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SEASONAL CHANGES IN THE HAEMATOLOGY OF THE FRESHWATER FISH, *CLARIAS BATRACHUS* OF TERAI REGION OF UTTARAKHAND

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ABSTRACT

The fish haematology is a vital source to know the health status of the fish. Now until much literature on several sides of haematopatho physio-biology is achievable on most of the vital freshwater fishes in India. The goal of this study to calibrate haematological study of Clarius *batrachus*. In this perusal, the calculated values were compared between male and female Clarias batrachus as well as a comparison between winter, summer and rainy seasons. *Haematological* parameters like *Haemoglobin* (Hb),Total erythrocyte count (TEC),Total leucocytes count (TLC), Packed cell volume (PCV), Mean corpuscular volume (MCV), Mean corpuscular *haemoglobin* (MCH), Mean corpuscular haemoglobin concentration (MCHC), Erythrocyte sedimentation rate (ESR), Differential leukocytes count (DLC) are taken for study. The freshwater fish showed that Hb, TEC, TLC, PCV, MCV, MCH, MCH and ESR are higher in male than female but Differential leukocytes count (DLC) is higher in female than male except thrombocytes.

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INTRODUCTION

For Indian diet fish is a vital food. Almost 100 million Indians eat fish. Fish is a good source of easily assimilated sublimate attribute animal protein. Fish composition 2-3% of protein fulfillment and 22.4% of total animal protein supply (Piska 1999). Vastly fishes keep 15-25% protein mid 1.5% fat. He also educed that fish may be sublimated effective dominant in decreasing bipod pressure interjacent inhibiting cardio-vascular disease. According Sarkar 2002 there are also signs that few fatty acids of fishes give security contrary renal disease in human beings. The Asian catfish, *Clarius batrachus* locally identified as 'magur' is a compatible eatable fish in India and other Asian countries comprising Bangladesh, Vietnam, Thailand, Malaysia, Indonesia, Mollah HFA *et al*., 1990. Haematological evaluation of blood is vital in estimating the health of various organisms added the fishes. Variations in the blood constitution of cell types are vital diagnostic signs reflecting diseases. Fish haematology is a necessary tool for the biologists as a frontline sentient indicator of crucial physiological and biochemical function as well as status of nutritional, health diseases and strains in impedance to varying environmental situations. Variations in haematological parameters dependent upon the aquatic biotope fish species, age and sexual matureness and health status, Blaxhall PC 1972, Patriche *et al*., 2011, Radu *et al*., 2009. Constitution of the blood of fishes changes with the altering situations of the environment and reactions instantly to any alteration in water quality because of the cognizant contact through gill surface. Alterations in haematology parameters of fish in connection to variant pollutants have been observed by Pamila *et al*., (1991), Bhatt and Farswan, (1992), Varadraj *et al.,* (1993), Gupta *et al.,* (1995), Srivastava *et al*., (1996), Kumar *et al*., (1999), Nair (2000), Kumari and Pandey (2002), Paulose (2002), Das and Bhattacharya (2002), Svobodova *et al*., (2003), Yaji and Auta (2007), Ramesh and Saravanan (2008), Jaffer Ali and Rani (2009). Assessment of the haemogram implicates the determination of the RBC, WBC, PCV, Hb, MCV, MCH and MCHC.

Study Area

This study is based on Terai region of Uttarakhand. Terai region of Uttarakhand is situated in the southern part of Himalayas. It is a part of Ganga river system. Seven reservoirs have been constructed in the Terai region of Kumaun hills of Uttarakhand. Some are Nanak Sagar, Tumaria, Baigul, Dhaura

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in the district of Udham Singh Nagar. Unfortunately, the fishes of Terai region have been deprived of adequate studies pertaining to protozoan pathogenicity though the waters have been substantially pampered by the industries and are most likely to cast their impact on the metabolic and physiological condition of the fish. In present study to detect the seasonal changes in fish hematology we selected four different sites of district Udham Singh Nagar namely; Nanak Sagar reservoir (Site-I), Dhaura reservoir (Site-II), Baigul reservoir (Site-III) and Tumaria reservoir (Site-IV) and selected fish for this study *Clarias batrachus*. The fish *Clarias batrachus* inhabit in dark shaded and densely planted streams and ponds. Marshy and swampy pools and puddles are their ideal living grounds and predatory tendencies, carnivorous and mason breeders.

