

# MORFOPHYSIOLOGICAL AND HEMATOLOGICAL FEATURES OF RECOVERY-MATERNAL STOCK OF STURGEON FISH REARING IN STURGEON FISH HATCHERY OF AZERBAIJAN

MAMEDOV CH.A.

*Fishery Research Institute under Ministry of Ecology and Natural Resources, Baku, Az1008, Azerbaijan 16, Demirchizade str., e-mail: m\_chingiz@yahoo.com*

## MORFOLOŠKI I HEMATOLOŠKI POKAZATELJI MATIČNOG JATA ZA OBNOVU JESETARSKIH RIBA GAJENIH U JESETARSKIM MRESTILIŠTIMA U AZERBEJDŽANU

### *Abstract*

In Azerbaijan the forming of recovery-maternal stock of sturgeon fish is carrying out since 2004 year and breeding of fish from the stage of larvae till the adult conditions is fulfilled by using of pool method. Meanwhile it is known that quality of a breeding material in many respects depends on conditions of their maintenance. The task of our researches included studying on the basis of mofophysiological and hematological parameters to the extent of forming of the major functional systems of uneven-aged species of recovery-maternal stock of sturgeon fish during their long growing in bondage.

Persian sturgeon (*Acipenser persicus*) of ages 1 to 5 served as study objects in 2009. Directly after collecting blood from a tail vein content of hemoglobin and ESR (erythrocyte sedimentation rate) were defined, and also smear of blood samples were made by classical technique of Romanovsky-Gimza. Calculation of blood corpuscles was carried out in chamber of Goryayeva with staining blood cells by neutral read and crystal violet. 200 leukocyte cells were counted in each test. For differentiation of cells of the red blood 500 erythrocytes of different age groups of experimental fish were counted on smear. Index of leucocytes shift is determined according to commonly accepted methodology.

As researches have shown, on the first to year of a life of young fish of the Persian sturgeon erythropoiesis is generated completely. It has been defined that mature erythrocytes (76,5 - 81,5 %) prevail in peripheral blood at all age groups of young fish of researched kind. Ratio of basophilic normoblasts has comprised 0,8-1,4%, and hemolyzed

erythrocytes 0,4-1,6 %. The insignificant number of pathological forms of erythrocytes, in our opinion, testifies to natural dying off of cells of erythrocyte series.

The structure of blood corpuscle of uneven-aged species of repair broodstock of the Persian sturgeon, grown up on industrial conditions, testifies that function of leukopoiesis is generated at them. Lymphoid nature of leukocytes was determined in researched fish of Persian sturgeon which was reared in the pool conditions of Sturgeon Fish Hatchery. The obtained information about the right (lymphoid) shift in leukogram of the blood of the uneven-aged young fish witnesses the normal developing leukopoiesis. Index of leukocytes shift has a direct dependence on the age of reared fish: yearlings – 0,54; two-year old – 0,40; three-year old – 0,38; four year old 0,37 and five-year old – 0,32.

Making preliminary conclusions of hematological researches of the Persian sturgeon as the modeling object used for formation of recovery-maternal stock on Khilly Sturgeon Fish Hatchery, it is possible to draw following conclusions: - 1. In process of growth of young Persian sturgeon the number of erythrocytes on unit of volume of blood increases; 2. On the first year of a life of young fish of the Persian sturgeon the erythropoiesis is generated completely; 3. The number of leukocytes on unit of volume of blood of the Persian sturgeon has seasonal variability and has no direct dependence on age of fish; 4. The quantity of immune cells (lymphocytes) has direct dependence on age of fishes.

**Key words:** *Persian sturgeon, recovery-maternal stock, erythrocyte, leukocyte, lymphocytes*

## INTRODUCTION

The abrupt decrease of scales of industrial reproduction of the sturgeon fish happened in whole Caspian region during recent years. The main reason of fall of scales of artificial reproduction of the sturgeon fish is shortage of pisciculturally quality producers. In this regard the forming of reproductive broodstock of sturgeon fish in conditions of Sturgeon Fish Hatchery based on fish of artificial generation and natural complex is priority trend of modern sturgeon-farming. In Azerbaijan the forming of recovery-maternal stock of sturgeon fish is carrying out since 2004 year and breeding of fish from the stage of larvae till the adult is fulfilled by using of pool method.

