

A.Y.AL. – ABOOD

Fish physiology

**STUDIES ON THE RELATIONSHIP BETWEEN SOME HAEMATOLOGICAL  
PARAMETERS AND THE BIOLOGY OF THE FISH, *SILURUS TRIOSTEGUS***

**ZMIANY PARAMETRÓW KRWI W CZASIE ROZWOJU RYBY *SILURUS TRIOSTEGUS***

Department of Biology, College of Science, University of Basrah, Iraq

Studies made on the fish, *Silurus triostegus* showed that haemoglobin concentration and haematocrit value increased as the age of the fish increased up to the fourth year of age and then decrease afterward. The condition factor shows a high value during the beginning of the maturation period and drops down at the end of this period.

The relationship between haemoglobin concentration and haematocrit value was investigated and the correlation coefficient ( $r = 0.9278$ ) was calculated which is statically highly significant. The cause of those variations were discussed.

**INTRODUCTION**

In recent years, the study of haematological parameters of fishes is gaining a recognition as a valuable tool for monitoring the health of the fish ( Bhaskarand Rao, 1985) and to provide the fisheries biologist with the physiological response to environmental stress ( Houstonand Dewilde, 1972).

The aim of the present paper is to study the relationship between haemoglobin concentration and haematocrit value of the fish *Silurus triostegus* on one hand and the relationship between those two haematological parameters and the age and the condition factor of the fish.

**MATERIALS AND METHODS**

The specimens of *S. triostegus* were collected from Shatt al – Arab River, near Najibia power plant, north of Basrah city. The blood was drawn into tubes containing

EDTA as an anticoagulant either by a heart puncture (for the large specimens) or by the severing of the peduncle (for the small specimens). The haemoglobin concentration per 100 ml of blood was determined by Sahli's haemometer as described by Radzeinskya (1966). For haematocrit value, the blood was drawn into a haematocrit tubes containing EDTA as an anticoagulant. Blood samples were centrifuged for 5 min at 3000 rpm. Haematocrit values were determined according to the method of Blaxhall and Daisy (1973). The vertebrae were chosen to determine the age of the fish due to the absence of scales in this species. The first five vertebrae were removed and washed in tap water for ten minutes, then for 5 minutes in 0.5% hydrogen peroxide

