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SOME HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF ENDANGERED IN SNAKEHEAD (Channa striatus)

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SOME HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF ENDANGERED IN SNAKEHEAD (*Channa striatus)*

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A project report submitted to faculty of agriculture, Universiti Putra Malaysia in fulfillment of the requirement of AKU4999 (final year project) for the award of the degree of Bachelor of Agriculture Science (Aquaculture)

DEPARTMENT OF AQUACULTURE
FACULTY OF AGRICULTURE
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CERTIFICATION OF APPROVAL

DEPARTMENT OF AQUACULTURE

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Title of project **: SOME HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF ENDANGERED SNAKEHEAD (*Channa striatus*).**

This is to certify that I have examined the final project report and all correction have been made as recommended by the panel of examiners. This report complies with the recommended format stipulated in the AKU4999 project guidelines, Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia.

Signature and official stamp of supervisor and cosupervisor.

_____

Dr. S.M Nurul Amin

Date:

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Abstract

A study was carried out to establish reference ranges for haematological and some biochemical variables for the healthy Malaysian Snakehead, *Channa striatus*. Thirty-seven individuals of the wild Snakehead were procured for the study. For convenience of study, they were grouped into four groups based on weight. Group 1(100g or less), group 2(101-200g), group 3(201-300g), and group 4(300 and above). The ranges of the mean weight, mean length and condition factor (K) for the entire sample were 73.67±11.9-330.00±15.8g, 191.7±10-337.2±16mm and1.37±02-1.64±02K respectively. The range mean values for haematological parameters were 28.67±31-33.67±7.2% for PCV, 26.0±1.0-31.33±6.9% for Haematocrit, 2.88±0.6-3.32±05×10 ^{12} cells/mL for RBC count, 6.33±1.2-7-33±1.5×10^{9} cells/mL for WBC count, 14.11±2.0-17.67±4.1% for Lymphocytes, 21.67±1.5-24.56±3.0% for Monocytes, 14.56±2.9-15.33±1.5% for Eosinophils and 14.78±8.1-21.33±2.9% for Basophils. The ranges of the biochemical variables were 116.72±23.7-124.39±29.2g/l, 34.0±5.0-35.58±5.9g/l, 23.33±2.9-35.32±9.5g/l, 1.03±0.4-1.64±0.8 mmol/L, 14.11±2.0-17.67±4.1 mmol/L and 94.9±38-106.48±18.1 mmol/L for Haemoglobin concentration, Plasma protein, Total protein, Urea concentration, Sodium concentration, and Chloride concentration respectively. The results show significant differences on the weight, length and condition factor (K) among the four groups, but no significant differences between haematological and biochemical parameters.

Abstrak

Satu kajian telah dijalankan untuk menunjukkan julat rujukan bagi hematologi dan beberapa pembolehubah biokimia bagi ikan haruan di Malaysia yang sihat, *Channa striatus*. Tiga puluh tujuh individu haruan liar telah diperolehi untuk kajian ini. Untuk memudahkan kajian ini dijalankan, sampel telah dikumpulkan ke dalam empat kumpulan berdasarkan berat. Kumpulan 1 (100g atau kurang), kumpulan 2 (101-200g), kumpulan 3 (201-300g), dan kumpulan 4 (300 dan ke atas). Julat berat min, bermakna panjang dan faktor keadaan (K) bagi keseluruhan sampel adalah 73,67 ± 11,9-330,00 ± 15.8g, 191,7 ± 10-337,2 ± 16mm and1.37 ± 02-1,64 ± 02K masing-masing. Julat bermakna nilai bagi parameter hematologi 28,67 ± 31-33,67 ± 7.2% bagi PCV, 26.0 ± 1,0-31,33 ± 6.9% untuk Haematocrit, 2,88 ± 0,6-3,32 ± 05 × 10 12 sel / mL untuk RBC kiraan, 6,33 ± 1,2 -7-33 ± 1.5 × 109 sel / mL untuk WBC kiraan, 14,11 ± 2,0-17,67 ± 4.1% untuk Limfosit, 21,67 ± 1,5-24,56 ± 3.0% bagi monosit, 14,56 ± 2,9-15,33 ± 1.5% untuk eosinofil dan 14,78 ± 8,1-21,33 ± 2.9% bagi Basophils. Antara pembolehubah biokimia adalah 116,72 ± 23,7-124,39 ± 29.2g / l, 34,0 ± 5,0-35,58 ± 5.9g / l, 23,33 ± 2,9-35,32 ± 9.5g / l, 1,03 ± 0,4-1,64 ± 0.8 mmol / L 14,11 ± 2,0-17,67 ± 4.1 mmol / L dan 94,9 ± 38-106,48 ± 18.1 mmol / L bagi kepekatan hemoglobin, protein plasma, protein Jumlah, kepekatan Urea, kepekatan Natrium, dan kepekatan Klorida masing-masing. Keputusan menunjukkan perbezaan yang signifikan terhadap faktor berat, panjang dan keadaan (K) di kalangan empat kumpulan, tetapi tiada perbezaan yang signifikan antara parameter hematologi dan biokimia.