Formation of recovery-maternal stock of sturgeon fish «from roe» assumes long growing of fish industrially. Meanwhile it is known that quality of a breeding material in many respects depends on conditions of their maintenance. Considering that the morphological analysis of blood is one of delicate and objective methods of an estimation of a physiological condition of an organism (Ivanova, 1983), the task of our researches included also studying on the basis of morphophysiological and hematological parameters to the extent of forming of the major functional systems of uneven-aged species of recovery stock of sturgeon fish during their long growing in bondage.

## MATERIALS AND METHODS

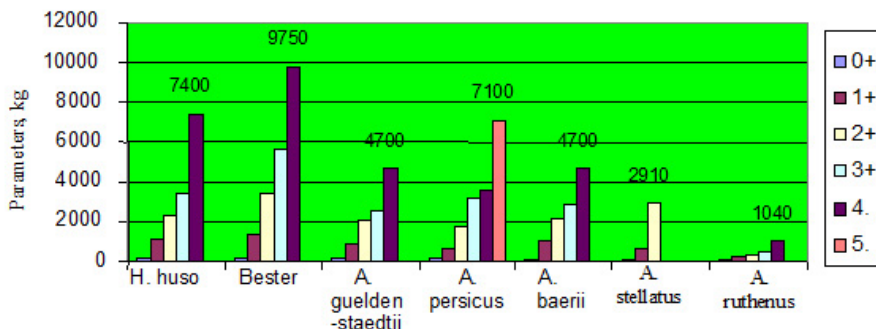
Persian sturgeon (*Acipenser persicus*) of ages 1 to 5 served as study objects in 2009. Ten experimental fish of each age group were sampled. Directly after collecting blood

from a tail vein content of hemoglobin and ESR (erythrocyte sedimentation rate) were defined, and also smear of blood samples were made by classical technique of Romanovsky-Gimza. Hemoglobin content was determined in a hemoglobinometer GF-3, and ESR was studied using the micromethod of G.P.Panchenkova (Musselius et al., 1983). Calculation of blood corpuscles was carried out in chamber of Goryayeva with staining blood cells by neutral read and crystal violet (Ivanova, 1983). 200 leukocyte cells were counted in each test. For differentiation of cells of the red blood 500 erythrocytes of different age groups of experimental fish were counted on smear. Index of leucocytes shift is determined according to commonly accepted methodology. Obtained data were processed by the standard methods of the statistical analysis and software package Stadia is used.

The global practice of fresh-water aquaculture proves a possibility of the maintenance and growing of sturgeon fishes in artificial conditions (Stroganov, 1968; Smolyanov, 1987; Popova et al., 2004; Chebanov et al., 2004; Cotenev et al., 2005). The principle of a bundling of maternal stock of sturgeon fish from spawn up to spawn is based on selection of elite posterity with the subsequent growing within 8-10 years up to mature sires. On the basis of posterity of artificial generation the recovery-maternal stock of sturgeon fish is formed with the purpose of reception of own sires on Khilly Sturgeon Hatchery since 2004 (Mamedov and Salmanov, 2009; Mamedov et al., 2009; 2010). At the moment five-year old- (427 pieces), four-year old- (250 pieces), three-year old- (200 pieces), two-year old- (1260 pieces) sturgeons and one-year old Persian sturgeon (*A.persicus*), starred sturgeon (*A.stellatus*) and Kura-river ship (*A.nudiventris*) (more than 1000 pieces) of industrial manufacture are grown as an experiment in conditions of the Khilly Sturgeon Hatchery.

## RESULTS AND DISCUSSION

Some ten of specimen of Siberian sturgeon (*A.baerii*), sterlets (*A.ruthenus*), beluga (*Huso huso*), besters (*H.huso x A.ruthenus*) and Russian sturgeons (*A.gueldenstaedtii*) are grown as an experiment in the Khilly Sturgeon Hatchery. The general quantity of recovery-maternal stock of different kinds of sturgeon fish on Khilly Sturgeon Hatchery constitutes about 4000 specimens. The dynamics of development of young sturgeons grown in Khilly Sturgeon Hatchery since 2004 is shown at the figure 1.



