Effect Of Weight And Length On Full Blood Count Of Cat Fish (*Clarias Gariapinus)*

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Abstract: This study was to investigate the effect of length and weight on *Clarias gariapinus* haematological parameters in commercial fish ponds in Gwargwalada Area council, in the F.C.T. 87 blood samples were collected from the 5th of March to the 10th of April, the samples were group into three bases on their weight and length Group one ranging from10-20cm and 180-278grams, and Group two 21-30cm and 280-503grams, and Group three 31-50cm and 509-900 grams. Each blood sample were examine for full blood count which consist of WBC, erythrocytes count (RBC), haemoglobin (Hb), hematocrits (PCV), leukocytes (WBC) differential count and blood indices such as MCV, MCH and MCH. All the calculation were evaluated using ANOVA method in the haematological evaluation the following result show no significant differences from the three group ($P<0.05$) PCV, RBC, WBC, MCHC, MCH, and MCV. While the rest of the result show a significant differences ($P<0.05$) Hb, Lymp, Neut, Eos, and Mon. from this result it could be concluded that the weight and length of *Clarias gariapinus* has effect on the following haematology (Hb, lymp, neut, Eos, and Mon). So it can be used to diagnose Anaemia, bone marrow disorder, viral infection and cancer.
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Introduction.

Clarias gariepinus belongs to the family *clariidae* and is the most common Nigerian fresh water fish prominent in aquaculture practice. They are easily cultured with large economic gains because of their breathing and hardy nature, suitable reproductive strategy, nutritional efficiency and attainment of large size in a short time (Fagbenro *et al.,* 2009). Fish are the cheapest sources of animal protein in Nigeria and constitute about 40% of animal protein intake by average Nigerian (Afolabi *et at.*, 2003; Sadiku and Oladimeji, 2001). However, the average protein intake by an average Nigerian was estimated to be about 63.24 /day, which is below 70g/caput/day FAO minimum recommendation (Falaye and Akinyemi 2005). Fresh water fish constitutes 69.6% of the total fish supply available to Nigeria (FOS, 2000). Rest of this amount is mudfish, *Clarias gariapinus burch*, family clariidae, of which marketing trends predict an increase in consumer demands, because most of its production comes from artisanal fisheries.

Fish production takes into account the quality of feed, which should not exceed the dietary requirements, but feed amounts to over two-thirds of the variable cost of a fish culture in an intensive management system.

Haematological studies of fish or other organisms in which both the input and output substance of almost all the metabolic processes and changes can be detected using the blood profile. Blood is a very good medium of assessing the health status of animals. Its analysis is crucial in many fields of ichthyology research and fish farming. Evaluation of the haematological profile usually gives vital information on the response of the body to injury, size, weight, stress (Nussey *et al,* 2002). Such an evaluation is indispensably important in arriving at diagnosis, making a prognosis and also in the assessment of the efficacy of therapy and toxicity of drugs and chemical substances (Ihedioha *et al*, 2004). Thorough knowledge of fish blood constituent through the regular monitoring of fish blood is a very useful diagnostic tool in establishing the health status of fish farm stocks. Haematology although not used regularly in fish medicine can provide sustainable diagnostic information once reference values are established. It is based line information of the species. The pace has been set by many researchers (Blaxhall, 2009, Adedeji *et al*, 2000, Kori-siakpere *et al,* 2005).

The use of haematological techniques is gaining importance for toxicological research, environmental monitoring and assessment of fish health condition (shah et al, 2004). Blood parameters are considered patho-physiological indicators of the whole body and therefore are important in diagnosing the structural and functional status of fish exposed to toxicants (Adhikari *et al,* 2004, Maheswaran *et al*, 2008).

Haematological analysis will enhance fish cultivation by facilitating early detection of situations of stress and disease that could affect production performance (Rehulka *et al*, 2004, Tavares-diuas *et al,* 2005).

A number of haematological indices such as haematocrit (HT), haemoglobin (HB), total erythrocyte count (TFC), packed cell volume (PCV), white blood

cell total (WBC), white blood cell differential (WBCD), and so on are used to assess the functional status and oxygen carrying capacity of blood stream (Shah *et al*, 2004).

Full Blood Count (FBC).

Is sometimes referred to as full blood examination or complete blood count, is one of the most common performed blood tests, as it can tell us so much about the state of health in any living organisms. It is important for diagnosing conditions in which the number of blood cells is abnormally high or abnormally low, or the cells themselves are abnormal.

A full blood count measures the status of a number of different features of the blood, including the following:

- The amount of haemoglobin in the blood.
- The number of red blood cells (red cell count).
- The percent5tage of blood cells as a proportion of the total blood volume (haematocrit or packed cell volume).
- The average amount of haemoglobin in the red blood cells (known as mean cell haemoglobin).
- The number of white blood cells (white cell count).
- The percentage of different type of white blood cells (leucocyte different count); and the number of platelets.

The following provides an explanation of the various components that are measured, and helps to demystify some of the jargon one may hear in relation to this blood test.

Haemoglobin (Hb).

Haemoglobin is an iron –containing compound found in the red blood cells, which transports oxygen around the body, measuring the concentration of haemoglobin the blood can help diagnose anaemia, a condition caused by

A deficiency of haemoglobin,

Anaemia can arise due to:

- Inadequate production of red blood cells in the bone marrow;
- Inadequate iron intake;
- Inadequate folate or vitamin B12 intake;
- Microscopic bleeding or other blood loss;
- A chronic illness; or
- A defect in the haemoglobin molecule itself.

This measurement may also detect abnormally high concentrations of haemoglobin. This may occur in organisms with lung disease, as an adaptation to high altitudes, or because of an abnormal increase in red cells production by the bone marrow (polycythamia vera).

Red cell count (RCC).

Red cell count is an estimation of the number of red blood cells per litre of blood

Abnormally low numbers of red blood cells may indicate anaemia as a result of blood loos, bone marrow failure, and malnutrition such as iron deficiency, over-hydration, or mechanical damage to red blood cells.

Abnormally high number of red blood cells may indicate congenital heart disease, some lung disease or polycythaemia vera.

Packed cell volumes (PCV) or haematocrit (HCT).

Haematocrit is a measurement of the percentage of red blood cells to the total blood volume.A low haematocrit may indicate failure, leukemia, multiple myeloma, nutritional deficiency, over-hydration or rheumatoid arthritis.A high haematocrit may indicate dehydration (for example, due to burns or diarrhoea), eclamsia (a serious condition that can occur during pregnancy) or polycythaemia vera.

Mean cell volume or mean corpuscular volume (MCV).

Mean cell volume is an estimate of the volume of red blood cells. It is useful for determining the type of anaemia a person might have.