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LIST OF ABBREVIATIONS / SYMBOLS

NaOH	Sodium hydroxide
NaCI	Sodium chloride
$MgCI_2$	Magnesium chloride
mL	mililiter
%	Percent
^{O}C	Degree centrigrade
EDTA	Ethylenediaminetetracetic Acid
g	gram
cm	centimetre
GRP	Group
PCV	Packed cell volume
WBC	White blood cell
RBC	Red blood cell

CHAPTER 1

INTRODUCTION

Channa striatus is the most popular snakehead in terms of its distribution and economic importance (Aliyu-Paiko, 2011). The species inhabits rivers, streams, swamps, mashes, ponds and canals throughout Southeast Asia (Boonyaratpalin *et al.,* 1985). *Channa* species is a voracious carnivore in feeding habit, living on live animals; such as zooplankton and insect larvae by the small fry whereas the bigger fingerlings, juveniles and adults feed on invertebrates, frogs and smaller fish (Menon and Chacho 1958). *C. striatus* is an air breathing catfish, which tolerates dissolved oxygen depleted water and can survive without water for a number of months as long as the skin and accessory breathing organ are not dried. The fish survives well in water with pH and temperature values between 4 and 5, and 28ºC and 35ºC although the recommended ranges are 6.5 to 8.5 and 30 ºC to 32 ºC respectively, (Smith 1945). Behead is one of the most common staple food fish in many parts of Southeast Asia, including Malaysia where it is regarded by the indigenes particularly Chinese as an effective medicinal commodity especially in the area of wounds healing (Boonyaratpalin *et al.,* 1985).

In South-East Asia, the aquaculture of *C. striatus* has been in practice since the 1970s, particularly in Thailand, with the culture expanding rapidly in the early 1980s to replace *Clarias* (Catfish) farming, due to its price fluctuations and disease problems (Boonyaratpalin *et al.,* 1985). *C. striatus* shows impressive growth habit under culture conditions; when stocked at the right density and fed

properly. The fish normally attains 300 to 500 g weight in about nine months and 500 to 800 g in eleven months (Boonyaratpalin *et al.*, 1985).

In Malaysia, according to the Department of Fisheries (DOF 2007) freshwater aquaculture contributed about 26% of the total aquaculture production in 2007 which added about 70,064 tonnes of fish to the nation's sea food. Out of this total, after tilapia, catfish and carps (which contributed 46%, 42% and 7%, respectively) snakehead species contributed as the 4th major species group (1% or 700.064 tonnes). Ng (2009) reported aquaculture of freshwater fish (including *C. striatus*) in Malaysia to have great potentials for expansion, consequence upon the availability of large inland freshwater bodies and favorable government policies, which created good enabling environment for the commercial production of the species, mainly by small scale farmers and some few commercial farms.

FAO (2009) noted that the culture of *C.striatus* has good potential for expansion. This couples with the popularity of the species by locals in Malaysia as a reliable source of protein for its excellent taste and flavor, in addition to the use for its pharmaceutical properties. Since the principal sources of the seeds (natural spawning grounds in the wild) are fast dwindling due to human activities like over-fishing, urbanization and pollution (Wee 1981; Lai 1998; Hossain *et al.*, 2008) the only redeemable way of guaranteeing sustainable seed production of this commercially important species is under aquaculture.

