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Seasonal Variations in the Erythrocyte Counts and Haemoglobin Content of *Cirrhinus mrigala* (Ham.)

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Introduction

The morphological and physiological characters of fish blood have also taxonomic significance (Gulliver 1875). The fish haematology has attracted less attention of the workers especially in freshwater fishes. Perusal of the available literature shows that little work has been done on seasonal variations in fish blood. However, Joshi and Tandon (1977) in *Heteropneustes fossilis*, Khan (1977) in *Clarias batrachus* and Chanchal et al. (1978) in *Anabas testudineus* observed the seasonal fluctuations in the blood of fishes. The present paper communicates a brief account of the seasonal variations in the erythrocyte counts and haemoglobin content of a freshwater major carp—*Cirrhinus mrigala* (Ham.).

Material and Methods

Two hundred and forty specimens of both the sexes of the fish were collected from the "Laramda fish farm" near Agra during 1976–77. The blood was collected from the tail region of the fish. Double Naubaure haemocytometer and Hayem's diluting fluid were used for the total count of erythrocytes. Haemoglobin was estimated by Sahle's haemoglobinometer and N/10 HCL.

Results and Discussion

The average total erythrocyte counts were found to vary from 1.04 to 2.40×10^6/mm^3 in male and 0.75 to 1.85×10^6/mm^3 in female (table 1). Females showed lower counts than males in all the months. The highest values (2.40×10^6/mm^3 in male and 1.85×10^6/mm^3 in female) were obtained in November (figure 1). This peak was followed by a continuous fall uptill February (1.04×10^6/mm^3 in male and 0.87×10^6/mm^3 in female), and again in May and June in both the sexes

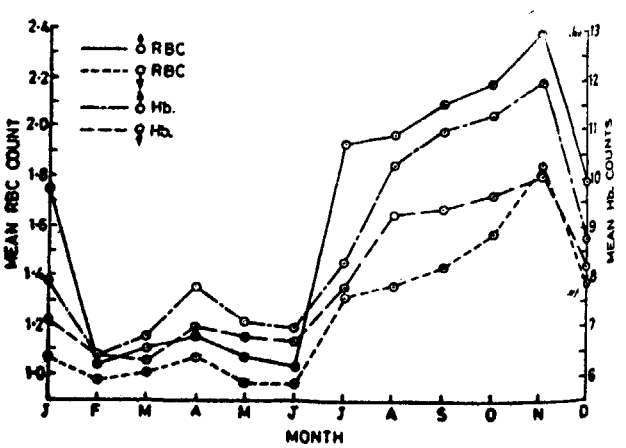

Figure 1 Seasonal variations in the erythrocyte counts and haemoglobin content of *Cirrhinus mrigala* (Ham.)

Table 1 *Seasonal variations in total counts of erythrocyte and haemoglobin content. Twenty specimens were examined in each month (ten males and ten females)*