A low MCV may indicate iron deficiency, chronic disease, pregnancy, a haemoglobin disorder such as thalassemia, anaemia due to blood cell destruction or bone marrow disorders.A high MCV may indicate anaemia due to nutritional deficiency, bone marrow abnormalities, liver disease, alcoholism, chronic lung disease, or therapy with certain medications.

Mean cell haemoglobin (MCH) and mean cell haemoglobin concentration (MCHC).

These measures are further guides to the investigation of anaemia. The MCH is the haemoglobin content of the average red cell. The MCHC is the average haemoglobin concentration in a given volume of packed red cells.

The MCH may be low in types of anaemia where the red blood cells are abnormally small. Or high in other types of anaemia where the red blood cells are enlarged (for example, as a result of folic acid or vitamin B12 deficiency).The MCHC is low in iron deficiency, blood loss, pregnancy and anaemia caused by chronic disease.

White Cell (leucocyte) Count.

White cell count estimates the total number of white blood cells per litre of blood. An abnormal high or low white cell count can indicate many possible medical conditions and a leucocyte differential count, which provides numbers of the different types of white cells, is usually needed to help make any diagnosis. Abnormally low number of white blood cells may indicate liver or spleen disorders, or exposure to radiation or toxic substances. A number of viral infections can cause a temporary reduction in the white cell count. Abnormally high levels of white blood cells may indicate infection, tissue damage, leukaemia, or inflammatory diseases.

Leucocyte (white cell) differential count.

Leucocyte differential count provides an estimate of the number of the five main types of white blood cells. These are neutrophils, monocytes, lymphocytes, eosinophil's, basophils.Each of the five types has a specific role in the body.

Neutrophils and monocytes: protect the body against bacteria and eat up small particles of foreign matter.

Lymphocytes: are involved in the immune process, producing antibodies against foreign organisms, protecting against viruses and fight cancer.

Eosinophil: kill parasites and are involved in allergic responses. High numbers of eosinophil may be associated with worm infections or exposure to substances that cause allergic reactions.

Basophils: also take part in allergic responses and increase basophil production may be associated with bone marrow disorders or viral infection.

Literature Review.

Research works have been conducted on the haematology of *clarias gariepinus* which have been used to determine it state of health. Dankishiya *et al,* (2009) reported on some haematological parameters of cultured *Clarias gariepinus* in Gwagwalada with mean values obtained for haematocrit, haemoglobin concentration and erythrocyte count as 37.77%, 11.54g/dl and $2.24x10^6$µl respectively. The mean cell haemoglobin, mean cell volume and mean cell haemoglobin concentration were found to be 52.15pg, 170fl and 30.44g/dl respectively. There was a weak negative correlation between weight and haematocrit, haemoglobin concentration and erythrocyte count, while there was weak positive correlation between weight and mean cell haemoglobin, mean cell volume as well as mean cell haemoglobin concentration (Dankishiya *et al,* 2009).

There were variations in all the haematological parameters measured during the study (Dankishiya *et al,* 20090. Similar variations in haematological profile of clariid catfish have been reported by other researchers. Korisiakpere (2006) noted wide variations in the haematocrit and erythrocyte indices of the catfish *Clarias* isheriensis. The mean haematocrit value recorded in the study is in agreement with the results from previous studies carried out by Adedeji *et al.*, (2000) and Adeyemo (2005) who got mean values of 37.0% and 36% respectively for *Clarias gariapinus*. Snieszko (1999) recorded a range of 40-50% when he worked on rainbow trout (*Salmo gairdneri*), brown trout (S*almo trutta)* and brook trout (*Salvelinus fontinalis*). Significant differences in haematocrit between sexes in sexually mature species have also been reported (Snieszko, 1999, and Mulcachy, 2000). The mean erythrocyte count of *Clarias gariapinus* obtained in this study is not in conformity with that of other workers. Adeyemo (2005) obtained a mean erythrocyte count of $3.52x10^6$/µl while Adedeji *et al*. (2000) recorded $2.4x10^6$/µl. The differences may be due to differences in climatic and environmental factor s in the places from where the species of fish were obtained as suggested by Barnhart (2001). According to Lenfant and Johnsen (2002), erythrocyte count greater than $1x10^6$/µl is considered high and is indicative of high oxygen carrying capacity of the blood which is characteristic of fishes capable of aerial respiration and with high activity. The male showed a wider range and gave higher mean values of the haematological Parameters than the female in Nigeria (Adedeji *et al.,* 2000 and Adeyemo, 2005). The result also revealed an inverse relationship between erythrocyte counts and size of erythrocyte, it was observed that higher counts of erythrocyte were recorded with decrease erythrocyte size and lower counts were recorded with large size erythrocyte. This attributes appears to be a genetic compensatory mechanism for the maintenance of effective oxygen transportation as reported by Kaneko (2008). Since *Clarias gariapinus* is one of the most frequent cultured fish in Nigeria, there is need to carry out more of these haematological studies so that reference interval can be determined for different population of the fish. A wider range of normal values may be necessary than for terrestrial animals in view of the fact that fishes are exposed to extremes of environmental conditions especially oxygen and carbon dioxide levels.

In another study , Ajani and Awogbade (2012) haematological changes of African catfish (*Clarias gariapinus*) juveniles induced by Diurothe result obtain from 96hr LC50 value of a working dilution of Diuron (0.03g/l) was obtained. The highest value of PCV and Hb was obtained the fish at higher concentration (1/2LC50), significant decreases were observed in total protein and albumin. Fish exposed to a working dilution of 1/10LC50 (0.003g/l) in this study showed no significant difference to the control.

It is little wonder that the PCV of fish exposed to 1/10LC50 increased than that of the control and other concentrations. Diuron is a substituted urea herbicide and urea is used as a fertilizer in agriculture. The 1/10LC50 concentration was too low to have an adverse effect on the exposed fish; instead it just releases nutrients into the water medium which helped in boosting the PCV of the tested fish. Contrary to the observation of Trivedi *et al*. (2005) no significant difference was observed in the red blood cell count among the fish exposed to the different concentrations. A significant increase in white blood cell count observed in fish exposed to 1/2LC50 is in agreement with the findings of Trivedi *et al*. (2005). It seemed that the effect was wearing out at 4 weeks.

The WBC count showed that at higher concentration, diuron could be toxic, of note is the

decrease observed at 4 weeks compared to 2 weeks at this concentration. Iqbal et al. (2006) corroborated this when he worked on the effect of urea exposure on the haematological parameters of *Clarias batrachus*. Velisek et al. (2007) also observed a decrease in leucocyte count which indicates the stress condition of the fish exposed to simazine. He noted that prolonged stress may have caused disruption of leukopoiesis, resulting in reduction of the total leucocyte count.

