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Comparative morphophysiological indices of Russian sturgeon from different years catch in the Volga River

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Abstract
The qualitative composition of the Caspian Sea sturgeon has been studied on the basis of multiyear factual material. The relationship between the length, weight and age, marked a slowdown of growth the sturgeon. At present, the size of the population of Russian sturgeon and other major sturgeon species as beluga and stellate sturgeon have fallen sharply in the last 10-15 years (2000-2016), almost the recruitment absent, both, from the natural and of aquaculture. The findings suggest that the anthropogenic factor, over the past 40 years, has a negative impact on the biological productivity of fishery water bodies (Caspian Sea and adjacent rivers) and have an impact on fishes, their biological and physiological state. Evaluation of morphophysiological transformations in sturgeons based on the use of a variety of morphophysiological and biochemical parameters gives us grounds to speak about a certain deterioration of the physiological conditions of these fishes over time, in the sea and river periods of their life.

Keywords: Sturgeon, morphophysiological indicators, Caspian Sea, fatness, anthropogenic factors

1. Introduction
Sturgeons, the archaic giants of the water face numerous threats to their survival. Despite surviving on earth for millions of years, sturgeons are now vulnerable to overfishing and interference in their natural habitat. According to IUCN, sturgeons are more critically endangered than any other group of species [1].
Despite the tens of millions of Roubles allocated by the state annually to Caspian Research Institute of Fisheries (CaspNIRKh) for the research purpose to study reproduction of the traditional of region fish species, sturgeons are on the verge of extinction. If earlier a country annually produces up to 70 million fingerlings, then in 2009 this figure totaled only 28 million [2].
The problem is solved highly ineffective, scientific approach has long stopped applying. Consequently - almost complete absence of sturgeons, the former object of pride, not only for the Astrakhan region, but the whole country.
Unfortunately, the adopted measures to restore populations of sturgeons, in our opinion, are not enough. Although in this direction by the State, including in the Caspian Sea, are made certain steps; functioning plants of growing fry and release them into the sea. For example, the Astrakhan plant supports the number of sturgeons through artificially reproduction of fingerlings, but at a very low level. Such assistance is not essential for a radical improvement of the situation in the Caspian Sea. Part of fingerlings is released, but this is not enough to restore the resource potential of these species [3].
Current circumstances require a revision of the entire restoration strategy of fisheries sector. Problem solution of restoration of fish industry in the area has no prospects without integrated state control over all of its components: protection, rehabilitation and cultivation of fish resources, exploitation, processing and sale of finished products.
Size of the population is dependent on habitat conditions, the extent of recruitment and fisheries exploitation commercial [4-6]. Changing of the water body ecosystem, long-term discharge of industrial wastewater into the Volga, Kura, Ural and other rivers of the Caspian Sea, especially in the 70-80 years, exploitation of fish stocks by fishing all are reflected in the population structure.
Knowledge of species, population, gender, age and individual variability of morphophysiological and biological parameters of the fish is necessary to assess the physiological status of the selected populations in different periods of their life cycle and its response to changing conditions of the habitat, as well as to identify the intrapopulation groups [7]. Morphophysiological studies combined with the environmental conditions acquire special relevance for the sturgeons, in view of their special value, the forthcoming use as an object of artificial cultivation, acclimatization and hybridization, as well as changes in the habitat conditions of these relict fishes in relation to developing the industrial exploitation of hydrocarbons in the Caspian Sea.

Data on of morphophysiological, physical and biochemical an indicator of sturgeon of the European part of the country is pretty much, but little comparative data in morphophysiology [8-10].

In this regard it is necessary to study the variability of the qualitative composition of morphophysiological indicators of sturgeons in river period of life, i. e, of running, and compare with the previous data, as the difference in the collection of materials over 30 years. Condition factor and organosomatic indices of fish represent a way of monitoring environmental factor influence on fish.

2. Materials and Methods

The main object of the study served the sturgeon within the river period of life in the Lower Volga River (about 46°28′N 48°16′E/48°42′N 44°30′E). Material has been collected during periods 1970-1972 years and in 2001-2004. To assess state of fishes we take into account, sex, gonad maturity, weight, length, and age. To assess the physiological state of fishes examined have used a set of morphophysiological indicators (relative weights of heart, liver, spleen and gonads (Tab.1).

The liver, spleen and heart were carefully removed and weighed.

Organosomatic indices (OSI) for gonads (GSI), liver (Hepatosomatic index (HSI)), heart (Cardio-somatic index (CSI)) and spleen index (SSI) were calculated as follows:

OSI = [weight of the organ (g) / weight of the fish (g)] x 100

The obtained results morphophysiology (indices of heart, liver, spleen and gonads) were statistically processed [11, 12]. Calculations of basic statistics were performed on a PC using the software excels. All investigated-887 specimens were processed and analyzed in Caspian Scientific Research Institute of Fisheries and Astrakhan state technological University Laboratories.

