

**THE EFFECT OF *Hamatopeduncularia* sp. AND *Caligus* sp.
ON SOME BLOOD PARAMETERS OF *Arius bilineatus*
(Val., 1840)**

Muna M. Jori and Essa T. Mohamad*

Dep. of physiology, Veterinary Coll., Univ. of Basrah, Iraq.

**Dep. of Marine Biology, Marine Science Centre, Univ. of Basrah, Iraq.*

ABSTRACT

The effect of two parasites *Hamatopeduncularia* sp. and *Caligus* sp. on some blood parameters of 121 marine catfish (Ariidae) *Arius bilineatus* were studied. The results showed that all blood parameters were higher in healthy fishes than those of infected ones, except W.B.C. counts. In all levels of infections there were a reduction in P.C.V., Hb. and R.B.C. counts and increased in W.B.C. counts. Male fishes have higher values than females either in healthy and infected status.

INTRODUCTION

The diseases and parasites that affect fish cause high mortalities in both cultured and wild fishes and such losses are considered as one of the major barriers against the expanding of fish industry (Overstreet, 1990).

It is well known that fish parasites can cause to their hosts a numerous negative effects such as chemical and physiological effects (Williams, 1967). Also parasites affect the swimming ability of their fish host (Russel, 1980).

The blood of every organism is adjusted to its life requirements, and the changes occurring in it are signalized very early (Sopinska, 1983). In fish as in the case of higher vertebrates and in human medicine, the blood picture can be used as an effective tool for detection of stresses caused by various environmental conditions in addition to diseases (Main & Khan, 1997). Changes in blood parameters of host during or after parasitic infection have received the attention of many workers especially in man and domestic animals (Kameswari & Rao, 1987). Hawkins & Mawdesley-Thomas (1972) in their bibliography documented over 900 references concerning fish haemetology, and they stated that in comparative pathology and histology of blood, little or no attention has been given to the fish. Burrows & Fletcher (1987), stated that such studies are greatly needed to understand the cellular basis of the disease process.

In Iraq, fish haematological studies are still scanty and neglected (Habish, 1977; Shamsuddin *et al.*, 1978; Hameed, 1980; Al-Mehdi & Khan, 1984; Hameed & Jiad, 1985; Al-Abood & Al-Hassan, 1988; Al-Hassan & Al-Abood, 1988; 1994; Al-Abood, 1989; 1992; Ahmed *et al.*, 1990; Al-Hassan *et al.*, 1990; Al-Daraji, 1995; Ahmed, 1996; Khamees, 1996; Jori, 1998; 2006). However in Iraqi marine habitat there is only one haematological study done by Al-Daraji (1995) dealing with pathohaematology of *Liza subviridis*.

The aim of the present article is to study the effect of two parasites (*Hamatopeduncularia* sp. and *Caligus* sp.) on some blood parameters of the Ariid catfish *Arius bilineatus*.

MATERIALS & METHODS

The materials studied consisted of 121 individuals of *Arius bilineatus* with total length range from 35-40 cm. The fishes were caught during March and April 2001 from Khor Abdullah North-West Arabian Gulf. Fishes were handled gently to avoid the stress as much as possible, and immediately killed by pithing them with a fine needle. After the completion of blood withdrawal, fishes were measured (Total length), sexed and their gills were removed searching for parasites.

The fishes were categorized into four groups as follows: Healthy fishes (Table 1) represents the uninfected fishes.

Fishes infected with *Hamatopeduncularia* sp. were categorized into three groups according to the level of infection (Table 2):

Group A: 1-10 specimens of parasites (light infection).

Group B: 11-20 specimens of parasites (mild infection).

Group C: More than 20 specimens of parasites (heavy infection).

While fishes infected with *Caligus* sp. were categorized into three groups according to the level of infection (Table 3):

Group A: 1-4 specimens of parasites (light infection).

Group B: 5-8 specimens of parasites (mild infection).

Group C: More than 8 specimens of parasites (heavy infection).

The blood assays were as follows:

- 1- The haematocrit value or Packed Cell Volume (P.C.V.) was determined according to Sood (1987).
- 2- The haemoglobin concentration (Hb) was estimated according to Main & Khan (1997).
- 3- The red blood cells (R.B.C.) counts and the white blood cells (W.B.C.) counts were counted according to Lucky (1977).

two replicates for every parameter were taken in most samples. All the data were tested statistically .

The Statistical Package for Social Science (SPSS) was used to analyze the results.