Platelets count for the fish exposed to ½LC50 concentration increased significantly at 2 weeks exposure. A significant decrease was observed at this same concentration at 4 weeks. The significant drop may be due to the effect of the diuron. Monocytes are phagocytic in action. It increases during chronic infection. They are a type of white blood cell involved in the immune response to foreign substances. The significantly observed increase ($P<0.05$) recorded in fish exposed to ½ LC50 and others signifies a physiological stress. Corroborated this when he studied the effects of bifenthrin on common carp. Monocyte clears up cellular debris after an infection. The significant increase in lymphocyte value obtained in fish at 2 weeks exposed to ½ LC50 diuron concentration compared to the rest and the control reflected the quick intervention needed in this situation. Lymphocytes are natural killer cells and at this concentration, more T-cells and B-cells were needed to destroy antigens and produce more antibodies, thus, the significant increase in the number at this concentration. At 4 weeks, the significant increase in lymphocyte persisted.

A sharp decrease recorded at 4 weeks in fish exposed to 1/10LC50 concentration when compared to the value obtained at 2 weeks may be due to the very low concentration of this sub lethal level in which the experimental fish were exposed to. A significant decrease in lymphocyte which is contrary to the norm, was recorded in fish exposed to ½ LC50 diuron concentration at 4 weeks.

The significant decrease observed in the activity of plasma enzyme ALT at 1/2LC50 concentration indicates stress-based tissue impairment. Velisek et al. (2007) observed this when he recorded that chronic exposure to simazine at 2 and 4µg /l resulted in a significant decrease in plasma ALT activity in fish. According to Velisek et al. (2007), change in activity of this transaminase indicates amplified transamination processes and an increase in transamination occurs with amino acid input into the TCA cycle to cope with the energy crisis during pesticide stress. The significant decrease observed in total protein values at 1/2LC50 may be due to the toxic effects of diuron on the immune system and/or the haemodilution effect. These results agreed with Hussein et al. (2009) and Mekkawy et al. Who reported a decrease of total protein in atrazine exposed Nile Tilapia and catfish. Borges et al. also recorded a decline in serum total protein level in fish *R. quelen* and *O. niloticus* in response to cypermethrin exposure. Davies et al. observed a decrease in total protein in rainbow trout after acute exposure to atrazine at a concentration of 50µg/l. Also, recorded a decrease in the concentration of plasma total protein and cholesterol in Korean rockfish (*Sebastes schlegeli*) exposed to cypermethrin. This result corroborates the significant decrease in cholesterol level obtained in fish exposed to 1/2LC50 and 1/5LC50 when compared with the control. Contrary to this result is the result of and who observed an elevation in cholesterol level in *R. quelen* and *O. niloticus* respectively.

This study confirmed that exposure to pesticides can result in significant haematological and biochemical changes of fish. The results indicate that Diuron, a substituted urea, could be toxic at high concentration, therefore, further studies are required to evaluate the potential.

In a research carried out by Adeyemo .et, al. (2003) on the haematological response of clarias gariapinus to changes in acclimation temperature .

Adult *Clarias gariepinus* of mean weight and mean standard length of 450 + 50gm and 34 + 5 cm respectively were allotted to aquaria at 10 fish per group (A -D) in replicates, based on the dose of cassava wastewater (CWW) to be administered (2, 5, 10 and 15 mls) respectively. Group E served as the control. The different doses were administered to the various groups for three consecutive days. After 96 hours, no mortality was observed in the control (Group E) and the group (Group A) injected with 2mls of cassava wastewater (CWW), 20% mortality was observed in the group that were injected with 5mls

(Group B) and 50% mortality was observed in the 10mls group (C). None survived (100%mortality) in the group that was injected with 15mls CWW. Haematological changes in groups A, B and C includes:

Anaemia marked by significantly low (at $p< 0.05$) PCV, Hb and RBC (in B and C alone). MCV values were significantly low in all the experimental groups relative to the control; MCH value was significantly low in Group A, while MCHC was significantly low ($p< 0.05$) in groups B and C. The total white blood cell (WBC) count was significantly higher ($p< 0.05$) than the control in all the experimental groups. Histopathological lesions were marked in the fish injected with the higher dose (10ml), the fish revealed severe necrosis, hypertrophy and vacuolation of hepatocytes. Other observation during the experiment includes reduced activities (swimming), haemorrhagic patches on the ventral surface of the fish, general discoloration and anoxia.

The effect of different acclimation temperatures on physiological parameters of

Clarias gariepinus over a period of eight weeks was assessed. Thirty-two fishes

Weighing approximately 400.0+5.0g were divided into four groups (A-D).

Fish each, based on the water temperature to which they were subjected: Group A (29+1oC) was the control while groups B (23+1oC), C (35+1oC) and D (41+1oC) were the test groups. Haematological and biochemical parameters were Considered after eight weeks. The result showed that there was no significant difference (at $p<0.05$) in the values at 23+1^{o}C, 35+1oC and 41+1^{o}C, except for haematocrit (Ht), haemoglobin (Hb) and total plasma protein (TPP) values, which were significantly different at 23±1^{o}C and 41±1^{o}C relative to the control (29±1^{o}C). The implication of temperature fluctuation of aquatic ecosystem on flora and the haematological and biochemical values of *Clarias gariepinus* at 23+1oC, 29+1oC, 35+1oC and 41+1oC. Using 29+1oC as the baseline temperature as it corresponds to the temperature of the natural habitat of *Clarias gariepinus*, the statistical analysis showed that there was no significant difference ($p<0.05$) in the physiological response of the fish at the various temperature levels for HCO3 -, Na+, K+ Cl and osmolality for the biochemical analysis and RBC, MCH, MCV, glucose level for the haematological analysis. However, at 23+1oC and 41+1oC there was a significant difference (at $p<0.05$) in Ht, Hb and TPP values when compared with the control (29+1oC). There was therefore no significant difference in the values obtained at35+1oC in both the haematological and biochemical parameters relative to the control.