**Figure 1.** The dynamics of development of young sturgeons grown in the Khilly Sturgeon Hatchery since 2004.

The system of blood forming of fish sensitively reacts to changes of factors of an environment. The content of hemoglobin in blood of the Persian sturgeon was defined in five age groups during the summer period. Concentration of hemoglobin of blood was in limits from (41,5±0,9g/l) to (54,0±1,1g/l). The quantity of erythrocyte at considered age groups in process of growth of grown up fishes has increased (Table 1).

**Table 1.** The hematological features of uneven-aged recovery specimens of the Persian sturgeon, rearing on Khilly Sturgeon Hatchery (2009)

Age of fishes	Amount of hemoglobin, g/l	ESR, mm/h	Amount of erythrocyte, mln./mm <sup>3</sup>	Amount of leukocyte th.sp./mm <sup>3</sup>
1.	41,5±0,9	4,3±0,4	0,365±0,062	11,7±2,1
2.	42,0±0,8	3,4±0,4	0,422±0,164	13,7±2,4
3.	47,0±0,9	2,5±0,5	0,509±0,036	14,3±1,9
4.	52,0±1,3	3,2±0,4	0,512±0,066	13,5±2,3
5.	54,0±1,1	2,9±0,5	0,4195±0,054	14,9±1,8

As researches have shown, on the first to year of a life of young fish of the Persian sturgeon erythropoiesis is generated completely. It has been defined that mature erythrocytes (76,5 - 81,5 %) prevail in peripheral blood at all age groups of young fish of researched kind.

Ratio of basophilic normoblasts has comprised 0,8-1,4%, and hemolyzed erythrocytes 0,4-1,6 %. The qualitative structure of erythrocyte at uneven-age individuals of the Persian sturgeon is presented in the table 2.

The insignificant number of pathological forms of erythrocytes, in our opinion, testifies to natural dying off of cells of erythrocyte series.

The structure of blood corpuscle of uneven-aged species of repair broodstock of the Persian sturgeon, grown up on industrial conditions, testifies that function of leukopoiesis is generated at them. It is necessary to note also that weight of separate elements of leukocytes formulas is of interest for an estimation of a physiological condition of grown up fish during the various periods of life cycle, both in norm and under influence of various factors.

**Table 2.** Differentiation of erythrocyte at uneven-age individuals of the Persian sturgeon

Age of fishes		Number on 500 erythrocyte, piece				
		Normoblasts			Normocytes	Pathological forms
		Basophilic	Polychromotophilic	Oxyphilic		
1	piece	7,2	6,4	101,8	382,5	2,1
	%	1,4	1,3	20,4	76,5	0,4
2	piece	4,3	11,4	89,6	392,3	2,4
	%	0,8	2,3	17,9	78,5	0,5
3	piece	-	3,1	81,3	407,5	8,1
	%	-	0,6	16,3	81,5	1,6

Lymphoid nature of leukocytes was determined in researched fish of Persian sturgeon (*A. persicus*) which was reared in the conditions of pool of Sturgeon Fish Hatchery. The functional activity of lymphocytes consists of realization of immunological response of organism.

The number of immune cells is affected not only by seasonal changes. The obtained information about the right (lymphoid) shift in leukogram of the blood of the uneven-aged young fish witnesses the normal developing leukopoiesis (Table 3) but also in direct proportion depends on the age of reared fish bred in artificial conditions. Index of leucocytes shift has a direct dependence on the age of reared fish: yearlings – 0,54; two-year old – 0,40; three-year old – 0,38; four year old 0,37 and five-year old – 0,32.

