Original Research

Haematological characteristics of *Synodontis nigrita* of the lower Niger River

Authors:
**Nwachi Oster Francis,
Ekokotu Paterson and
Adogbeji**

Institution:
Department of Fisheries and
Aquaculture Delta State
University,
Asaba Campus, Nigeria.

ABSTRACT:

Haematological characteristics of *Synodontis nigrita* in the lower part of river Niger was studied in the present study. A total of 20 adult *Synodontis nigrita* was collected at a landing site in the lower part of river Niger. The blood samples were collected from the kidney behind the anal fin. The values of the haematological parameters were measured using the standard and approved methods. The following values were recorded, Haemoglobin 9. 36 ± 1.1 g/dl, Red Blood Cells 2.19 ± 0.74 X 10^{12} g/L, White Blood Cells 2.44 ± 0.24 X 10^{12} g/L, Mean Corpuscular Haemoglobin Concentration 30.29 ± 0.01 % and Mean Corpuscular Volume 1.65 ± 0.43 U^3 and Mean Corpuscular Haemoglobin 4.75 ± 0.43 p/g. Data obtained from this study will serve as the base line for haematological parameters in the monitoring of fish health and productivity of *Synodontis nigrita* which will be valuable in this era for increased farming activities in the Niger Delta region of Nigeria.

Corresponding author:
Nwachi Oster Francis

Email Id:
fish2rod@yahoo.com

Web Address:
http://jresearchbiology.com/
documents/RA0549.pdf

INTRODUCTION

Hematology is the science dealing with the anatomical, physiological and pathological aspect of blood. Blood transports oxygen and other nutrients to the Cardiovascular system and other organs. Hematology is derived from the Greek word 'haima' meaning blood and it is a branch of medical science concerned with diseases of blood and blood forming tissues (Jeremy Butterfield, 2003). Hematological parameters are closely related to the responses of the animals to the environment. The environment where fish live could exert influence on the hematological characteristics (Kori-Slakpere, 1985; Ayotunde and Ochang, 2006). The primary functions of blood are oxygenation, transfer of nutrition to tissues, maintenance of acid base balance, removal of metabolic waste product from tissue, etc.

Hence, any dysfunction of blood can have severe effects on the physiological activities of the entire body. Certain physiological dysfunctions in the body are reflected as alterations in the blood constituents which can be used as diagnostic indicators. The history of applying hematological methods as diagnostic tools in the episodes of non-infectious diseases in confined and free-living population of fish is quite meager (Bhaskar and Rao, 1990).

Synodontis nigrita are non-bony fishes inhabiting freshwater of tropical Asia and Africa (Idodo-Umeh, 2003) The hematological studies of freshwater fish species *Synodontis nigrita* which is of a physiological interest contributing to a greater understanding of the variation of blood characteristics, in relation to factors such as phylogenetic position, ecological habitat, food selection and mode of life. Erythrocyte status is usually described in terms of one or more of the three primary and derived indices. The primary indices are Hemoglobin content (HB), Hematocrit (HCT) and Red Blood Cell (RBC). The derived indices are Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH) and Mean Corpuscular Hemoglobin Concentration (MCHC). Leucocytes are centrally involved in the phagocytic and immune responses to the pathogens viz., bacteria, viral and similar challenges. The study of hematology and blood biochemistry of fish is of physiological interest because it contributes to greater understanding of the important factors (Ballarin *et al.,* 2004). This work is aimed at studying the hematological characteristics of *Synodontis nigrita* found in the lower region of river Niger forming a base line for future reference on the state of the fish that reside in the lower part of the river.

MATERIALS AND METHODS

Description of the study area

The experiments were carried out at the wet laboratory of Delta state University Abraka, Asaba Campus, between the months of March and May 2012.