RESULTS

According to the data obtained in Tables 1, 2, 3 and 4, the results can be summarized in the following points:

- 1- All blood parameters were higher in healthy fishes than those of infected ones, except, W.B.C. counts (Table 1). These differences were not statistically significant.
- 2- Male fishes have higher values than females either in healthy and infected status; also these differences were statistically not significant.
- 3- The effect of *Hamatopeduncularia* sp. on blood parameters was higher than those of *Caligus* sp. (Table 2). Statistical significant differences were apparent between these two infections.
- 4- The effect of mixed infection with the two types of parasites *Hamatopeduncularia* sp. and *Caligus* sp. is more harmful than that of separately infected fishes with one type of parasite (Table 4).

Table 1: Means of some blood parameters of uninfected (healthy) *Arius bilineatus* (\pm S.E.).

Sex	No. of Fishes	Hb %	P.C.V. %	R.B.C. 6 Count*10	W.B.C. 3 Count*10
♂	11	50.5 \pm 2.1	28.0 \pm 0.097	2.9 \pm 0.27	11.2 \pm 0.78
♀	10	46.0 \pm 2.83	26.1 \pm 0.084	2.2 \pm 0.23	10.0 \pm 0.51

$P \leq 0.05$

Table 2: Means of some blood parameters of *Arius bilineatus* infected with *Hamatopeduncularia* sp. (\pm S.E.)

sex	Status of infection	No. of Fishes	Hb %	P.C.V. %	R.B.C. 6 Count*10	W.B.C. 3 Count*10
♂	A	5	40.3 \pm 1.12	23.1 \pm 0.93	2.02 \pm 0.031	16.3 \pm 1.12
	B	5	24.6 \pm 2.37	8.8 \pm 1.03	1.01 \pm 0.06	23.1 \pm 1.36
	C	6	25.0 \pm 1.6	9.4 \pm 0.87	0.90 \pm 0.04	30.4 \pm 2.21
♀	A	6	33.6 \pm 0.97	20.3 \pm 1.07	1.70 \pm 0.01	13.5 \pm 1.18
	B	5	20.2 \pm 1.1	6.9 \pm 0.96	0.72 \pm 0.03	22.0 \pm 2.11
	C	5	20.9 \pm 0.98	7.2 \pm 0.88	0.69 \pm 0.02	28.6 \pm 2.01

P \leq 0.05

Table 3: Means of some blood parameters of *Arius bilineatus* infected with *Caligus* sp. (\pm S.E.)

sex	Status of infection	No. of Fishes	Hb %	P.C.V. %	R.B.C. 6 Count*10	W.B.C. 3 Count*10
♂	A	6	38.0 \pm 2.06	22.3 \pm 1.63	2.00 \pm 0.27	15.2 \pm 1.20
	B	5	28.5 \pm 1.94	11.5 \pm 0.99	1.23 \pm 0.18	20.4 \pm 2.03
	C	7	31.4 \pm 2.1	12.0 \pm 1.79	1.02 \pm 0.11	28.6 \pm 3.15
♀	A	6	30.4 \pm 1.87	19.0 \pm 1.91	1.63 \pm 0.19	12.0 \pm 0.97
	B	5	25.7 \pm 1.05	9.4 \pm 1.33	1.11 \pm 0.20	21.3 \pm 2.10
	C	5	28.9 \pm 1.93	10.1 \pm 1.75	0.93 \pm 0.13	25.9 \pm 1.24

P \leq 0.05

Table 4: Means of some blood parameters of *Arius bilineatus* infected with *Hamatopeduncularia* sp. and *Caligus* sp. (\pm S.E.)

SEX	STATUS OF INFECTION	NO. OF FISHES	HB %	P.C.V. %	R.B.C. 6 COUNT*10	W.B.C. 3 COUNT*10
♂	A	6	30.0 ± 2.71	19.2 ± 2.07	1.50 ± 0.02	28.4 ± 0.96
	B	5	18.0 ± 1.63	6.3 ± 0.21	0.62 ± 0.01	31.3 ± 1.43
	C	5	16.2 ± 1.34	5.2 ± 0.13	0.51 ± 0.01	29.0 ± 1.62
♀	A	7	26.0 ± 2.35	15.3 ± 1.62	1.11 ± 0.03	27.5 ± 0.89
	B	5	15.5 ± 0.98	5.0 ± 0.71	0.48 ± 0.01	28.5 ± 1.11
	C	6	14.1 ± 1.13	4.5 ± 0.21	0.33 ± 0.03	26.8 ± 1.34

P \leq 0.05**DISCUSSION**

The results showed that higher values of blood parameters were in males fishes than in those of females, this results agreed with Sopinska (1983), Al-Daraji (1995), Jori (1998 & 2006). Such differences between sexes may be attributed to some genetic differences (Fourie & Hattingh, 1976), while Raizada *et al.*, (1983) suggest that these differences are related to differences in the metabolic rate which are higher in males than in females.