MATERIALS AND METHODS

Adult fishes were amassed from various spots of selected reservoirs of Terai region. The fishes were captured by local fisher with the help of gill net in summer and winter season until cast net was utilized in the rainy season. The gathered fish was carried on an identical day in a pot impregnated with pond water to the laboratory and the investigations were carried out. After it fresh fishes were dissected and the blood was gathered from the caudal region.

About 2 hr after each extraction, the blood samples were procedure for Total Leucocytes Count (TLC), Haemoglobin (Hb), Total Erythrocytes Count (TEC), Erythrocyte Sedimentation Rate (ESR), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Packed Cell Volume (PCV), Mean Corpuscular Haemoglobin Concentration (MCHC) and Differential Leukocyte Count (DLC). The haemoglobin concentration per 100 ml of blood was calculated with a Sahli's haemometer. For differential counts of blood cells, blood films were stained by Leishmann's stain and Wright's stain, MCV, PCV, MCHC, MCH, ESR were determined by Wintrobe method. Total erythrocyte count and Total leucocytes count of blood were determined by Neubauer hemocytometer and Hayem's solution was utilized as dilute fluid.

RESULT

In this study haematology of fish *Clarias batrachus* comprised total leucocytes count (TLC), haemoglobin (Hb), total erythrocytes count (TEC), erythrocyte sedimentation rate (ESR), mean corpuscular volume (MCV), mean corpuscular haemoglobin(MCH), packed cell volume (PCV), mean corpuscular haemoglobin concentration (MCHC) and differential leukocytes count (DLC) in winter, summer and rainy seasons.

Table 1. Showing seasonal changes in hematological parameters in male and female *Clarias batrachus*

Parameters	Sex	Winter	Summer	Rainy
TEC	M	1.81±0.47	1.70±0.38	2.39±0.48
($\times10^6$/cmm)	F	1.62±0.39	1.62±0.49	2.12±0.53
TLC	M	8092.01±187.25	9358.45±180.5	11592.69±203.75
(/cmm)	F	7493.572±148.25	8599.83±156	10525.11±193.25
MCV (μm^3)	M	158.24±5.34	177.35±7.65	236.35±9.44
	F	173.00±6.95	192.03±9.14	251.56±9.96
ESR	M	1.32±0.27	2.25±0.41	2.00±0.41
(mm/hours)	F	1.16±0.28	2.18±0.30	1.83±0.39
MCH	M	28.72±1.45	29.50±1.40	29.64±1.58
(%)	F	28.10±1.56	28.94±1.56	29.37±2.03
PCV	M	31.3±1.69	33.25±2.32	34.37±2.66
(%)	F	30.35±1.98	31.72±2.14	34.3±2.26
Hb	M	9.83±0.68	11.08±1.36	11.04±1.60
(gm %)	F	9.47±0.66	10.25±1.57	10.80±1.54
MCHC	M	33.28±2.65	35.93±2.28	33.62±1.54
(%)	F	33.18±2.35	32.79±1.21	32.03±1.70

Table 2. Haematological parameters of Differential Leukocytes Count (%) in *Clarias batrachus*

Seasons	Sex	DLC (%)					
		Small Lymphocytes	Large Lymphocytes	Monocytes	Neutrophils	Eosinophils	Thrombocytes
Winter	M	18.02±2.19	8.11±0.56	1.59±0.60	10.21±2.31	0.86±0.20	66.58±3.57
	F	24.85±2.21	8.29±0.90	1.80±0.66	10.71±2.66	0.94±0.41	54.80±3.10
Summer	M	22.06±2.09	5.53±0.90	1.60±0.69	13.07±2.60	0.71±0.23	71.52±2.29
	F	24.35±2.59	5.76±0.87	1.89±0.51	11.91±2.21	0.85±0.42	59.29±2.26
Rainy	M	29.12±2.89	9.98±1.32	1.30±0.60	9.14±1.53	0.51±0.30	56.30±1.40
	F	32.09±2.19	10.68±1.61	1.47±6.53	9.27±1.31	0.72±0.31	55.59±1.52