Collection of fish samples

A total of 20 adult *Synodontis nigrita* were

Table 1: Haematological parameters of twenty four healthy fish samples

ABBREV	PARAMETERS (UNITS)	MEAN	STD. DEV.	STD. ERROR	RANGE
L	Length (cm)	11.56	3.68	0.82	13.40
W	Weight (g)	13.07	3.55	0.79	11.20
PCV	Packed Cell volume (%)	31.10	3.73	0.83	12.00
HB	Haemoglobin (g/dl)	9.36	1.19	0.27	3.63
RBC	Red Blood Cell (x10^{12} g/L)	2.19	0.74	0.16	2.90
WBC	White Blood Cell (x10^{12} g/L)	2.44	0.24	0.05	0.80
MCHC	Mean Erythrocyte Haemoglobin Count (%)	30.29	0.01	0.00	0.04
MCV	Mean Erythrocyte Volume (U^3)	1.65	0.43	0.09	1.53
MCH	Mean Erythrocyte Haemoglobin (p/g)	4.75	1.36	0.30	4.63

obtained from the fisher man landing at the bank of lower Niger area. Blood standards with approved hematological procedures were carried out as described by Blaxhall and Daisley (1973). Assessment of various blood parameters of *Synodontis nigrita* were carried out; HB was done by cyanmethemoglobin method, RBC analysis and Leucocratic (LCT) were done with neubauer hematocytometer using standard diluents. Erythrocyte indices such as Packed Cell Volume (PCV), MCV, MCH and MCHC were estimated using the standard Formulae (Barbara, 1991). Differential counts such as neutrophils, lymphocytes and monocytes were done on the blood film stained with Crumwald Giemsa Stain (Miale, 1982). Linear regression was used to test the interspecies relationship between the different blood parameters of *Synodontis nigrita*. The coefficient of regression was analyzed for statistical significance using the student t-test at 5% level of significance.

RESULT AND DISCUSSION

The hematological characteristics observed in the present study-based on twenty (20) healthy fish samples, showed that hemaglobin is 9.36 g/dl (Table 1). This was also reported by Kori-siakpere *et al.,* 2005 for healthy *Synodontis nigrita* from Warri, in the Delta State but lower than the value (11.48 g/dl) which was reported by Ayotunde *et al.* (2007) from the four water bodies of South Western Nigeria. Difference in the geographical location and acclimation period could be the reason for

low or high result obtained in the present study. The low region of the Niger has many tributaries; from small, stream, most of this water pass through urban area where house hold waste water, small scale industries and farms channel their effluent through open drainage even without treatment. This load can lower the oxygen available for the aquatic animals in the river.

A red blood cell count of 2.19×10^{12} g/L in the present study was higher than 2.00×10^{12} g/L which was reported by Ayotunde *et al.* (2007) for *Synodontis nigrita* from the south-Western Nigeria and 1.67×10^{12} g/L which was also reported by Kori-Siakpere *et al.* (2005), for *Parachanna obscura* from Warri River. White blood count value of 2.44×10^{12} g/L obtained from the present study was lower than 5.54×10^{3} mm^3 , reported by Kori-Siakpere *et al.* (2005) for *Synodontis nigrita*. The result was however lower than 3.0×10^{12} g/L reported by Adebayo *et al.* (2009) for *Synodontis nigrita*. The low result obtained in the study could be attributed to the difference in generic make up of the fish and probably difference in the level of appetite of the fish.

Mean values for the hematological indices, obtained from the present study for *Synodontis nigrita* from lower Niger River showed that, MCHC-30.29 %, MCH-4.75 p/g and MCV-1.65 U^3 were higher than the MCHC-24.89%, MCV-0.148 p/g, MCH-22.48 p/g for *Synodontis nigrita* from the four water bodies of South-Eastern Nigeria Ayotunde *et al.* (2006). The low or high values obtained from this study could be as a result of the

Table 2: Correlation analysis of hematological parameters, showing intraspecies hematological relationship

	L	W	PCV	HB	RBC	WBC	MCHC	MCV	MCH
L	-0.046	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.00
W	-0.422	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.00
PCV	-0.231	0.55	0.000	0.000	0.000	0.000	0.00	0.000	0.00
HB	-	-0.121	0.537	0.000	0.000	0.000	0.00	0.000	0.00
RBC	-0.572	0.27	0.886	0.430	0.000	0.000	0.00	0.000	0.00
WBC	-0.439	0.43	0.966	0.588	0.827	0.000	0.00	0.000	0.00
MCHC	0.239	0.256	0.477	0.112	0.287	0.000	0.00	0.000	0.00
MCV	0.185	-0.156	-0.503	-0.104	-0.47	-0.388	0.00	0.000	0.00
MCH	0.270	-0.75	-0.243	0.515	-0.387	-0.194	-0.67	0.0224	0.00

fish.