The declining in Hb, P.C.V., R.B.C. counts values and increasing in W.B.C. counts in all status of infection when compared with healthy (uninfected) fishes was also noticed in fishes infected with some vibrios (Harbell *et al.*, 1979) or with other bacterial agents (Iwama *et al.*, 1986) or naturally infected with protozoan parasites (Hoffmann & Lommel, 1984) or with helminth or/and with crustacean parasites (Al-Daraji, 1995, Khamees, 1996, Jori, 1998 & 2006).

The higher effect of *Hamatopeduncularia* sp. on the blood parameters in comparison with these of *Caligus* sp. may be attributed to the high feeding activity of the monogenean parasites on its host tissues. Kabata (1970) stated that blood feeding parasites can be expected to exert a significant influence on the composition and volume of host blood.

Fishes with ergasilids infection, may can be undergoes asphyxia status

(Kabata, 1985), also the crustaceans can cause gill erosion extending beyond the epithelial layer causing obstructed branchial blood vessels and hyperplasia of epithelium which reduces the respiratory function of the gills (Paperna & Overstreet, 1981), in addition to mixed feeding of ergasilids on its host including blood cells and integument cells (Kabata, 1970).

Mixed infections have higher effect on blood parameters than single infections, which may be attributed to the interaction between asphyxia and anemia (Jori, 1998 & 2006).

REFERENCES

- Ahmed, A.M. 1996. Osmotic and ionic status in fish inhabiting the water bodies of Basrah/Iraq. Ph.D. Thesis, Basrah Univ., 145p. (In Arabic).
- Ahmed, H.K. Al-Muktar, M.A. and Kittan, S.A.S. 1990. Haematological study on the Carp, *Cyprinus carpio* L., cultivated in Basrah, Iraq. Basrah J. Agric. Sci., 3(1&2): 81-87.
- Al-Abood, A.Y. 1989. Studies on blood haemoglobin and haematocrit of the silurid fish, *Silurus triostegus* in relation to weight. Riv. Idrobiol., 28(3): 255-259.
- Al-Abood, A.Y. 1992. studies on the relationship between some haematological parameters and the biology of the fish, *Silurus triostegus*. Acta Ichthyol. Piscat., 22(2): 197-203.
- Al-Abood, A.Y. and Al-Hassan, L.A.J. 1988. Haematocrit values in some freshwater fishes of Iraq. Basrah J. Agric. Sci., 1(1): 31-34.
- Al-Daraji, S.A.M. 1995. Taxonomical and ecological studies on the metazoan parasites of some marine fishes of Khor Al-Zubair estuary, north-west of the Arabian Gulf. Ph.D. Thesis, Univ. Basrah, 182 p.
- Al-Hassan, L.A.J. and Al-Abood, A.Y. 1988. Preliminary studies on the haemoglobin concentration in some freshwater fishes of Iraq. Cybium, 12(1): 17-21.
- Al-Hassan, L.A.J. & Al-Abood, A.Y., 1994. Differential blood cell counts of three species of freshwater fishes from Basrah, Iraq. Pakistan J. Zool. 26(3): 278-280.
- Al-Hassan, L.A.J., Al-Abood, A.Y. and Al-Seyab, A.A. 1990. Seasonal variations in the haemoglobin concentration and haematocrit values of *Silurus triostegus*. Acta Ichthyol. Piscat., XX(1): 99-103.
- Al-Mehdi, M.I. and Khan, A.A. 1984. Haematology of a freshwater carp *Cyprinion macrostomus* from Northern Iraq. Environmental & Ecology, 2(3): 222-226.