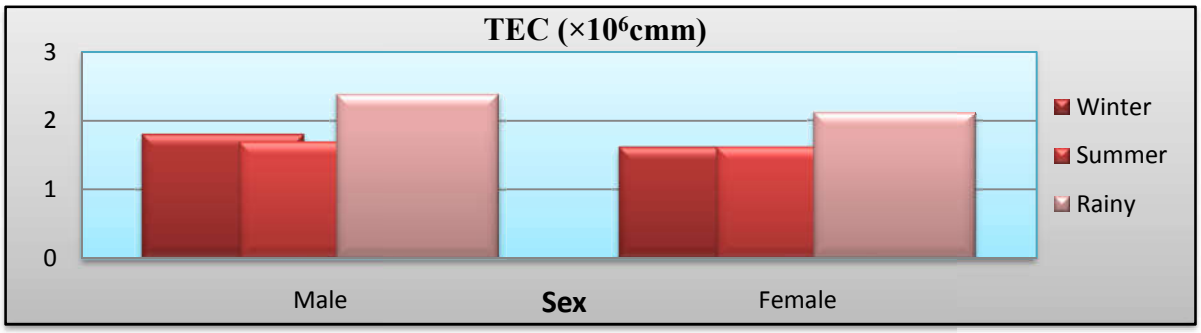

Fig. 1. Seasonal changes in Total Erythrocyte count ($\times10^6$cmm) in *Clarias batrachus*

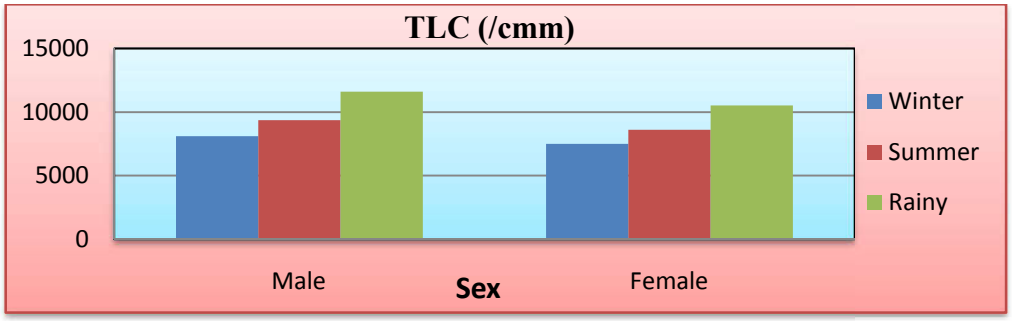

Fig. 2. Seasonal changes in Total Leucocytes Count (/cmm) in *Clarias batrachus*

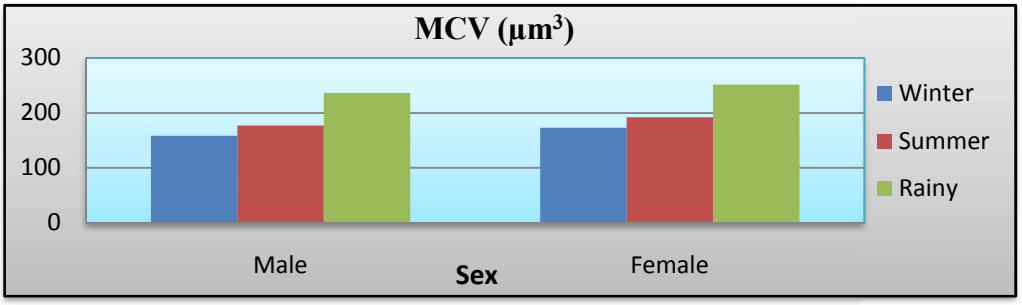

Fig. 3. Seasonal changes in Mean Corpuscular Volume (μm^3) in *Clarias batrachus*

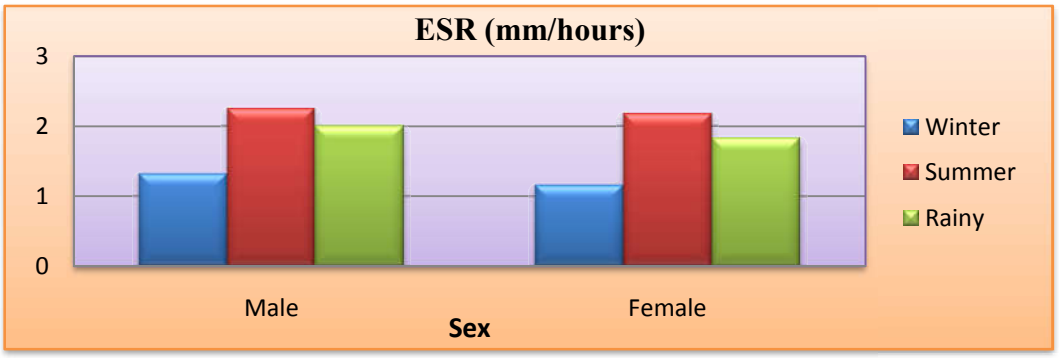

Fig. 4. Seasonal changes in Erythrocyte Sedimentation Rate (mm/hours) in *Clarias batrachus*