Acclimation is the sum total of the adjustments, which fish make to long term changes in their environment. The changes are most frequently thought of in terms of seasonal or other temperature changes but can also occur in response to changes in oxygen level, salinity or other environmental factors. The changes are complex mixtures of adjustment in hormones, metabolic pathways, enzymes and behaviour, which occur at all functional levels from the molecular and cellular to the whole organism and population. Temperature has a profound effect on chemical and biological processes. As chemical and biological reaction rates double for every 10^{o}C increase in temperature, the metabolic activity of aquatic organisms also increases and animals uses twice as much oxygen (Howerton, 2001)

The result of this investigation showed a decrease in haematocrit (Ht), haemoglobin (Hb) and total plasma protein (TPP) at 23+1oC and 41+1oC relative to control (29+1oC). It is well known that a reduced quantity and

Quality of erythrocytes and a decreased haemoglobin level lead to a deteriorated

Oxygen supply. In addition to the transport of oxygen, erythrocytes have other functional tasks in the body, an insufficient quantity and quality of red cells would therefore consequently have several additional effects on metabolism beyond the simple oxygen supply for tissue metabolism, decrease TPP has also been reported to be suggestive of malabsorption (Gross *et al*, 2009). The highest blood glucose level however was observed at 23+1oC and high blood glucose levels at low temperatures is indicative of retarded metabolism, and is also an index of sub-lethal stress (Hattingh, 2003, Connors *et al,* 2001, Best *et al*, 2001). The HCO3 -, Na+, K+, Cl- and osmolality were temperature independent, this is an indication that *Clarias gariepinus* seems to have the ability to conserve osmolality over a wide and/or higher temperature range.

According to Smith *et al* (2002), osmolality values remained relatively stable in carp at all temperatures, whereas in *S. mossambicus* a wide span was observed at 15oC and at 25oC in trout. There was no significant difference in the Ht, Hb and TPP at 35+1oC. The MCV, MCH, MCHC were temperature independent. It can therefore be concluded that *Clarias gariepinus* has a high adaptive ability.

However, it should be noted that fish differ in their tolerance to extremes in

Temperature depending on the species involved, stage of development, environmental temperature dissolved oxygen (D.O.), pollution, season and

Extent to which the environment is heated and that temperature fluctuations affects feeding rate, spawning, D.O. uptake, pH level and other water quality parameters which would then affect the well-being of the fish. When water is highly heated, much energy, oxygen and vapour is released into the air, leaving behind a high concentration of CO2, which makes the water more acidic. Wastewater therefore has a high acidity (pH 1.6-1.8) and this renders it especially harmful to fish. The temperature of water had a direct influence on the toxicity of many pollutants and on the growth of microorganism. Temperature of inland water fluctuates with industrial use.

Studies have shown that when the water quality is affected by toxicants, any physiological changes will be reflected in the values of one or more of the haematological parameters (Van Vuren, 2004). Thus, water quality is one of the major factors, responsible for individual variations in fish haematology. The decrease in MCV after short-term exposure coupled with low haemoglobin content indicates that the red blood cells have shrunk, either due to hypoxia or microcytic anaemia. At this stage, microcytosis may be due to the decrease in the haematocrit during exposure.

The fluctuation in the MCH (for those in groupA) in the present study, clearly indicates that the concentration of haemoglobin in the red blood cells were much lower in the exposed fish than in the control fish, thereby, depicting an anaemic condition. The significant decrease in the MCHC (for those in groups B and C) after exposure, is probably an indication of red blood cell swelling and /or to a decrease in haemoglobin synthesis. Buckley et al. (2000) reported that prolonged reduction in haemoglobin content is deleterious to oxygen transport and any blood dyscrasia and degeneration of the erythrocytes could be ascribed as pathological conditions in fishes exposed to toxicants. The result of the histopathological studies carried out in the present work is in agreement with Wade *et al*, 2002, who reported that following 96hr-toxicity assay of cassava (*manihot esculenta* Crantz) effluent on the Niltilapia, histopathological examination of the kidney, gill and liver of the treated fish indicated damages, ranging from oedema and telangiectasis of the gill lamella and gill hyperplasia to vacuolation of the liver cells and necrosis. In a 96-hr bioassay test performed on the toxic effect of Cassava mill effluent to the African Catfish - Heteroclarias Hybrid of *Heterobranchus bidorsalis* (Male) and Clarias gariepinus (Female), the LC50 was determined as 50.12mgl -1. Exposed fish became darker in colour and showed sign of respiratory distress, increased opercula movement was observed before death occurred (Oti, 2002). Since cyanide is a potent respiratory poison, un-detoxified or insufficiently detoxified cyanide-containing liquid wastes could easily contaminate fish and ultimately extinguish aquatic life if discharged into aquatic environments.

Materials And Methods

This study was conducted in Gwargwalada, one of the six area council of the federal capital territory of Nigeria, Abuja. It lies between latitudes $8^0$55' north and $9^0$00' north and longitudes $7^0$00' east and $7^0$05'beast. it covers a total of 65square kilometres with a temperature range of 21^0c to26.7^0c and annual rainfall of approximately 1,650mm.

The commercial fish pond is located in Gwagwalada area council, FCT-Abuja. Abuja is located in the centre of Nigeria with a landscape of 8,000 square kilometres. It lies between the latitude of 9^0 12N and longitude of 70^0 11E. It is bounded to the north by Kaduna and Niger state, to the south by Kogi state, to the east by Nasarawa state to the west by Niger state. This work was carried out in university of Abuja main campus at the faculty of veterinary medicine in physiological laboratory. It lasted for one month, from the 5th of March and rounded up on the 10th of April .

Experimental Fish.

Eighty seven (87) catfish (*Clarias gariepinus*) were collected from a commercial pond around secretariat beside Atlas hotel in Gwagwalada (Abuja). Eighty seven (87) blood samples were collected within the period of 5th of March to 10th of April the sample were group into three base on their weight and length. Group one ranging from10-20cm and 180-278grams, and Group two 21-30cm and 280-503grams, and Group three 31-50cm and 509-900 grams. Each blood sample. All fish under experimentation were examined individually and recorded for freemen from any skin lesions or furunculosis (Foda, 2007).

Collection of blood samples .

Fish were caught individually in a small hand net from the containers. After the preliminary investigation of the length and weight, the fish were then placed belly upwards and blood samples was drawn from the posterior caudal vein (Schmit et al, 2010).with a heparinised $2cm^3$ disposable plastic syringes and a 21 gauge disposable hypodermic needle. The use of plastic syringe is a necessary precaution with fish blood because contact with glass results in decreased coagulation time. The site chosen for puncture (about 3 – 4cm from the genital opening) was wiped dry with tissue paper to avoid contamination with mucus. The needle was inserted perpendicularly to the vertebral column of the fish and gently aspirated during penetration. It was then pushed gently down until blood started to enter as the needle punctured a caudal blood vessel.

Blood was taken under gentle aspiration until about 1cm3 has been obtained, then the needle was withdrawn and the blood gently transferred into EDTA anticoagulant tube to prevent clot at room temperature

Parked cell volume (PCV) procedure.

the PCV capillary tube is deep into the blood sample in the EDTA for collection then the capillary containing the blood sample is sill with after which the sill capillary is placed in the micro haematocrit centrifuge to be spin for 5minutes then it remove to be read using haematocrit reader.