**Table 3.** The leukogram of uneven-aged young fish of Persian sturgeon, %

Parameters		Age of fishes				
		1	2	3	4	5
Neutrophils  ----- Переводы прямо с мобильного: <a href="http://m.translate.ru">http://m.translate.ru</a> Нейтрофилы	blastical forms	-	-	-	-	-
	myelocytes	5,9	7,0	6,5	6,4	6,1
	metamyelocyte	7,0	5,2	2,6	2,4	2,5
	Stab	9,5	4,4	8,4	7,5	5,7
	segmentonuclear leukocyte	2,5	1,5	1,9	2,6	3,1
	pathological forms	-	-	-	-	-
eozinophils		10,0	10,6	8,0	8,1	6,7
monocytes		-	-	-	-	-
lymphocytes		65,1	71,3	72,6	73,0	74,1
ISL (Index of leucocytes shift)		0,54	0,40	0,38	0,37	0,32

## CONCLUSIONS

Making preliminary conclusions of hematological researches of the Persian sturgeon as the modeling object used for formation of maternal stock on Khilly Sturgeon Fish Hatchery, it is possible to draw following conclusions:

1. In process of growth of young Persian sturgeon the number of erythrocytes on unit of volume of blood increases;
2. On the first year of a life of young fish of the Persian sturgeon the erythropoiesis is generated completely;
3. The number of leukocytes on unit of volume of blood of the Persian sturgeon has seasonal variability and has no direct dependence on age of fish;
4. The quantity of immune cells (lymphocytes) has direct dependence on age of fishes.

The data of hematological analysis allow to drawing a preliminary conclusion that functional development of the recovery species of the sturgeons on Khilly Sturgeon Hatchery runs without significant deviations from physiological standards.

Creating of spawning school in the sturgeon fish rearing station allows the save the gene pool of the sturgeon fish and enlarge the opportunities of their artificial reproduction for releasing to natural reservoirs. The schools which are formed in artificial way are not alternative for the natural reproduction, but are the assured source of receiving of sturgeon young fish.

## REFERENCES

*Chebanov, M.S., Galich, E.V., Chmirh, Yu.N.* (2004): A guide on breeding and growing of sturgeon fishes. Rosinformagrotekh. Moscow. 147 pp.

*Cotenev, B.N., Bursev, I.A., Nikolayev, A.I., Dergaljeva, J.T.* (2005): Strategy of preservation of sturgeon fish. *Pisciculture and fishery*, 1, 10-13.

*Ivanova, N.T.* (1983): The atlas of blood cells of fish. *Leqkaya i pishevaya promishlennost*. Moscow. 184 pp.

*Mamedov, Ch. A., Gadjiyev, R.V., Akhundov, M.M.* (2009): New technologies for sturgeon-breeding in Azerbaijan. Science. Baku. 260 pp.

*Mamedov, Ch. A., Salmanov, Z.S.* (2009): Aquaculture in Azerbaijan: Pool method rearing of sturgeon fishes and their repair-maternal stock in Khilly Sturgeon Hatchery. Abstracts of Presentations presented at the 6-th International Symposium on Sturgeon. Wuhan. Hubei Province. China. 208-210.

*Mamedov, Ch.A., Guseinova, G.G., Gadjiyev, R.V., Akhundov, M.M.* (2010): Aquaculture of sturgeon fish as the method of preservation of this relict fish. Abstracts of Presentations presented at the Global Conference on Aquaculture 2010. Phuket, Thailand. 123-124.

*Musselius, V.A., Vanyatinskiy, V.F., Vichman, A.A. et al.* (1983): A laboratory practical work by illnesses of fish. *Leqkaya i pishevaya promishlennost*. Moscow. 296 pp.

*Popova, A.A., Piskunova, L.V., Shevchenko, V.N.* (2004): Biological and technological regalements' of formation and the maintenance of maternal stocks of the sturgeon and beluga in conditions of Sturgeon Fish Hatchery in the delta of Volga. *Pisciculture researches on Caspian Sea: Results of scientific research works for 2003*. Astrakhan. 496-502.

*Smolyanov, I.I.* (1987): Technology of formation and operation maternal stock of the Siberian sturgeon in warm-water facilities. VNIIPRX. Moscow. 33 pp.

*Stroganov, N.S.* (1968): Acclimatization and cultivation of sturgeon fish in ponds. Moscow University. Moscow. 377 pp.