

Evaluation of Some Haematological Variables of *Acipenser persicus* and *Acipenser stellatus* at Different Water Temperatures

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Abstract: Some haematological variables including Red Blood Cells (RBC), White Blood Cells (WBC) differential counts, Haemoglobin (Hb), Haematocrite (HCT), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC) were measured in 90 stellate sturgeon juveniles *Acipenser stellatus* (1-2 years old) and 90 Persian sturgeons *Acipenser persicus* (1-2 years old) at different water temperature 10-15°C, 16-20°C and 21-25°C. Also these parameters were evaluated in 84 adult including *A. persicus* (54 samples) and *A. stellatus* (30 samples) collected from Caspian Sea during spring and autumn 1997. The results have showed that WBC differential counts, Hb, HCT, MCV and MCH were identical for both species at the mentioned water temperatures. However, the values for RBC of *A. persicus* were generally less than those of *A. stellatus*. These haematological factors relatively increased with the water temperature increasing. Although RBC and WBC values of *A. persicus* were less than those of *A. stellatus*. The rates for HCT, MCV and MCH were higher in *A. persicus*.

KEY WORDS: Caspian sea, Acipenseridae, Haematology.

Introduction

In the literatures a minimum information is available concerning haematological characteristics of Acipenseridae as one of the commercially important groups of anadromous aquatic organisms (Alykrinskyaya & Dolgova, 1984 ; Martem' Yanov, 1995 ; Clementi *et al.*, 1997 ; Domezain *et al.*, 1997 and Bahmani *et al.*, 1999). Alykrinskyaya & Dolgova (1984) demonstrated that haematological variables of some species of sturgeons are identical at the juvenile stage. In an attempt by Bahmani *et al.*, (1999) some haematological features including RBC, WBC, Hb and total albumin of *Acipenser persicus* juveniles and *Huso huso* at different stages of growth were studied. They noted that these indices increase with the fish age increasing. Such haematological indices are useful in evaluation

of environmental conditions in a target aquatic animal. However, more information is necessary to obtain a nominally standard or reliable haematological index, particularly, when the fish exposed to different environmental conditions.

Therefore, in this study a number of haematological variables consisting of RBC, WBC, Hb, HCT, ESR, MCV, MCH, MCHC, and clotting time of two species of juveniles sturgeons including *A. persicus* and *A. stellatus* were studied at different water temperatures of 10–15°C, 16–20°C and 21–25°C. These parameters were also measured in adults of the same species caught from the Caspian Sea during spring and autumn 1997.

Materials and Methods

Fish

One hundred and eighty juveniles of *A. persicus* (n=90, average weight = 235gr, age=1–2 years old) and *A. stellatus* (n=90, average weight=166gr, age=1–2 years old) were examined. These fish were produced at Shaheed Rajaii hatchery and reared in freshwater at 7-12°C. They were fed with sturgeon pellet, three times a day. 2-3 weeks before blood collection the fish adapted to water temperature of 10–15°C, 16–20°C and 21–25°C.

Eighty four adults *A. persicus* (n=30, average weight = 24 kg) and *A. stellatus* (n=54, average weight = 8.43 kg) caught during spring or autumn 1997, were also tested.

Haematological studies:

Adequate blood samples were obtained using the fish caudal vein. Each blood sample was divided into 3 parts in tubes containing heparin, sodium citrate and tube without any anti coagulant. Routine and standard haematological work (Blaxhall & Diasley, 1973 ; Harmers, 1995 ; Reagan & DeNicola, 1998 and Javahery, 1982) were undertaken to measure the indices of RBC, WBC differential leukocyte count, Hb, HTC, MCV, MCH, MCHC and CT.

Statistical work:

The mean value, standard deviation and standard error of the mean data were calculated and the results were compared using the SPSS software.

Results

The results of haematological variables of *A. persicus* and *A. stellatus* in both juvenile and adult stages are shown in tables 1 and 2, respectively. Generally, the values of RBC of *A. persicus* were less than those of *A. stellatus* (Table 1) ($P>0.05$). WBC differential counts were identical for both species of fish. Also, the rates of Hb, HCT, MCV, and MCHC were similar for both of species. Furthermore, these values were fairly increased with increasing in water temperature (Table 1). In addition, the values of RBC and WBC differential counts of *A. persicus* were less than *A. stellatus*. However, the rates of HCT, MCV and MCH of *A. persicus* were more than *A. stellatus*.