Homoglobin (Hb) procedure.

I used haemoglobin meter to conduct this test using my pipette I add one drop of d blood sample in d haemoglobin tube then add hydrogen chloride HCL into d tube and keep staring until colour match then took my reading. The haemoglobin concentration was measured by the cyan-methaemoglobin method (Blaxhall and Daisley, 2009) at a wavelength of 540nm.

White blood count -total (WBC t) procedure.

One drop of blood sample was added to 19 drop of Turk solution stir then adds a drop of the mixture on a number counting chamber then fixes it under the microscope to count your white cell.

White blood cell count-differential (WBC d) and red blood cell count (RBC) procedure.

Blood sample was place on a slide then stain for enumeration of red blood cell (Shaws, 2002). Blood smears were air dried for 5minute, fixed in absolute methanol, and stained for 60 seconds in giamsa stain. It was wash and allows to dry then view under the microscope.

The percentage of RBC, WBC, and thrombocyte were determined by counting 1,500cells. the WBC and thrombocyte percentage was multipled by the RBC count from the haemocytometer to determine the WBC and thrombocyte absolute count for the differential count, WBC and thrombocytes were counted until 200 WBC were enumerated on blood smears, and the percentage of each WBc typeand and of thrombocyte were multiplied by the total WBC and jkkijthrombocyte count to obtain absolute differential cell counts. this methodof manuallydeterming total WBC and differential count has been recommended for avian (Zinkl, 2005) and fish (Stoskopf, 2006) blood, because nucleated RBC prevent accurate enumeration using automated analysis (Huffman et, at,1997). The majority of blood values determined for fishes have been reported as +or –SEM (Hrubec et al., 2000). The Total Red Blood Cell (RBC) was obtained by employing the methods described by Dacie & Lewis (2011).

MCHC, MCH and MCV determination.

Mean cell hemoglobin concentration (MCHC), mean cell volume (MCV), and mean cell hemoglobin (MCH) were calculated using the following equations: MCHC = (Hb / PCV) · 100, MCH = (Hb / RBC) X 10 and MCV = (PCV / RBC) X 100 (Wickham et al, 2008).

Result.

Table 1: Histological parameters for group one.

Length (cm)	Weight (g)	Pcv (%)	Hb (g/dl)	RBC x10^6 (mc/mm^3)	Wbc x10^3 (m/mm)	Mchc (g/dl)	Mcv (fl)	Mch (pg)	Lymp (%)	Neut (%)	Eos (%)	Mon (%)
23	180	20.0	8.5	2.12	28.73	42.5	94.33	40.09	65.09	20.0	13.09	13.00
21	170	34.0	6.5	2.18	21.50	19.11	155.96	29.81	80.11	25.0	17.16	19.00
25	189	29.0	9.0	3.23	16.40	31.03	89.78	27.86	67.34	31.0	20.32	12.00
23	180	25.0	7.5	3.35	21.34	30.00	74.62	22.38	70.19	27.0	30.43	9.00
24	185	22.0	9.o	3.43	20.03	40.90	64.13	26.23	78.62	21.0	23.78	20.00
20	190	27.0	4.5	3.05	25.20	16.66	88.52	14.75	72.13	30.0	28.29	10.00
25	199	24.5	10.0	3.54	9.59	40.81	69.20	28.14	83.76	23.0	32.21	16.00
23	195	21.0	5.0	4.05	17.40	23.80	85.05	12.34	75.24	37.0	19.35	5.00
26	211	390.0	9.5	4.24	13.60	2.43	919.81	22.40	63.32	22.0	15.78	22.00
30	264	35.0	12.0	5.00	29.17	34.28	70.00	24.00	71.45	24.0	19.18	7.00
28	250	31.0	11.0	4.75	22.07	35.48	65.26	23.15	68.12	33.0	31.92	19.00
30	260	45.0	10.5	4.45	28.73	23.33	101.12	23.59	74.23	36.0	29.85	25.00
22	198	33.0	7.0	3.55	23.40	21.21	92.95	19.71	60.77	23.0	18.63	5.00
27	200	38.0	9.5	3.87	20.90	25.00	98.19	24.54	80.14	28.0	32.57	18.00
27	210	29.0	10.0	3.82	22.03	34.48	75.91	26.17	83.73	24.0	30.24	18.00
20	155	25.0	5.5	3.23	22.07	22.00	77.39	17.02	62.44	20.0	24.67	15.00
24	179	36.0	9.0	3.29	25.30	25.00	109.42	27.35	66.27	22.0	34.93	10.00
25	198	28.8	7.5	3.19	21.50	26.04	90.28	23.51	64.31	32.0	27.44	13.00
26	230	25.0	4.5	3.43	20.20	18.00	72.88	13.11	64.93	28.0	25.81	16.00
30	266	39.0	11.0	5.23	23.40	28.20	74.56	21.03	75.48	31.0	22.65	20.00
29	258	47.0	12.5	4.00	19.50	26.59	117.5	31.25	73.53	27.0	30.32	24.00
26	231	38.0	6.9	3.64	20.80	18.15	104.39	18.95	65.76	22.0	32.54	21.00
27	275	29.5	8.5	6.01	20.00	28.81	49.08	14.14	63.71	21.0	29.23	23.00
21	180	23.0	5.0	3.70	18.43	21.73	62.16	13.51	54.20	20.0	21.99	19.00
28	251	29.0	7.0	4.37	21.50	24.13	66.36	16.01	59.27	24.0	27.31	20.00
30	297	40.5	10.5	6.45	25.30	25.92	62.79	16.27	67.90	32.0	39.43	29.00
24	150	20.5	5.5	2.84	17.80	26.82	72.18	19.36	56.71	23.0	24.58	18.00
29	278	35.0	9.5	4.32	28.73	27.14	81.01	21.99	64.35	30.0	36.54	26.00
25	275	23.0	7.0	3.47	23.70	30.43	66.28	20.17	56.38	25.0	23.76	20.00

Table 2: Histological parameters for group Two.