The study of the physiological and haematological characteristics of cultured fish Species is an important tool in the development of aquaculture system, particularly in regard to the use in detection of healthy from diseased or stressed animal (Rainza-Paiva *et al.*, 2000; O'Neal and Weirich, 2001.) The changes in the blood characteristics of *Channa striatus* caused by stress due to exposure to environmental pollutants, diseases or attack by pathogens have been studied by a number of authors (e.g. Onusiriuka and Ufodike, 2000; Ezeri, 2001; Gabriel *et al.*, 2001). These indices have been effectively employed in monitoring the responses of the fish to the stressors and evaluating its health status under such adverse conditions. Reports on the normal hematological and biochemical blood parameters of many aquaculture fish species depends on sex, environment and others factor. The paucity of reliable references of the normal condition has been a major hindrance in assessing the state of health of natural fish population. This study aims to establish reference ranges for haematological and biochemical values for healthy *Channa striatus* collected from swamps Selangor, Malaysia. The objectives of the present research are the following;

1. To investigate some important haematological indices of snakehead like as packed cell volume (PCV), Haematocrit, RBC, WBC, Lymphocytes, Monicytes, Eosinophils and Basophils.

2. To estimate some biochemical parameters of snakehead like as Haemoglobin, Plasma, Urea, Sodium and Chloride.

REFERENCES

Al-Dohail M.A.S. (2005) The effect of mixed feeding schedules on growth performance and diurnal digestives protease activities of African Catfish Clarias gariepinus. MSc thesis, Universiti Sains Malaysia, Malaysia

A.Jesu Arockiaraj, M. Muruganandam, K. Marimuthu and M. A. Haniffa. (1999). Utilization of Carbohydrates as a Dietary Energy Source by Striped Murrel *Channa striatus* (Bloch) Fingerlings. 103 – 111.

Annasari Mustafa1,, M. Aris Widodo2, Yohanes Kristianto3 (2012). Albumin And Zinc Content Of Snakehead Fish (*Channa striata*) Extract And Its Role In Health. Vol 1 no 2.

Bagenal, T.B. and A.T. Tesch, (1978) Conditions and growth patterns in fresh water habitats. Blackwell Scientific Publications, Oxford

BERTALANFFY, L. V. (1938) A quantitative theory of organic growth (inquiries on growth laws. 11.) Human Biol. 10, 181-213

Bolger, T. and P.L. Connolly, 1989. The suitable of suitable indices for the measurement analysis of fish condition. J. Fish Biol., 34(2), 171-182.

Centeno L., Silva-Acun_ a R., Barrios R., Lugo R.S., Matute C. and Pe.rezY.J.L. (2007) Haematological characteristics of the cachama (Colossoma macropomum) in three phases of growth in Delta Amacuro state,Venezuela. ZootecniaTropical 25, 237-243.

F. Francesco., P. Satheeshkumar., D. Senthil., F. Caterina., P. Giuseppe (2012). A comparative study of hematological and blood chemistry of Indian and Italian grey mullet (mugil cephalus linneaus 1758)., *Herbert Open Access Journals.*

FAO (1969) Manual of Methods for Fish Stock Assessment - Part 1. Fish Population Analysis

Fanouraki, E., Divanach, P., Pavlidis M (2007) Baseline values for acute and chronic stress indicators in sexually immature red Porgy (*Pagrus pagrus*). Aquaculture 265, 294-304.

Froese, R. (2006) Cube law, condition factor and weight-length relationships: history, metaanalysis and recommendations. J. Appl. Ichthyol. 22, 241-253

Harikrishnan R., Rani M.N. and Balasundaram C. (2003) Hematological and biochemical parameters in common carp, Cyprinus carpio, following herbal treatment for Aeromonas hydrophila infection. Aquaculture 221, 41-50.

H. Mohamed., and H. Agab (2004). Haematological and biochemical indices of clarias garipeinus collected from River Nile, Sudan. *Journals fisheries and aquatic science.*

Houston K. (1997) Are the classical haematology variables acceptable indicators of fish health? Trans Am Fish Soc 126, 879-894.

