relationship b(2.54) observed in the parasitized fish in this current study shows negative allometry which means length increases while the body weight or mass reduces or body becomes slimmer compared to length, while non infested shows positive allometry (b=3.24) the length of the fishes reduces and weight increases which means fish becomes robust. When b of regression is 3 it means weight changes proportionally with the cube of the length this is a perfect isometry when b is < or >, it means growth is allometry, when b< 3 it means the weight increases less quickly than the cube of the length and b>3 it means weight increases faster than the cube of the length and allometry is positive.

Several studies on length-weight relationship of infested fish have also shown negative allometry which agrees with the findings of this current study. Berrouk *et al.* (2022) also showed negative allometry on copepods of Crucian Carp *(Carassius carassius)* in Beni-Haroun Dam in Algeria. Also Berrouk (2019) reported negative allometry in infested fish in their study. Amulejoye *et al.* (2022) reported negative allometry in the parasitized fish in Ilaje L.G.A; Ondo State, Nigeria, which agrees with /in context with the result of this study. Ajala and Fawole (2019) also reported that infested fishes show negative allometry in which ectoparasites of *Clarias gariepinus* was found to be probably a major factor for low in

weight and the affected morphometric value, an indication that the infestation had probably affected the growth in weight as reported by Kaur *et al.* (2013). The observed negative allometry might not be unconnected with the effect of parasites which according to Gomes *et al.* (2017) reported that these protozoan can increase their number when the host fish is overcrowded, resulting in weight loss, emaciation, mortality and they inhabit the intestine because of their general feeding habit.

Iyaji and Eyo (2008) reported that heavy parasitic infections are associated with weight loss and often mortality in different species. Ajibare *et al.* (2020) and Loto *et al.* (2021) reported that environmental factors and fish interaction within its habitat may account for morphological differentiation rather than genetic differences. The "b" value could also be an indication of the physiological condition of the fishes and it varies in environmental condition and well being (Biswas, 1993)

Tolba *et al.* (2018) showed no effect Length-Weight Relationship of endohelminth of *L. callensis, C. Carpio and A. abrama* in the same dam. Hadjou *et al.* (2017) reported that the parasitized group have a positive allometry (b=3.19) which contradicts the findings of this current study.

In fisheries science, the condition factor is used to compare the "condition" "wellness" and the well being of the fish, which normally is affected by biotic and abiotic environment condition and can be used to assess the aquatic ecosystem, which they live (Anene, 2005). Ajala and Fawole (2019) also find out that regression analysis between parasite intensity and body weight in infested fish were negatively correlated. It showed that while the intensity of parasites increases, the body weight reduces. This study is in consistent with the findings of Oniye *et al.* (2004); Ajala and Fawole (2019) that parasitized male *C.gariepinus* have less condition factor than unparasitized. Findings reported in several other studies also agree with the result of this current study that the condition factor of parasitic infested fish are lower than non-infested fishes Boucenna (2017); Berrouk (2019); Berrouk *et al.*(2022). Ramandane *et al.* (2013) reported significance difference in the condition factor of the parasitic infested and non-parasitic infested fish.

The findings of Amulejoye *et al.* (2022); Indarjo *et al.* (2021); Loto *et al.* (2021) and Akombo *et al.* (2014) disagree with the findings of this study that the condition factor of parasitized fish is k>1.5 which indicates good fish and good environmental condition. Therefore, their studies reported that fish species are very fat, healthy and in normal condition when they grow in good environmental conditions. Tolba *et al.* (2018) find similarity between condition factor of parasite infested and non-infested fishes in three species and host they studied.

CONCLUSION

Parasitic infestation and infection of *C. gariepinus*) in Omi Dam was found to reduce the growth in weight of the fish. This reduction led to a decrease in the value of regression coefficient, giving the infested fishes a negative allometric growth pattern. The effect of the parasitic infestation on the weight affected the values of morphometric indices. High parasitic infestation and infection can greatly reduce the productivity of fish in aquaculture.

REFERENCES

Ajala, O.O. and Fawole, O.O. (2019). Morphometric Indices and Enteroparasitic Infestation of *Clarias gariepinus* (Burchell, 1822) in a Tropical Reservoir. *Agricultural Sciences*, 10, 1286-1297.

Ajibare, A.O., Omobepade, B.P. and Loto, O.O. (2020). Condition factor and length-weight relationship of Berried African

Scientia Africana, Vol. 22 (No. 2), August, 2023. Pp 107-114
© Faculty of Science, University of Port Harcourt, Printed in Nigeria *ISSN 1118 – 1931*

River Prawn (*Macrobrachium vollenhovenii)* in Asejire Reservoir, Nigeria. West African *Journal of Fisheries and Aquatic Sciences*, 1: 35-42.

Akombo, P.M., Akange, E.T., Adikwu, I.A. and Araoye, P.A. (2014). Length-weight relationship, condition factor and feeding habits of *Synodontis schall* (Bloch & Schneider, 1801) In River Benue at Makurdi, Nigeria. *International Journal of Fisheries and Aquatic Studies*, 1, 42-48.

Amulejoye, F.D., Ajibare, A.O., Arosoye, A.S. and Adegeye, A.T.(2022). Occurrence of parasite, length-weight relationship and condition factor of *Sarotherodon melanotheron* (Ruppel, 1852) in Ilaje Local Government Area of Ondo State, Nigeria. *Agricultural Science and Technology*, 14(3):67-73.

Anderson, O.R. and Neumann, R.M. (1996) Length, weight and associated structural indices. In Nielsen, L. A., Johnson, D. L. (Eds.) Fisheries techniques. Bethesda, American Fish Society. 447-482.