Length (cm)	Weight (g)	PCV (%)	Hb (g/dl)	RBC x10^6 (mc/mm^3)	WBC x10^3 (m/mm)	Mchc (g/dl)	Mcv (fl)	Mch (pg)	Lymp (%)	Neut (%)	Eos (%)	Mon (%)
36	454	30.05	9.30	5.01	21.50	30.94	59.98	18.56	92.03	3.2	63.07	5.33
34	376	33.00	11.47	5.66	24.13.	34.75	58.30	20.26	87.33	1.33	43.09	12.22
31	470	32.00	11.33	5.41	21.50	35.40	59.14	2094	90.32	1.64	44.06	9.27
40	500	32.07	9.30	5.00	20.80	28.99	64.14	46.50	89.23	5.67	24.09	4.33
32	354	20.08	12.17	4.71	23.40	60.60	42.63	25.83	85.67	3.33	50.12	10.18
37	290	23.00	6.17	6.17	22.54	26.82	37.27	10.00	82.45	1.67	34.13	7.45
37	380	47.05	9.53	4.00	28.73	20.25	117.62	23.82	92.03	3.2	37.09	5.33

Length (cm)	Weight (g)	PCV (%)	Hb (g/dl)	RBC x10^6 (mc/mm^3)	WBC x10^3 (m/mm)	Mchc (g/dl)	Mcv (fl)	Mch (pg)	Lymp (%)	Neut (%)	Eos (%)	Mon (%)
34	498	35.05	10.72	6.12	19.80	30.58	57.27	17.51	87.33	1.33	54.09	12.34
31	297	42.00	12.47	5.00	28.73	29.69	84.00	14.94	90.33	1.67	32.07	9.34
32	300	40.08	9.80	4.47	20.90	24.45	89.66	21.92	89.33	5.45	33.98	4.73
36	345	47.04	10.37	5.15	22.67	22.04	91.33	20.13	85.67	3.33	45.15	10.33
34	491	39.07	8.53	4.29	22.06	21.83	91.07	19.88	83.90	7.23	51.07	10.67
39	502	18.05	9.30	5.01	20.03	51.52	36.02	18.57	87.00	8.31	33.23	5.00
31	459	23.05	11.47	6.12	21.50	49.76	37.66	18.74	82.00	2.33	43.1	15.67
35	380	35.04	11.33	5.60	24.10	32.33	62.57	20.23	87.00	3.55	21.00	9.67
34	364	45.06	9.93	5.41	21.50	22.03	83.29	18.35	90.43	5.33	25.08	5.00
38	372	26.15	9.30	5.87	20.80	35.56	44.54	15.84	82.33	4.33	43.12	13.67
34	484	26.05	12.17	4.00	23.40	46.71	65.12	30.42	84.33	6.33	35.09	10.00
40	454	30.05	14.28	5.00	25.20	47.52	60.1	28.56	78.00	5.33	23.09	14.43
40	455	35.00	12.54	6.17	27.23	35.82	56.72	20.32	85.00	8.34	37.07	12.00
38	478	29.03	5.80	4.71	18.54	19.79	61.63	12.31	76.89	7.23	36.09	10.34
38	359	30.5	4.12	2.10	15.00	13.50	145.23	19.61	46.00	4.33	43.01	9.89
31	370	32.00	5.42	1.67	4.70	16.93	191.61	32.45	44.00	5.12	43.01	5.00
35	362	36.00	5.51	1.23	17.00	15.30	292.68	44.79	65.00	9.42	54.42	6.43
37	373	33.15	2.28	1.57	22.90	6.87	211.14	14.52	50.00	12.61	26.07	8.50
37	454	29.05	8.50	2.10	16.88	29.25	138.33	40.47	49.66	7.00	25.09	7.21
32	4 82	26.00	5.25	7.60	14.05	20.19	34.21	6.90	41.50	5.26	21.11	12.11
39	503	36.05	10.17	5.25	17.75	28.21	68.66	19.37	66.00	11.13	27.11	12.00
36	494	38.00	8.10	4.70	17.40	21.31	80.85	17.23	51.00	10.24	24.07	10.81

Table 3: Histological parameters for group Three.

Length (cm)	Weight (g)	PCV (%)	Hb (g/dl)	RBC x10^6 (mc/mm)	WBC x10^3 (m/mm)	MCH (pg)	MCV (fl)	MCHC (g/dl)	Neu (%)	Leu (%)	Eos (%)	Mon (%
48	800	49	13.0	5.12	28.72	26.53	95.70	25.39	8.13	46.00	30.55	5.33
55	760	43	10.0	2.32	19.78	23.25	185.34	43.10	2.33	44.00	32.89	12.33
42	690	37.5	12.0	3.61	28.77	32.00	103.87	33.24	3.33	65.00	40.20	9.33
50	700	44.5	12.5	2.80	20.70	26.96	158.92	44.64	5.33	50.00	35.55	4.867
49	820	56.5	12.0	6.20	22.78	21.23	91.12	19.35	9.43	25.00	28.90	10.87
39	645	24.5	11.0	4.7	22.60	44.89	52.12	21.27	6.75	49.00	22.76	10.32
50	780	33.5	8.5	5.10	20.53	25.37	65.68	16.66	6.33	66.00	43.12	5.00
50	600	43.5	12.5	3.9	21.50	23.73	111.53	32.05	4.63	50.00	43.32	15.78
38	590	35.5	14.0	2.7	21.60	39.43	131.48	51.85	3.21	41.00	42.67	9.56
47	900	45.0	12.0	3.12	24.45	26.66	144.23	38.46	7.00	50.00	39.23	5.00
44	765	42.18	13.5	5.19	20.80	32.00	81.27	26.01	1.67	92.03	40.43	13.67
37	578	18.5	10.0	5.93	23.43	54.05	31.19	16.86	1.33	87.33	53.23	10.00
38	780	33	15.0	5.80	23.54	45.45	56.89	25.86	5.65	90.33	61.26	3.02
46	830	45	12.0	6.25	16.33	26.66	72.00	19.2	4.33	89.76	43.14	12.33
41	870	40	9.5	3.61	17.65	23.75	110.80	26.31	5.52	85.822	32.43	9.65
40	815	45	13.0	2.75	18.56	28.88	163.63	47.27	3.21	67.21	43.89	4.89
48	785	50.5	12.0	5.12	9.95	23.76	98.63	23.43	5.67	83.33	15.67	10.33
36	580	36.5	12.0	3.34	21.45	32.87	109.28	35.92	1.87	90.33	20.54	12.13
48	500	17.5	12.0	3.67	24.21	68.57	47.68	32.69	4.78	39.00	19.43	7.54
36	765	31.5	16.0	4.09	21.56	50.79	77.01	39.11	6.41	37.00	17.58	7.23
36	690	30.5	8.5	2.85	20.50	27.86	107.01	29.82	5.43	39.43	43.80	10.87
44	645	25.0	11.5	4.34	23.80	46.00	57.60	26.49	8.31	33.76	37.30	9.43
49	650	43.0	9.5	5.89	20.40	22.09	73.00	16.12	3.33	87.44	38.09	8.76
43	800	44.5	10.0	3.81	19.23	22.09	73.00	16.12	5.67	82.11	40.20	12.09
37	800	50.5	8.5	2.56	27.09	22.47	116.79	26.24	4.51	87.00	40.32	13.08
50	900	47.0	9.0	2.87	20.15	16.83	197.26	33.20	6.13	90.25	40.43	6.90
42	769	36.5	9.5	3.00	17.65	19.14	163.76	31.35	3.1	82.33	28.78	5.87
40	550	40.5	12.0	3.94	14.87	26.02	121.66	31.66	1.33	84.00	42.85	7.88
35	670	31.0	12.0	4.32	13.47	29.62	103.58	30.45	3.02	33.00	19.63	6.79

Hypothsis.