3. Results and Discussion

The length of the running Russian sturgeons, caught in the river Volga in 1970-1972 years ranged from 105.0 cm to 182.0 cm in females against 112.0 cm to 203.0 cm for males. The data in table 1 show that both the total length of females and males during season changes. The greatest average length was observed in specimens caught in May, in females as well in males. The smallest length was in the individuals of the October and April movement, respectively. It should be noted that the highest values had been at individuals of that migrate in the seventies. The total length of the moved Russian sturgeon caught in 2001-2004, is undergoing a sharp seasonal fluctuations. The greatest length for males was noted in June, and the lowest - in July. The average length of females caught in 2001-2004 amounted to 119,8 ± 1,2 cm and ranged from 102.0 to 153.0 cm, in males - 107,6 ± 1,34 cm and from 91.0 to 144.0 cm respectively.

In comparison with the data obtained in the period 1970 - 1972, it is seen that average length and weight of the Russian sturgeon caught in 1970-1972, larger than that Russian sturgeon caught in 2001-2004 (in males as well as females) (Table 1, Fig. 1).

By comparing the average mass in running migrants of Russian sturgeon, caught in different years, it must be emphasized that the of Russian sturgeon caught in two thousandth years, it was less than that of specimens caught during the seventies, both in female and in males.

Table 1: Comparative quality composition of the migratory Russian sturgeon in the river period of life in 1970-1972 and 2001-2004 years

months	Number of ind., N		Average length, cm; range		Weight, Kg; range	
	1970-1972	2001-2004	1970-1972	2001-2004	1970-1972	2001-2004
June	40♂	25♂	129.05±2.24	107.3±8.1	11.87±0.68	11.1±0.6
			109.0-182.0	97.0-135.0	6.7-20.1	6.0-14.0
	47♀	6♀	149.7±2.1	138.0±3.14	20.07±0.62	17.03±1.0
			129.0-203.0	116.0-153.0	12.6-46.1	14.5-21.0
July	158♂	9♂	127.5±0.77	121.0±2.13	12.15±0.24	9.69±0.65
			105.0-145.0	95.0-125.0	6.5-18.5	7.0-14.2
	107♀	8♀	145.74±1.24	135.75±4.2	21.67±0.98	16.76±1.55
			123.0-198.0	102.0-150.0	10.2-43.6	11.8-22.8
August	172♂	7♂	125.64±0.98	128.0±5.7	11.69±0.24	10.77±1.01
			109.0-158.0	95.0-142.0	8.0-19.5	6.8-14.7
	84♀	-	153.0±1.41	-	22.92±0.71	-
			112.0-185.0	-	9.3-48.0	-
Sept.	119♂	36♂	126.64±0.76	124.78±1.38	13.45±1.44	9.02±0..32
			106.0-115.0	91.0-144.0	5.1-18.7	6.0±14.9
	69♀	-	147.14±1.39	-	20.97±0.7	-
			124.0-182.0	-	10.6-41.8	-
Total	496♂	77♂	127.2±1.18	107.6 ± 1.34	12.29±0.65	10.12 ± 0.5
			105.0-182.0	91.0-144.0	5.1-20.1	6.0 – 14.9
	300♀	14♀	148.9±1.53	119.8 ± 1.2	21.4±0.75	16.9 ± 0.13
			112.0-203.0	102.0-153.0	9.3-48.0	11.8 – 22.8

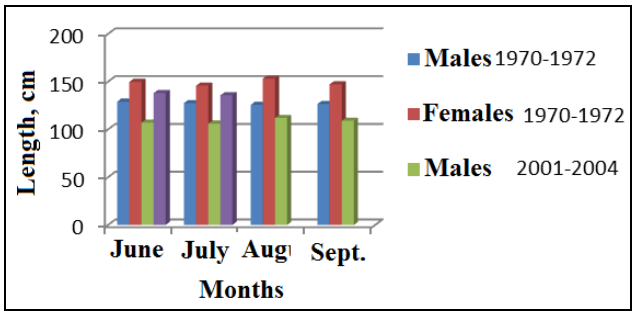

Fig 1: Seasonal variability of the length of Russian sturgeon in the river period of life

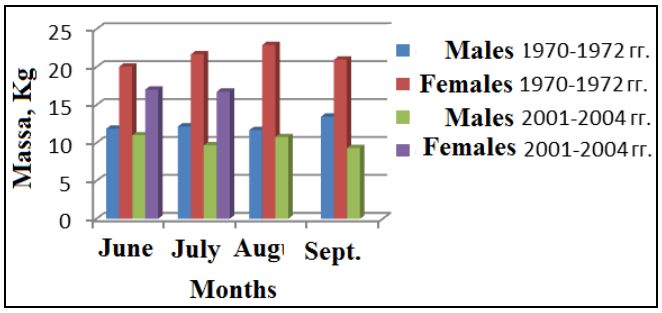

Fig 2: Seasonal variability of the length of Russian sturgeon in the river period of life

Weight of the migrated Russian sturgeon during the season was changed. The highest average weight in migrated males was in June (11.1 ± 0.6 kg), while the minimum - in September (9.02 ± 0.32 kg).