Jan. E. Bly., T. M. Buttike., E. F. Edward *et., al* (1985). The effect of in vivo acclimation temperature on the fatty acid composition of channel catfish (ictalurus punctatus peripheral blood cells). *Journals comp. biochem. Physiol 4 : 791-795.*

J Qin and A. W. Fast. (1997). Food selection and growth of young snakehead *Channa striatus.* 21 – 25.

Jianguang Qin, Arlo W. Fast, Daniel DeAnda,Ronald P. Weidenbach. (1997). Growth and survival of larval snakehead (*Channa striatus*) fed different diets., 105-113.

Kori-S. O. ., Ikomi R. B and Ogbe M. G. (2011). Biochemical response of the African catfish: clarias gariepinus (burchell, 1822) to sublethal concentration of potassium permanganate. *Journal annals of biological research: 1-10.*

Kumar S., Sahu N. P., Pal A. k., Choudry D., Yengkokpan S., Mukherjee S. C (2005) Effect of dietary carbohydrate on haematology, respiratory burst activity and histological changes in *L. rohita* juveniles. Fish Shell immunol 19, 331-344.

K. V. SASTRY~ AND ABAD A. SIDDIQLJI. (1984). Some Hematological, Biochemical, and Enzymological Parameters of a Fresh-Water Teleost Fish, *Channa punctatus,* Exposed to Sublethal Concentrations of Quinalphos. Page 8-13.

K.'Sampath & T. J. Pandian. (1980). Effects of density on food utilization and surfacing behaviour in the obligatory air-breathing fish channa striatus., 113 – 117.

Le-Cren, E.D., 1951. The length-weight relationship and seasonal cycle in gonadal weight and condition in the perch (*Perca fluviatilis*). J. Animal Ecol. 20, 201-219

Natt, M.P., Herrick, C.A., (1952) A new blood diluent for counting erythrocytes and leucocytes of the chicken. Poult. Sci. 31, 735–738.

Nguyen Van Trieu, Duong Nhut Long and Lam My Lan. (2001). Effects of Dietary Protein Levels on the Growth and Survival Rate of Snakehead (*Channa striatus* Bloch) Fingerling)., 1-5.

Norman Y. S. Woo and S. I. CHEUNG., (1980). Metabolic effects of starvation in the snakehead, *Ophiocephalus Maculatus.*, page 623.

O.Kori-Siakpere., J.E.G. Ake., And E. Idoge (2005). Haematological characteristics of the African snakehead, parachanna obscura. *African journal of biotechnology, 4: 527-530.*

O. B. Adedeji., (2010). Acute effect of diazinon on blood plasma biochemistry in the African catfish (*Clarias gariepinus*). *Journal of clinical medicine and research 2: 001 – 006.*

Qin, J., Fast, A.W., DeAnda, D. And Weidenbach, R.P. 1997. Growth and survival of larval snakehead (*Channa striatus*) fed different diets. Aquaculture, 148: 105-113.

Ranzani-Paiva M.J.T., Ishikawa C.M., das Eiras A.C. and da Silveira V.R. (2004) Effects of an experimental challenge with Mycobacterium marinum on the blood Parameters of Nile Tilapia, Oreochromis niloticus (Linnaeus, 1757). Brazilian Archives of Biology and Technology 47, 945-953.

S. Agrahari., K. C. Pandey., K. Gopal (2007). Biochemical alteration induced by monocrotophos in the blood plasma of fish, channa punctatus (bloch). *Journals pesticide biochemistry and physiology 88 : 268 – 272.*

S Puttinaowarat[1,2], K D Thompson[1], A Kolk[3], A Adams.(2002). Identification of Mycobacterium spp. Isolated from snakehead, *Channa striata* (Fowler), *and Siamese fighting fish, Betta splendens (Regan),* using polymerase chain reaction–reverse cross blot hybridization (PCR–RCBH). Volume 25, Issue 4, pages 235–243.

Thumronk Amornsakun, Wasan Sriwatana and Ponpanom Promkaew. (2001) Feeding behaviour of snake head fish, *Channa striatus* larvae., 667-670.