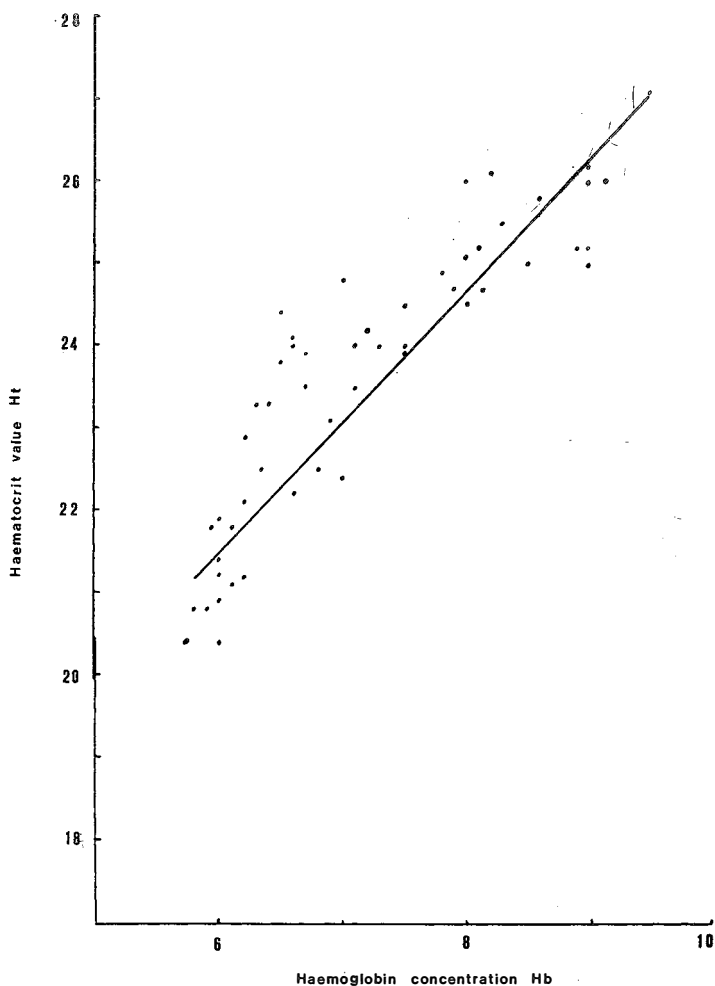


Fig. 1. Regression line between individual Hb concentration values and the corresponding PCV values for *Silurus triostegus*

and left to dry at room temperature. To clear the annuuli on the surface of the centrum, 1:1 mixture of glycerine and alcohol were used.

Growth rings read latter on according to the method described by El – Bolock (1972). The length and weight of the fish were taken to the nearest millimeter and gram respectively.

## RESULTS AND DISCUSSION

The results show that the haemoglobin concentrations and the haematocrit value vary as the fish become older. The younger fish of age group I show relatively higher values. The value of those two haematological parameters continue to increase up to the fourth age group and then decrease afterward. Thus the older fish which belongs to age group V and older show comparatively lower values for each parameter (Table 1).

Table 1

Haemoglobin concentration (Hb) and haematocrit value (Ht) variation in relation to age group

Age group	Hb	Ht
I	6.0	23.8
II	6.8	24.5
III	7.5	25.7
IV	9.0	25.9
V	7.2	24.3
VI	5.5	22.4

The young fish usually, show high physical activity and active feeding during growth (Chanchal, et al., 1979), this will explain the high values obtained for haemoglobin concentration and haematocrit value. On the other hand, the older fish show a [slow] metabolic activity after ascertain age (Joshi and & Tandon, 1977). Four years of age is the upper most limit in *S. triostegus*. Thus, lower values for haemoglobin concentration and haematocrit, were obtained for older fish. The same results were obtained by different workers for different fish species (Johanson, et al., 1974; Hameed and Jiad, 1986; and Chaudhuri, et al. 1986).

The condition factor which is the index of the well-being of the fish shows a higher value during the beginning of the maturation period which starts at the end of February. During the latter period of maturation its value drops down (Table 2).

This trend coincide with that obtained for haemoglobin concentration and haematocrit value. These results may support the assumption that a small range of variation in these values results from active feeding even in spawning season in *S. triostegus*. The same results were reached by other workers on different fish species (Ishioka and Fushimi, 1975).

Table 2

Variation of condition factor (k), haemoglobin concentration and haematocrit value (Ht) during the maturation period

Condition factor (k)	Hb	Ht	Month
0.7478	7.5	22.4	February
0.7630	7.8	22.9	March
0.7840	8.2	23.8	April
0.7245	6.5	22.0	May

The relationship between haemoglobin concentration and haematocrit value was investigated by plotting a graph of these data (Figure 1) which gave the regression equation:

$$\text{Ht}(\%) = 12.3561 + \text{Hb}(\text{g}/100 \text{ ml}) 1.5491$$

the coefficient of correlation ( $r$ ) was 0.9278 which is statically highly, significant ( $p < 0.001$ ). This correlation may suggests that haematocrit may be used as a general index of haematological status (Houston and Dewide, 1972). On the other hand, Swift (1982) suggested that the similarties between the regression equation that obtained for haemoglobin concentration and haematocrit value of fishes from diverse habitat could well indicate the physical condition of the fish. Thus it needs to investigate further such relationship for other fishes from diverse habitat that living in the vicinity of Basrah or from other water bodies of Iraq to compare it with that of *S. triostegus*.