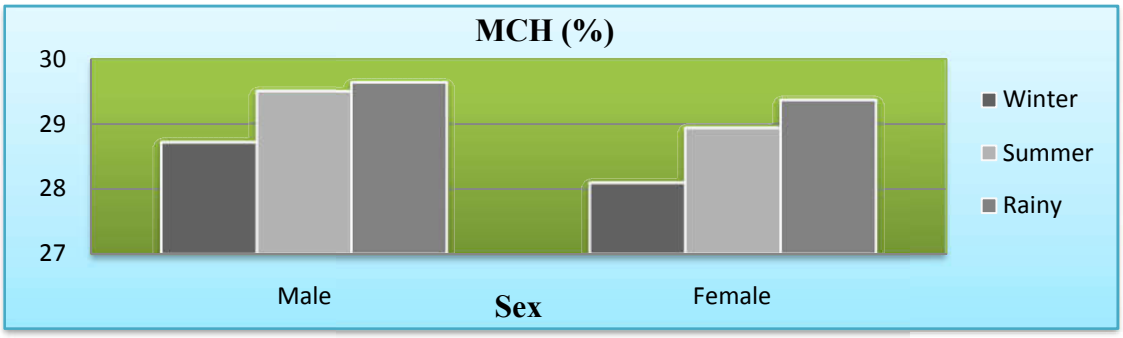

Fig. 5. Seasonal changes in Mean Corpuscular Haemoglobin (%) in *Clarias batrachus*