Month	Male				Female			
	Mean Red cell counts ($\times 10^6$/mm^3)	SE of mean	Mean haemo-globin content (g/100 ml)	SE of mean	Mean Red cell counts ($\times 10^6$/mm^3)	SE of mean	Mean haemo-globin content (g/100 ml)	SE of mean
Jan.	1.70 1.75	1.82 ± 0.46	7.2 7.9	8.5 ± 0.28	1.00 1.07	1.12 ± 0.14	7.0 7.1	7.5 ± 0.46
Feb.	1.02 1.04	1.10 ± 0.05	6.0 6.4	7.2 ± 0.49	0.80 0.87	0.94 ± 0.41	5.6 6.4	7.2 ± 0.52
Mar.	1.02 1.11	1.18 ± 0.03	6.4 6.8	7.3 ± 0.05	0.85 1.01	1.12 ± 0.41	6.0 6.3	6.8 ± 0.42
Apr.	0.99 1.16	1.40 ± 0.07	6.7 7.8	8.6 ± 0.34	0.98 1.08	1.20 ± 0.39	6.0 7.0	8.0 ± 0.25
May	0.89 1.08	1.24 ± 0.16	6.0 7.1	8.1 ± 0.36	0.65 0.77	1.06 ± 0.63	6.0 6.8	8.0 ± 0.50
June	0.98 1.04	1.16 ± 0.05	6.0 7.0	8.0 ± 0.07	0.66 0.75	0.80 ± 0.05	6.0 6.7	7.5 ± 0.60
Jul.	1.68 1.94	2.30 ± 0.60	6.9 8.3	9.2 ± 0.74	1.08 1.32	2.00 ± 1.30	7.2 7.8	8.3 ± 0.50
Aug.	1.80 1.98	2.21 ± 0.10	8.6 10.3	12.4 ± 0.72	1.04 1.37	1.57 ± 1.03	8.6 9.3	10.0 ± 0.10
Sept.	1.54 2.11	2.74 ± 0.28	9.9 11.0	12.2 ± 0.78	1.12 1.44	2.00 ± 0.23	8.4 9.4	10.8 ± 0.69
Oct.	1.25 2.19	3.18 ± 0.47	10.6 11.3	12.0 ± 0.06	1.00 1.58	1.89 ± 0.15	8.4 9.7	11.4 ± 0.75
Nov.	1.85 2.40	2.89 ± 0.52	10.8 12.0	13.6 ± 0.48	1.68 1.85	2.00 ± 0.07	9.0 10.1	11.6 ± 0.03
Dec.	1.15 1.79	2.18 ± 0.26	8.0 8.8	9.8 ± 0.33	0.96 1.37	1.86 ± 0.39	8.0 8.2	8.5 ± 0.22
Average mean values of the year	1.34 1.64	1.95 ± 0.25	7.7 8.7	9.7 ± 0.39	0.99 1.23	1.46 ± 0.43	7.1 7.9	8.8 ± 0.42

(table 1). From July on wards (1.94×10^6/mm^3 in male and 1.32×10^6/mm^3 in female) it increased consistently till November, in both the sexes (figure 1).

Unlike the RBC counts, the Hb content also shows seasonal fluctuation in both males and females. (6.4 to 12.0 in males and 6.3 to 10.1 in females) (table 1). The highest values (12.0g% in male and 10.1g% in female) were observed in the month of November (figure 1). This is followed by a continuous fall till the month of February (in males) and March (in females) (table 1). In April it again increases slightly (7.8g% in male and 7.0g% in female), followed by a steady fall upto the month of June in both the sexes (figure 1). The values again increased continuously from the month of July to November in both the sexes. Practically in every month the Hb content values were higher in males than the females.

From the above, it follows that the values of the total RBC counts and Hb content are lower during spawning (June) and winter (December to February) periods and higher after spawning period (July–November). Males show higher values than the females. Robertson et al. (1961) in *Oncorhynchus tschamytscha*, Orecka (1970) in *Tinca tinca*, Joshi and Tandon (1977) in *Heteropneustes fossilis* and *Mystus vittatus*, Khan (1977) in *Clarias batrachus*, and Chanchal et al. (1979) in *Anabas testudineus* also recorded the same fluctuation in the RBC counts and Hb content during different seasons and in different sexes.

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References

Chanchal A K, Pandey B N, Singh S B and Prasad S 1979 Cyclic changes in haematologic values of *Anabas testudineus*; *Ann. Zool.* **15** 111–123

Gulliver G 1875 Observations on the sizes and shapes of the red corpuscles of the blood of vertebrates, with drawing of them to a uniform scale and extended and revised measurement; *Proc. Zool. Soc. Lond.* 474–495

Joshi B D and Tandon R S 1977 Seasonal variation in haematologic values of freshwater fish. I. *Heteropneustes fossilis* and *Mystnus vittatus*; *Comp. Physiol. Ecol.* **2** 22–26

Khan S H 1977 Studies on haematology of freshwater catfish, *Clarias batrachus*. I. Seasonal variations in erythrocytes and leucocyte counts, *Comp. Physiol. Ecol.* **2** 88–92

Orecka T Einszpron 1970 Quantitative changes in the circulating blood of *Tinca tinca* in the annual cycle; *Pol. Arch. Hydrobiol.* **17** 435–444

Robertson O H, Krupp M A, Favour C B, Hane S and Thomas F T 1961 Physiological changes occurring in the blood of the Pacific Salmon (*Oncorhynchus tschamytscha*) accompanying sexual maturation and spawning; *Endocrinology* **68** 733–746