H_0 : there is no significant difference in length of the three groups

H_1 : there is significant difference in length of the three groups

Descriptive
Length

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	25.4483	3.07741	.57146	24.2777	26.6189	20.00	30.00
2.00	29	35.4483	2.94699	.54724	34.3273	36.5692	31.00	40.00
3.00	29	43.3793	5.61512	1.04270	41.2434	45.5152	35.00	55.00
Total	87	34.7586	8.40399	.90100	32.9675	36.5498	20.00	55.00

Anova
Length

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4682.759	2	2341.379	141.374	.000
Within Groups	1391.172	84	16.562		
Total	6073.931	86			

α= 0.05

Conclusion: we reject H_0 since the p-value (0.000) < 0.05 level of significant. Therefore there is significant difference in length of the three groups.

Hypothsis.
H_0 : there is no significant difference in weight of the three groups
H_1 : there is significant difference in weight of the three groups

Descriptive
Weight (g)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	217.3793	41.45946	7.69883	201.6090	233.1496	150.00	297.00
2.00	29	417.2414	69.48569	12.90317	390.8104	443.6723	290.00	503.00
3.00	29	725.0690	107.83086	20.02369	684.0523	766.0856	500.00	900.00
Total	87	453.2299	223.67406	23.98038	405.5585	500.9013	150.00	900.00

Anova
Weight (g)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	3793697.402	2	1896848.701	313.104	.000
Within Groups	508890.000	84	6058.214		
Total	4302587.402	86			

α= 0.05

Conclusion: we reject H_0 since the p-value (0.000) < 0.05 level of significant. Therefore there is significant difference in weight of the three groups.

Hypothesis
H_0 : there is no significant difference in PCV(%) of the three groups
H_1 : there is significant difference in PCV(%) of the three groups

Descriptive
PCV(%)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	42.8552	67.16319	12.47189	17.3077	68.4027	20.00	390.00
2.00	29	32.7145	7.44696	1.38287	29.8818	35.5472	18.05	47.05
3.00	29	38.6441	9.52382	1.76853	35.0215	42.2668	17.50	56.50
Total	87	38.0713	39.16318	4.19873	29.7245	46.4181	17.50	390.00

Anova
PCV(%)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1505.363	2	752.682	.485	.617
Within Groups	130397.525	84	1552.351		
Total	131902.888	86			

α= 0.05

Conclusion: we accept H_0 since the p-value (0.617) >0.05 level of significant. Therefore there is no significant difference in PCV of the three groups.

Hypothesis

H_0 : there is no significant difference in Hb(g/dl) of the three groups
H_1 : there is significant difference in Hb(g/dl) of the three groups

Descriptive
Hb

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	7.9448	2.73778	.50839	6.9034	8.9862	.00	12.50
2.00	29	9.1941	2.86872	.53271	8.1029	10.2853	2.28	14.28
3.00	29	11.4828	1.92485	.35744	10.7506	12.2149	8.50	16.00
Total	87	9.5406	2.91499	.31252	8.9193	10.1618	.00	16.00

Anova
Hb

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	186.717	2	93.358	14.415	.000
Within Groups	544.040	84	6.477		
Total	730.757	86			

α= 0.05

Conclusion: we reject H_0 since the p-value (0.000) < 0.05 level of significant. Therefore there is significant difference in Hb (g/dl) of the three groups.

Hypothesis

H_0 : there is no significant difference in RBC of the three groups
H_1 : there is significant difference in RBC of the three groups

Descriptive
RBC

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	3.8552	.97264	.18061	3.4852	4.2251	2.12	6.45
2.00	29	4.6586	1.55300	.28839	4.0679	5.2494	1.23	7.60
3.00	29	4.1000	1.20803	.22432	3.6405	4.5595	2.32	6.25
Total	87	4.2046	1.29721	.13908	3.9281	4.4811	1.23	7.60

Anova
RBC

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.836	2	4.918	3.063	.052
Within Groups	134.881	84	1.606		
Total	144.717	86			

α= 0.05

Conclusion: We accept H_0 since the p-value (0.052) > 0.05 level of significant. Therefore there is no significant difference in RBC of the three groups.
Hypothesis
H_0 : there is no significant difference in WBC of the three groups
H_1 : there is significant difference in WBC of the three groups

Descriptive
WBC

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	21.6662	4.43837	.82419	19.9779	23.3545	9.59	29.17
2.00	29	20.7383	4.70960	.87455	18.9468	22.5297	4.70	28.73
3.00	29	20.8990	4.13570	.76798	19.3258	22.4721	9.95	28.77
Total	87	21.1011	4.40111	.47185	20.1631	22.0392	4.70	29.17

Anova
WBC

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	14.264	2	7.132	.363	.697
Within Groups	1651.538	84	19.661		
Total	1665.802	86			

α= 0.05

Conclusion: we accept H_0 since the p-value (0.697) > 0.05 level of significant. Therefore there is no significant difference in WBC of the three groups.
Hypothesis
H_0 : there is no significant difference in MCHC of the three groups
H_1 : there is significant difference in MCHC of the three groups

Descriptive
MCHC

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	26.5510	8.24109	1.53033	23.4163	29.6858	2.43	42.50
2.00	29	29.6186	12.39195	2.30113	24.9050	34.3323	6.87	60.60
3.00	29	31.3431	12.05256	2.23810	26.7586	35.9277	16.83	68.57
Total	87	29.1709	11.10752	1.19085	26.8036	31.5383	2.43	68.57

Anova
MCHC

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	341.696	2	170.848	1.398	.253
Within Groups	10268.727	84	122.247		
Total	10610.423	86			

α= 0.05

Conclusion: we accept H_0 since the p-value (0.253) > 0.05 level of significant. Therefore there is no significant difference in MCHC of the three groups.