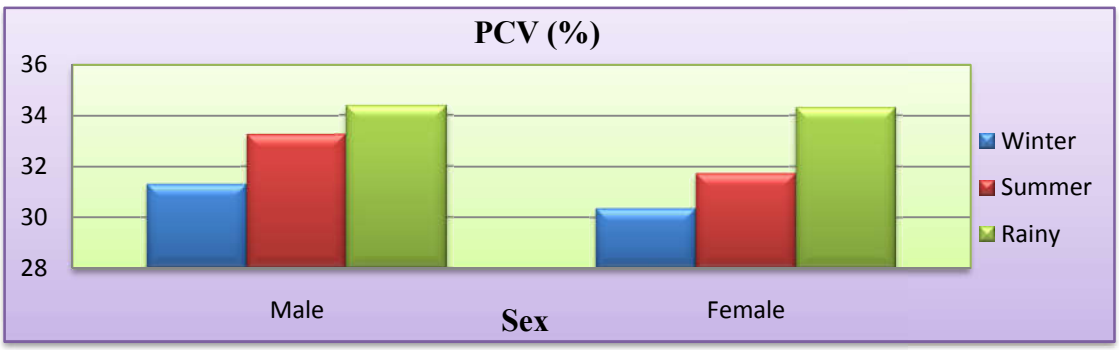

Fig. 6. Seasonal changes in Packed Cell Volume (%) in *Clarias batrachus*

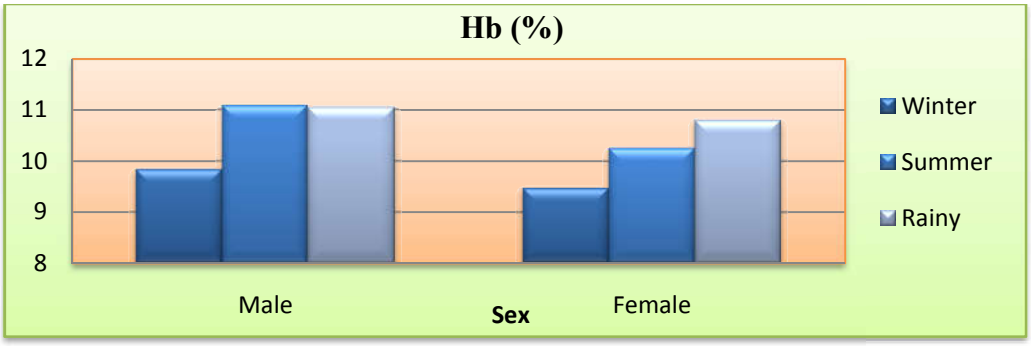

Fig. 7. Seasonal changes in Haemoglobin Contents (%) in *Clarias batrachus*

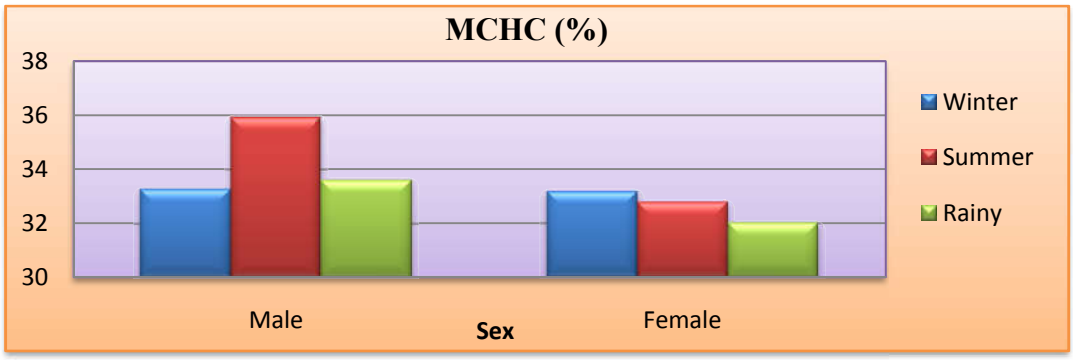

Fig. 8. Seasonal changes in Mean Corpuscular Haemoglobin Concentration in *Clarias batrachus*

Change in results of haematological parameters in male and female *Clarias batrachus* are shown in table 1 and 2. The finding of this perusal shown the impact of sex on blood parameters of *Clarias batrachus*. In table 1 and 2, there are differences in haematological parameters during various seasons. Hb (%) is found more in male *Clarias batrachus* than female, it means male is more active than female. And slightly variation is also shown in seasons (Fig. 7). In winter less Hb is observed which exhibit more quiescence in winter seasons of fishes. The value of TEC ($\times 10^6$/cmm), TLC (/cmm), MCV (μm^3), ESR (mm/hr), MCH (%), PCV (%) and MCHC (%) mostly lower in winter season than the summer and rainy season (Table 1, Fig. 1, 2, 3, 4, 5, 6 and 8). And slightly difference is observed in summer and rainy seasons the value of all haematological parameters are found more in male than female *Clarias batrachus* (Table 1). WBC is an indiscernible part of circulating blood of vertebrates. The leucocytes for mammals are well determined and classified. According to Joshi (2000), in case of fishes for a prolonged time consistency could not be received in classification and nomenclature of different type of leucocytes, though structurally with minor alterations circulating leucocytes are identical between most classes in fishes as in mammals. The value of DLC (%) in *Clarias batrachus* is higher in female than male except in summer season in the form of small lymphocytes, large lymphocytes, monocytes, neutrophils, eosinophils and thrombocytes are the types of DLC (%) (Table 2). Thrombocyte is found more in male than female in all seasons. Higher DLC in female shows eggs, carriage stage, hostile condition or infection in the female. A slight variation in all seasons is found in DLC (%) value.

DISCUSSION

Fisheries sector shows a vital role. Fish exist in a most familiar contact with their environment. Any type of change in environment would impact the physiology of fishes. The blood is called to be a mirror in which entire important procedures taking part in the organisms are reflected, so blood parameters are utilized in sightedness the biological procedure taking place in fish species. In this study, valuable alteration in hematological parameters was observed in male and female *Clarias batracus* in different seasons. The RBC of an organism defines the carrying capacity of dissolved oxygen. The Hb is found higher in male than female due to high metabolic rates of male fish. Pondering the sex variations, various studies exhibited that the male fish has greater values in nearly entire hematological parameters except in TLC. These greater values in males may be a virtue to their physiological activeness. The MCV of erythrocytes clear from the current observation suffers a straight relationship with the size of blood cells, greater the cells, higher the MCV. And high % of MCHC is due to the big size of erythrocytes.

Conclusion

In conclusion, the study exhibited that haematological parameters considered as a precious tool for monitoring of fish health. Haematological studies on fishes have supposed valuable excellence due to growth accentuation on pisciculture and greater consciousness of pollution in the aquatic ecosystem.

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