Table 1 : Haematological values of Juveniles *Acipenser persicus* and *Acipenser stellatus* at 3 different water temperatures (average \pm SD, n=30)

Water temperature (°C)	RBC	WBC	Lym. (%)	Mon. (%)	Nut. (%)	Eso (%)	Hb (gr/dl)	HCT (%)	MCV (fl.)	MCH (Pg)	MCHC (%)	CT (Sec)
10 - 15	A	63 \pm 7.2	20 \pm 3.4	85 \pm 3.4	0.1 \pm 0.21	14 \pm 2.02	0.9 \pm 0.85	21 \pm 2.1	333 \pm 59	70 \pm 15.1	24 \pm 2.1	40 \pm 19.5
	B	84 \pm 22.1	10 \pm 1.8	56 \pm 16.4	0.1 \pm 0.17	39 \pm 13.7	4.9 \pm 2.9	27 \pm 3.9	321 \pm 96.4	71 \pm 29.7	22 \pm 1.7	40 \pm 21.6
16-20	A	71 \pm 12	12 \pm 4.8	91 \pm 2.1	0	8 \pm 2.7	5.4 \pm 0.88	23 \pm 3.7	323 \pm 28.8	76 \pm 8.6	23 \pm 3.02	165 \pm 34.5
	B	79 \pm 16.9	13.5 \pm 4.2	82 \pm 4.2	0	16 \pm 4.9	4.5 \pm 0.74	17 \pm 3.1	224 \pm 31.13	59 \pm 9.08	26 \pm 1.8	192 \pm 31.1
21-25	A	63 \pm 7.9	14 \pm 5.2	90 \pm 5.9	0	8.5 \pm 30.2	1.5 \pm 0.1	20 \pm 1.5	317 \pm 30	71 \pm 8.5	22 \pm 1.4	200 \pm 66.4
	B	1.5 \pm 13.7	16 \pm 2.9	87 \pm 5.4	0	12 \pm 5.5	1 \pm 0.85	26 \pm 1.7	248 \pm 32.1	53 \pm 5.4	22 \pm 1.7	115 \pm 58.5

A: *A. persicus*B: *A. stellatus*RBC: Red Blood Cells ($\times 10^4/\text{mm}^3$)WBC: White Blood Cells ($\times 10^4/\text{mm}^3$)

Hb= Haemoglobin

HCT= Haematocrite

MCV= Mean Corpuscular Volume

MCH= Mean Corpuscular Haemoglobin

MCHC = Mean Corpuscular Haemoglobin Concentration

Lym. = Lymphocyte

Mon. = Monocyte

Nut. = Nutrophile

Eso = Eosinophile

Table 2 : Haematological values (average \pm SD) of adults *Acipenser persicus* (30 samples) and *Acipenser stellatus* (54 samples)

Fish Species	RBC	WBC	Lym. (%)	Mon. (%)	Nut. (%)	ESO (%)	Hb (gr/dl)	HCT (%)	MCV (fl)	MCH (Pg)	MCHC (%)	CT (Sec)
<i>Acipenser Persicus</i>	95 \pm 16.9	10 \pm 4.3	70 \pm 11.1	1 \pm 0.54	22 \pm 11.1	7 \pm 2.6	10.8 \pm 1.5	39 \pm 5.4	411 \pm 97.5	109 \pm 53.2	28 \pm 1.8	175 \pm 40
<i>Acipenser stellatus</i>	110 \pm 19.3	16.5 \pm 4.4	52 \pm 12.3	0.1 \pm 0.25	36 \pm 11.1	11.9 \pm 3.4	9.3 \pm 2.3	33 \pm 7.15	300 \pm 39.02	85 \pm 13.2	28 \pm 3.2	165 \pm 60

Discussion

Assessment of haematological features of a particular species of fish under various environmental conditions would help not only to standard haematological indices, but also to identify unsuitable habitats for aquatic organisms. This is very important because in aquaculture practices, the prompt stress/disease diagnosis is critical to avoid economical loss due to mismanagement and outbreak of infections.

Although, it is difficult to compare the haematological indices results recorded by different researchers because of variations in environmental habitats, particularly under different water quality, there is generally fair similarity between the present study and other researchers e.g. Shamsavani *et al.*, (1999) and Bahmani *et al.*, (1999). In this study the values for RBC, Hb and HCT of juvenile *A. persicus* and *A. stellatus* were relatively less at the water temperature of 10-15°C than those at 21-25°C. This may be due, in part, to Acipenseridae requirement of an optimum water temperature of 21-25°C. Roberts *et al.*, (1989) reported that RBC value of tropical fish generally are more than that of cold-water species. Also, comparison of blood indices between juvenile and adult species of *A. persicus* and *A. stellatus* showed that these values are more in adults indicating the effect of age on the haematological indices of sturgeons. Similar results were found by Bahmani *et al.*, (1999) who compared the effects of age on the blood indices of *A. persicus* and *Huso huso*.

Bahmani *et al.*, (1999) indicated that RBC, Hb and WBC and differential counts of growing *A. persicus* and *Huso huso* in earth ponds decreased comparing to those kept in fiberglass tanks. They believed these differences could be due to suitable rearing conditions e.g. food availability, adequate oxygen and suitable sanitary conditions provided for tank culture system. However, they ignored water temperature conditions which is a critical factor significantly influencing the haematological, physiological and immunological features of fish. In the present study comparing the mentioned blood indices of juvenile *A. persicus* and *A. stellatus* under similar culture conditions and exposed to 3 different temperatures, indicated that a water temperature of 21-25°C is the suitable temperature for artificially growing these species of sturgeons as more antibody titers were found in juvenile *A. persicus* at this temperature (Soltani personal communications).

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