- Burrows, A.S., and Fletcher, T.C. 1987. Blood leukocytes of the turbot, *Scophthalmus maximus* (L.). *Aquaculture*, 67: 214-215.
- Fourie, F.R. and Hattingh, J. 1976. A seasonal study of the haematology of carp (*Cyprinus carpio*) from a locality in the Transval, South Africa. *Zool. Afr.*, 11(1): 75-80.
- Habish, A.H. 1977. Ecological and biological studies on the larval nematode, *Contracaecum* sp., a parasite of the fishes in Basrah, Iraq. M. Sc. Thesis, Univ. Basrah, 98p.
- Hameed, A.H.M. 1980. Seasonal changes in some haematological aspects of three species of Iraqi fishes of the genus *Barbus* in Sadat Al-Hindia. M. Sc. Thesis, Univ. Baghdad, (In Arabic).
- Hameed, A.H.M. and Jiad, J.H. 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(1): 77-86. (In Arabic).
- Harbell, S.C., Hodgins, H.O. and Schiewe, M.H. 1979. Studies on the pathogenesis in vibriosis in coho salmon *Oncorhynchus kisutch* (Walbaum). *J. Fish Dis.*, 2: 391-404.
- Hawkins, R.I. and Mawdesley-Thomas, L.E. 1972. Fish haematology: A bibliography. *J. Fish Biol.*, 4(2): 193-232.
- Hoffmann, R. and Lommel, R. 1984. Effects of repeated blood sampling on some blood parameters in freshwater fish. *J. Fish Biol.*, 24: 245-251.
- Iwama, G.K., Greer, G.L. and Randall, D.J. 1986. Changes in selected haematological parameters in juvenile Chinook salmon subjected to a bacterial challenge and a toxicant. *J. Fish Biol.*, 28: 563-572.
- Jori, M.M. 1998. Study of the parasites of two mugilid fish species and the effect of some on the blood parameters. M.Sc. Thesis, Univ. Basrah., 136 p. (In Arabic).
- Jori, M.M. 2006. Parasitic study on the Asian catfish *Silurus triostegus* (Heckel, 1843) from Al-Hammar marshes, Basrah, Iraq. Ph.D. Thesis, Univ. Basrah, 199 p.
- Kabata, Z. 1970. Diseases of fishes. Book 1: Crustacea as enemies of fishes. T.F.H. Publ. New Jersey, 171 p.
- Kabata, Z. 1985. Parasites and diseases of fish cultured in the tropics. Taylor & Francis Publ. Ltd. London, 318 pp.
- Kameswari, M. and Rao, L.N. 1987. Studies on host-parasite relationships. I: Post-helminth infection: haematological changes in *Rana tigrina*. *Acta Parasitol. Pol.*, 32(2): 187-193.
- Khamees, N.R. 1996. Life cycle, pathological effects and control of some copepod crustaceans infesting gills of the Mugilid fish, *Liza abu* in Basrah. Ph.D. Thesis, Univ. Basrah, 92 p.

- Lucky, Z. 1977. Methods for the diagnosis of fish diseases. Amerind Publ. Co. pvt. Ltd. N.Y., 140 pp.
- Main, A. and Khan, T.H. 1997. Some records on haematology, milk analysis and wool production in adult sheep; and on haematology in adult goat maintained around Quetta (Pakistan). Pakistan J. Zool., 29 (1): 87-89.
- Overstreet, R.M. 1990. Metazoan parasitic diseases: Introductory remarks. In: Pathology in marine science, (Eds. Perkins, F. O. & Cheng, T. C.). Acad. Press, California, pp: 261-266.
- Paperna, I. and Overstreet, R.M. 1981. Parasites and diseases of mullets (Mugilidae). In: Aquaculture of grey mullets, (Ed. Oren, O.H.). Cambridge Univ. Press, pp: 411-493.
- Raizada, M.N., Jain, K.K. and Raizada, S. 1983. Monthly variations in the haematocrit value (PCV) in a teleost, *Cirrhinus mrigala* (Ham.). Comp. Physiol. Ecol., 8(3): 196-198.
- Russel, L.R., 1980. Effects of *Truttaedacnitic truttae* (Nematoda: Cucullanidae) on growth and swimming of rainbow trout *Salmo gairdneri*. Canad. J. Zool., 58: 1220-1226.
- Shamsuddin, M., Al-Gailany, H.B., Mohammed, M.K. and Jasim, M.K. 1978. Erythrocyte measurements in some vertebrate species of Iraq. Bull. Nat. Hist. Res. Centre, 7(2): 49-67.
- Sood, R., 1987. Medical laboratory technology. Jaypee Brothers, Med. Publ. India, 390 pp.
- Sopinska, A. 1983. Effect of physiological factors, stress, and disease on hematological parameters of Carp, with a particular reference to Leukocyte pattern: I. Variability of hematological indices of carp in relation to age and gonad maturity stage. Acta Ichthyol. Piscat., XIII(2): 59-81.
- Williams, H.H. 1967. Helminth diseases of fish. Helminth. Abst. 36: 261-295.

***Caligus* sp. *Hamatopeduncularia* sp.
Arius bilineatus (Val., 1840)**

*

*

Hamatopeduncularia sp.

Arius 121

Caligus sp.

bilineatus