Furthermore, the statistical analysis revealed that Red Blood Cell Count (RBCC), correlated positively with all the hematological parameters measured, except weight (-0.572 g), hemoglobin (0.430 g/dl), MCV (-0.47 U^3) and MCH (-0.387 p/g) which correlated negatively with RBC (Table 2). There was a significant difference (p<0.01) between the mean of the hematological parameters measured except weight (-0.439 g), hemoglobin (0.588 g/dl), MCH (-0.194 p/g), MCHC (0.287 %) which showed negative correlation with WBC.

MCV correlated positively with all the hemoglobin parameters except RBC (-0.47 g/L) which exhibited negative correlation with MCV. MCH, correlated positively with all the hematological parameters, except RBC (-0.387 g/L), WBC (-0.194 g/L), which showed negative correlation with MEH.

MCHC, correlated positively with all the hematological parameters measured, except RBC (0.287 g/L) and WBC (0.0 g/L) which showed negative correlation with MCHC.

Hemoglobin showed positive correlation with all the hematological parameters except RBC (0.430 g/L) and WBC (0.588 g/L), which showed negative correlation with hemoglobin.

CONCLUSION

The hematological characteristics of *S. nigrita* from R. Niger revealed variations in some parameters compared to the results obtained from the same fish in some selected rivers in the western region of Nigeria. The result from Warri River which is in the same area has similar hemoglobin content. Other parameters like the red blood cell and white blood cell content of the fish in river Niger found to be lower compared to other rivers in the western region. The hematological indices of *S. nigrita* is also high, this can be because of oil exploration and oil drilling in this region.

REFERENCES

Adebayo GB, Olatunji G and Adekola FA. 2009. Isolation and characterization of the organic components of a black indigenous mineral hair dye. *International Journal of Physical Sciences*, 4(12):770 -776.

Ayotunde EO, Ochang SN and Okey B. 2007. Parasitological examinations and food composition in the gut of feral African carp *Labeo coubie* in the Cross River, Southeastern Nigeria. *African Journal of Biotechnology,* 6(5):625-630.

Ayotunde EO and Ochang SN. 2006. Haematological characteristics and plasma chemistry of an African carp *Labeo coubie* (Ruppell) in the Cross River, South Eastern Nigeria. *Journal of Aquatic Sciences,* 21(1):47-55.

Ballarin L, Dall' Oro M, Bertotto O, Libertini A, Francescon A, Barbaro A. 2004. Haematological parameters in *Umbrina cirrosa* (Teleostei, Sciaenidae): a comparison between diploid and triploid specimens. *Comparative Biochemistry and Physiology Part A: Molecular and Integrative Physiology*, 138(1):45-51.

Bhaskar BR and Rao KS. 1990. Use of haematological parameters as a diagnostic tool in determining the health of milkfish *Chanos chanos* (Forskal) brackishwater culture. *Aquaculture and Fisheries Management,* 21 (1):125-129.

Blaxhall PC and Daisley KW. 1973. Routine haematological methods for use with fish blood. *Journal of fish Biology*, 5(6):771-781.

Jeremy Butterfield 2003. Collins English dictionary: complete and unbridged Publishers Harper Collins 6th ed.

Barbar JB, Dacie JV and Lewis SM. 1991. Practical haematology 11th edition Edinburg; Churchill Livingstone.

Idodo-Umeh G. 2003. Diel variation in the fish species of River Ase, Niger Delta Nigeria. *Tropical Freshwater*

Biology, 12(1):63-76.

Kori-Slakpere O. 1985. Haematological characteristics of *Clarias isheriensis* Sydenham. *Journal of Fish Biology,* 27(3):259-263.

Kori-Siakpere O, Ake JEG and Idoge E. 2005. Haematological characteristics of the African snake head, *Parachanna obscura. African Journal of Biotechnology,* 4(6):527-530.

Miale JB. 1982. Laboratory medicine; Publisher Mosby incorporated 6th edition 115p.