The average weight in migrated females caught in 2001 - 2004 was 16.9 ± 0.13, and in males 10.12 ± 0.5 kg. Weight of females ranged from 11.8 to 22.8 kg, in males-from 6.0 to 14.9 kg (Table 1, Figure 2).

Average Fulton's condition factor (K) in migrated males of Russian sturgeon caught in the Volga River in 2001-2004, from June to September ranged from 0.37 to 0.77 and the average for the season was 0.53 ± 0.03. Fulton's condition factor of migrated females caught in the Volga River in June - July an average equaled 0.65 ± 0.02 with a range from 0.59 to 0.80.

Fulton's condition factor in females of Russian sturgeon was higher in comparison with males, and the average was 0.65 ± 0.02 and 0.53 ± 0.03 respectively (Table 2).

Table 2: Seasonal variability of Condition factor (K) and the age of Russian sturgeon in the Volga River in 1970-1972 and 2001–2004

Months	Sex	Number of ind., N		Condition factor Range		Age, Years Range	
		1970-1972	2001-2004	1970-1972	2001-2004	1970-1972	2001-2004
June	♂	40	25	0.54±0.01	0.58±0.08	12.18±0.55	15.36±1.08
				0.42-0.65	0.37-0.77	9.0-29.0	10.0-35.0
	♀	47	6	0.65±0.01	0.64±0.02	18.04±0.45	17.0±0.68
				0.52-0.79	0.59-0.69	13.0-35.0	16.0-20.0
July	♂	158	9	0.58±0.01	0.55±0.04	12.26±0.18	13.22±0.49
				0.45-0.79	0.43-0.76	8.0-17.0	11.0-15.0
	♀	107	8	0.63±0.01	0.67±0.03	18.87±0.66	16.5±1.02
				0.52-0.81	0.59-0.86	11.0-34.0	12.0-21.0
Aug.	♂	172	7	0.58±0.09	0.51±0.04	12.28±0.18	15.86±1.64
				0.46-0.7	0.45-0.76	9.0-27.0	11.0-22.0
	♀	84		0.66±0.01	-	19.65±0.48	-
				0.42-0.86	-	10.0-35.0	-
Sept.	♂	119	36	0.58±0.09	0.46±0.01	11.8±0.21	14.22±0.48
				0.45-0.69	0.39-0.53	8.0-27.0	8.0-20.0
	♀	69		0.64±0.06	-	18.35±0.48	-
				0.47-0.79	-	10.0-33.0	-

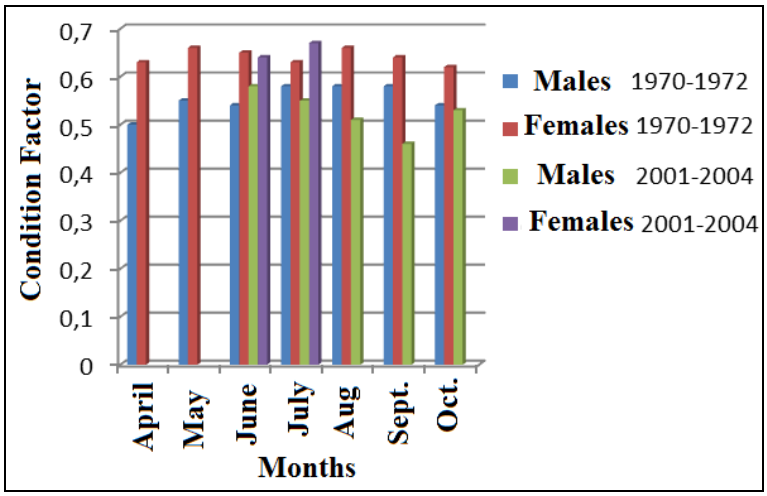

Fig 3: Seasonal variations of Condition factor (K) of Russian sturgeons in the river Volga in 1970-1972 and in 2001-2004 years

Fulton's condition factor of migratory fish in the 1970-1972 years was ranged from 0.42 to 0.86. In migrated females it was somewhat broader than in males. Maximum condition factor of females was observed in fish caught in May. In the summer months, it was about the same, and in October there was a decrease. In migrated males from April it increased, in June and July reaches the highest value, and decreases in October.