Hypothesis

H_0 : there is no significant difference in MCV of the three groups

H_1 : there is significant difference in MCV of the three groups

Descriptive

MCV

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	112.1072	156.78659	29.11454	52.4688	171.7457	49.08	919.81
2.00	29	86.9921	58.92536	10.94217	64.5781	109.4061	34.21	292.68
3.00	29	103.5183	42.21521	7.83917	87.4605	119.5761	31.19	197.26
Total	87	100.8725	99.11637	10.62639	79.7480	121.9971	31.19	919.81

Anova

MCV

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	9450.691	2	4725.346	.475	.623
Within Groups	835417.968	84	9945.452		
Total	844868.660	86			

α= 0.05

Conclusion we accept H_0 since the p-value (0.623) > 0.05 level of significant. Therefore there is no significant difference in MCV of the three groups.

Hypothesis

H_0 : there is no significant difference in MCH of the three groups

H_1 : there is significant difference in MCH of the three groups

Descriptive

MCH

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	22.0286	6.28122	1.16639	19.6394	24.4179	12.34	40.09
2.00	29	93.5183	384.86011	71.46673	-52.8747	239.9112	6.90	2094.00
3.00	29	29.6593	9.57041	1.77718	26.0189	33.2997	16.12	51.85
Total	87	48.4021	222.05020	23.80628	1.0767	95.7274	6.90	2094.00

Anova

MCH

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	89387.335	2	44693.668	.904	.409
Within Groups	4150953.857	84	49416.117		
Total	4240341.192	86			

α= 0.05

Conclusion: we accept H_0 since the p-value (0.409) > 0.05 level of significant. Therefore there is no significant difference in MCH of the three groups.

Hypothesis

H_0 : there is no significant difference in LYMP of the three groups

H_1 : there is significant difference in LYMP of the three groups

Descriptive
LYMP

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	68.6028	8.03907	1.49282	65.5449	71.6607	54.20	83.76
2.00	29	76.6124	16.71768	3.10440	70.2533	82.9715	41.50	92.03
3.00	29	4.7497	2.13713	.39685	3.9367	5.5626	1.33	9.43
Total	87	49.9883	34.05149	3.65070	42.7309	57.2456	1.33	92.03

Anova
LYMP

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	89954.418	2	44977.209	386.984	.000
Within Groups	9762.896	84	116.225		
Total	99717.314	86			

α= 0.05

Conclusion: we reject H_0 since the p-value (0.000) < 0.05 level of significant. Therefore there is significant difference in LYMP of the three groups.

Hypothesis
H_0 : there is no significant difference in NEUT of the three groups
H_1 : there is significant difference in NEUT of the three groups

Descriptive
NEUT

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	26.2414	4.92555	.91465	24.3678	28.1150	20.00	37.00
2.00	29	5.3531	3.04864	.56612	4.1935	6.5127	1.33	12.61
3.00	29	64.3952	22.75044	4.22465	55.7414	73.0490	25.00	92.03
Total	87	31.9966	27.99902	3.00181	26.0292	37.9640	1.33	92.03

Anova
NEUT

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	51987.443	2	25993.721	141.491	.000
Within Groups	15431.855	84	183.713		
Total	67419.297	86			

α= 0.05

Conclusion: we reject H_0 since the p-value (0.000) < 0.05 level of significant. Therefore there is significant difference in NEUT of the three groups.

Hypothesis
H_0 : there is no significant difference in EOS of the three groups
H_1 : there is significant difference in EOS of the three groups

Descriptive
EOS

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	26.3448	6.50687	1.20829	23.8697	28.8199	13.09	39.43
2.00	29	36.9921	11.24871	2.08883	32.7133	41.2708	21.00	63.07
3.00	29	35.7997	10.81919	2.00907	31.6843	39.9151	15.67	61.26
Total	87	33.0455	10.77233	1.15491	30.7496	35.3414	13.09	63.07

ANOVA
EOS

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1973.734	2	986.867	10.354	.000
Within Groups	8005.971	84	95.309		
Total	9979.705	86			

α= 0.05

Conclusion: We reject H_0 since the p-value (0.000) < 0.05 level of significant. Therefore there is significant difference in EOS of the three groups.

Hypothesis

H_0 : there is no significant difference in MON of the three groups

H_1 : there is significant difference in MON of the three groups

Descriptive
MON

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	29	16.9655	6.20761	1.15273	14.6043	19.3268	5.00	29.00
2.00	29	9.2845	3.18212	.59090	8.0741	10.4949	4.33	15.67
3.00	29	8.9947	3.15861	.58654	7.7933	10.1962	3.02	15.78
Total	87	11.7482	5.73355	.61470	10.5263	12.9702	3.02	29.00

ANOVA
MON

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1185.286	2	592.643	30.321	.000
Within Groups	1641.841	84	19.546		
Total	2827.127	86			

α= 0.05

Conclusion: we reject H_0 since the p-value (0.000) < 0.05 level of significant. Therefore there is significant difference in MON of the three groups.

Discussion

There were variations in all haematological parameters measured during the study. similar variations have been reported in the haematological profile of other *clarias* catfishes by other researchers. Kori-siakpere (2003) noted wide variations in the haemoglobin concerntration, haematocrit and erythrocyte indices of the catfish *clarias isheriensis* the mean haematocrit values recorded in this study is in agreement with results from previous studies carried out by Adedeji et al., (2000) and Adeyemo, (2005) who got mean values of 37.0% and 36.0% respectively for *clarias gariepinus*. sniesko (2006) recorded a range of 40-50% when he worked on rainbow trout (salmo gairdneri), several researchers have reported significant differences in haematocrit between sexes in sexually mature species (snieszko, 2006 and Mulcachy 1970). this observation is consistent with the result obtained in this study. the mean erythrocyte count of C. gariepinus obtained in this study is not in conformity with that of other workers. Adeyemo (2005) obtained a mean erythrocyte count of 3.52x 10^6 /ul while Adedeji et al. (2000) recorded 2.4x10^6 the differences in climatic and environmental factors in the places from where the species of the fish were obtained as suggested by Barnhart (2001).

Conclusion

The evaluation of haematological characteristics in fish has become an Important means of understanding normal, pathological processes and toxicological impactssudova *et al*. (2008). Haematological alterations are usually the first detectable and quantifiable responses to environmental change wandelaar bonga(1997).

Haematological profiles can provide important information about the internal environment of the organism masopust J. (2000). The observed decrease in PCV, WBC, MON, and MCV they tend to decrease as the weight increases

For fish in the three group is in line with the observation they is a slight increases in Hb, Rbc, and MCH this tend to increase as the weight decrease. While MON, EOS, NEUT, and MCH keeps fluctuating that is to say the weight and length of the fish have no effect in them.

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