Anene, A. (2005). Condition Factors of Four Cichlid Species of a Man- Made Lake in Imo Southeast, Nigeria. *Turk. J. Fish. Aqunt. Sci*, 5: 43-47.

Berrouk, H., Sid, A., Lahoual, A., Sahtout, F., Kaouachi, N. and Boualleg, C.(2022). Effect of parasitic copepods on length-weight relationship of Crucian Carp(*Carassius carassius*) in Beni-Haroun Dam, Mila City.Algeria. *Animal Research International*, 19(3): 4625 – 4633.

Berrouk, H., Lahoual, A., Sahtout, F., Kaouachi, N. and Boualleg, C.(2021). Effect of parasitic copepods on the growth of *Abramis brama* fish from Beni-Haroun dam of Mila city (Northeast Algeria). *Ukrainian Journal of Ecology*, 11(8): 79 – 88.

Berrouk, H. (2019). Etude des Crustacés Ectoparasites Branchiaux de L'ichtyofaDulçaquicole du Barrage Béni-Haroun-Mila.Thèse de Doctorat, Université Mohamed Cherif Messaadia, Souk-Ahras, Algerie.

Biswas, A. (1993) Management of International Waters: Problems and Perspective. *Water Resources Development*, 9, 142-144.

Blackwell, B.G., Brown, M.L. and Willis, D.W. (2008). Relative weight (Wr) status and current use in fisheries assessment and management. *Reviews in Fisheries Science*, 8:1-44.

Boucenna, I. (2017). Etude des Crustacés Parasites de l'ichtyofaune des Ecosystèmes Dulçaquicoles de la Région de Souk-Ahras. Thèse de Doctorat, Université Chadli Benjdid, El Taref, Algérie.

Fechhelm, R.G., Griffiths, W.B., Wilson, W.J., Gallaway, B.J. and Bryan, J.D. (1995). Intra- and interseasonal changes in the relative condition and proximate body composition of broad whitefish from the Prudhoe Bay Region of Alaska. *Transactions of the American Fisheries Society*, 124:508-519.

Garcia, C.B., Duarte, J.O., Sandoval, N., Von Schiller, D., Melo, G. and Navajas, P. (1998). Length–weight relationships of demersal fishes from the Gulf of Salamanca, Colombia, Naga. ICLARM Quart 1998; 21(3):30-32.

Gomes, G.B., Hutson, K.S., Domingos, J.A., Chung, C., Hayward, S., Miller, T.L. and Jerry D.R. (2017). Use of environmental DNA (eDNA) and water quality data to predict protozoan parasites outbreaks in fish farms. *Aquaculture*, 479: 467-473.

Hadjou, Z., Ramdane, Z., Amel, N., Tazi, M., Bellal, A. and Charane, M. (2017). (Condition index in two groups of Effect of parasitism on the length/weight relationship and the Perciformes Sparidae), parasitized and unparasitized

speciPagellus acarne (Risso, 1826) mens, from the Eastern Coast of Algeria.

Indarjo, A., Salim, G., Nugraeni, C.D., Zein, M., Ransangan, J., Prakoso, L.Y., Suhirwan and Anggoro, S. (2021). Length-weight relationship, sex ratio, mortality and growth condition of natural stock of *Macrobrachium rosenbergii* from the estuarine systems of North Kalimantan, Indonesia. *Biodiversitas*, 22: 846-857.

Iyaji, F.O. and Eyo, J.E. (2008). Parasites and their fresh water fish host. *Bio-Research*, 6 (1): 328-338.

Kaur, P., Shrivastav, R. and Qureshi, T.A. (2013). Effect of helminth parasitic load on the length weight-ratio of fresh water fish, *Channa striatus.Biosci. Biotech. Res. Comm*. 6(2): 208-211.

King, R.P. (1996). Length–weight relationships of Nigerian freshwater fishes. *Fishbyte*, 19:53-58.

Lecren, C.D. (1951). The Length-weight Relationship and seasonal cycle in Gonad weight and Condition in Perch, *Perca fluviatilis. Journal of Animal Ecology*, 20:201-219

Loto, O.O., Ajibare, A.O. and Abah, J.P. (2021). Gut contents, feeding ecology and condition factor of *Sarotherodon melanotheron* inhabiting Lagos Lagoon, Nigeria. *International Journal of Science and Global Sustainability*, 7, 69-74.

Nazek, J., Chassan, Y., Carol, S. and Muhammmed, H.E. (2018). Length-weight relationships and relative condition factor of fish inhabiting the marine area of Eastern Mediterranean city, Tripoli-Lebanon. *Egyptian Journal of Aquatic Research*, 44:299-305.

Oniye, S.J., Adebote, D.A. and Ayanda, O.I. (2004). Helminth parasites of *Clarias gariepinus* in Zaria, Nigeria. *Journal of Aquatic Science*s, 19(2):71-76.

Ramdane, Z., Trilles, J.P., Mahe, K. and Amara, R. (2013). Metazoan ectoparasites of two teleost fish, Boops boops (L.) and Mullus barbatus barbatusL. from Algerian coast: diversity, parasitological index and impact of parasitism. *Cybium*, 37(1-2): 59 – 66.

Tolba, M., Kaouachi, N., Boualleg, C., Mouaissia, W., Allalga, A., Berrouk, H. and Boulahbal, S. (2018). Impact of parasitic helminths on the growth *of Luciobarbus callensis* populating Béni Haroun dam (East of Algeria). *World Journal of Environmental Biosciences*, 7(1): 92 – 99.