#### ACKNOWLEDGEMENT

My sincer thanks are due to Mr. Saleh M.AL Betran and Mr. Baha H. Jaber of the Najibia power plant, north of Basrag city for their help in obtaining fish samples.

#### REFERENCES

- Bhaskar B.R. and K.S. Rao, (1985). Some haematological parameters of tarpon, *Megalops cyprinoides* (Broussonet) from Veiahapatnam harbour. *Matsya*, 11: 63-69.
- Blaxhall P.C. and K.W. Daisley, (1973). Routine haematological methods for use with fish blood. *J. Fish. Biol.* 5: 771.
- Chanchal A.K., B.N. Pandey, B. Singh and S. Prasad, (1979). Cyclic changes in haematologic values of *Anabas tesudineus* (Bloch) *Ann. Zool.* 15: 111-123.
- Chaudhuri S.H., T. Pandit, and S. Banerjee, (1986). Size and sex related variations of some blood parameters of *Sarotherodon mossambica*. *Environment & Ecology*, 14, 1: 61-63.
- EL-Dolock A.R., (1972). Use of vertebrae for determination of age and growth of Nile catfish. *Bull. Inst. Ocean. & Fish.*, Cairo, 2: 53-82.
- Hameed A.H. and J.H. Jiad, (1985). The relationship between age and blood constituents of *Barbus xanthopterus* (Heckel) in the different seasons from Sadat/Al-Hindia, Iraq, *J. Biol. Res. Centre*, 17: 77-86.

- Houston A.H. and M.A. Dewilde, (1972). Some observations upon the relationship of microhaematocrit values to haemoglobin concentrations and erythrocytes numbers in the carp *Cyprinus carpio* L. and brook trout, *Salvelinus fontinalis* (Mitchill). J. Fish. Biol., 4: 109–115.
- Ishioka H. and T. Fushimi (1975). Some haematological properties of matured Red Sea Bream, *Chrysophrys major* Temminck et Schlegel. Bull. Nansei Reg. Fish. Res. Lab., 8: 11–20.
- Johansson M.L., G.A. Dave, K. Lewander and U. Lidman, (1974). Metabolic and haematological studies on the yellow and silver phases of the european eel, *Anguilla anguilla* L. (III) haematology. Comp. Biochem. Physiol. 47B: 593–599.
- Joshi B.D. and R.S. Randon, (1977). The correlation of body size and some haematological values of the freshwater fish. I. *Clarias batrachus*. J. Anim. Morphol. Physiol. 24, 2: 339–343.
- Radzinskaya L.L., (1966). Changes in the blood indices of juvenile and spawning Neva salmon, *Salmo salar* L. Vop. Iktiolog. 6: 568–572.
- Swift D.J. (1982). The blood haemoglobin concentration of the Atlantic mackerel, *Scomber scomber* L. Comp. Biochem. Physiol. 73A, 2: 229–232.

A.Y.AL – ABOOD

#### ZMIANY PARAMETRÓW KRWI W CZASIE ROZWOJU RYBY *SILURUS TRIOSTEGUS*

#### STRESZCZENIE

Badania hematologiczne przeprowadzone na rybie *Silurus triostegus* pochodzącej z rejonu Shatt al – Arab River (Namibia) wykazały, że koncentracja hemoglobiny i wartość hematokrytu u tego gatunku nie jest stała. W miarę wzrostu ryb, w zakresie grup wiekowych I–IV wzrasta a obniża się w grupie V i VI.

Współczynnik kondycji ryb osiąga najwyższą wartość w początkowej fazie dojrzewania i obniża się po zakończeniu tego okresu.

Stwierdzono wysoką statystycznie korelację ( $r = 0,9278$ ) między koncentracją hemoglobiny i wartością hematokrytu w badanych grupach wiekowych ryb.

Authors' address:

Received: 1992.03.31

Department of Biology, College of Science  
University of Basrah, Iraq