It should be mentioned that the females of Russian sturgeon condition factor larger than in males, and this peculiarity can be seen throughout the season.

The results show that there were 1970 individuals of the most well-fed-1972, and the least in 2001-2004 (Table 2, Figure 3).

Spawning stock of Russian sturgeon has been multiage structure. Age of the females ranged from 10.0 to 35.0 years in 1970-1972 and from 12.0 to 21.0 years during the period 2001-2004, and in males-from 8.0 to 23.0 and from 8.0 to 35.0 years, respectively.

Seasonal changes in the age structure of Russian sturgeon caught in 2001–2004 were revealed; in spawners caught in July, the average age was a minimal-13.22 ± 0.49 years (males), the greatest age registered in June-15.36 ± 1.04 years. The average age of females was 16.75 ± 0.25 years and ranged from 12.0 to 21.0 years, while the migrating males - 14.66 ± 0.6 and 8.0-35 years, respectively.

In catches 1970-1972 years the average age also changed during the season. The median age migrating males r ranged from 11.0 ± 0.67 to 13.21 ± 0.89 years; females-from 17.23 ± 0.08 to 21.78 ± 1.61 years. The highest average age was marked in specimens caught in May.

Comparing the data obtained in the period 2001-2004, with the materials of previous years (1970-1972), it should be noted that all we studied the qualitative composition of indicators (length, weight; fatness on Fulton, age) fell sharply. This indicates that at present the number of Russian sturgeon population has declined sharply in the last 10-15 years of its completion is virtually absent (Table 2, Figure 4).

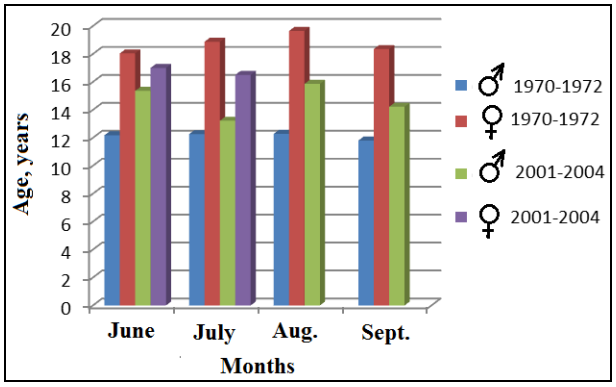

Fig 4: Seasonal variability of the age of Russian sturgeon in the river period of life

The relative weights of internal organs in spawners of Russian sturgeon in the river period of life are not the same, reflecting the peculiarities of the metabolic processes in these species, which are changed throughout the season.

Comparing Gonadosomatic index in females of Russian sturgeon in the maturity stage III-IV catches from different years, namely for the period 1970-1972 and 2001-2004, we noted that Gonadosomatic index in 2000th years found to be lower than that of fish in 1970s years. For example, in April 2001-2004 Gonadosomatic index in the period of 2001-2004 found to be lower than that of fish in 1970-1972 period – 23.0 ± 1.19%. In May and August figures differ by only 1% with a deviation to a high side at individuals caught in 1970-1972 (Fig. 5).

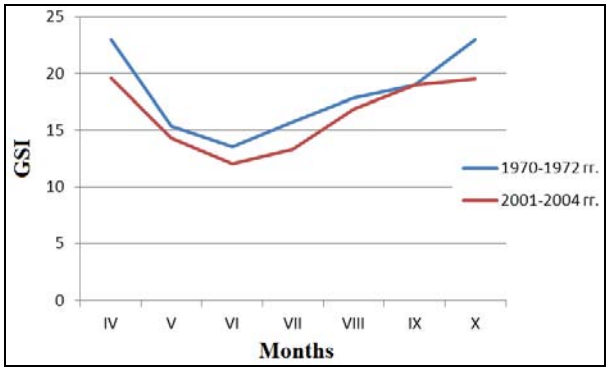

Fig 5: Comparative characteristics of seasonal changes in the relative weight of the gonads of females (GSI) of Russian sturgeon in the river period of life

In September the indicators are practically equal: in 1970 - 1972-18.95 ± 0.07%, 2001-2004-19.0 ± 0.15%. In October, the picture is almost the same as in April: in 1970-23.0 ± 2.78%, the 2000s-19.5 ± 0.14%.

The amplitude of the oscillations Gonadosomatic index of Russian sturgeon females in 1970-1972 is much wider than in 2001-2004.

If in April 2001-2004 GSI fluctuation was only 16.3-20.1%, then in 1970-1972, the fluctuation was 8.26-35.33%. In October of 2001-2004 fluctuation of GSI of Russian sturgeon females was 16.1-22.0% and in individuals caught in 1970 - 1972 it was between 11.0 and 39.0%.

Indicators of GSI of Russian sturgeon males caught in 1970 - 1972 is also very contrasting in comparison with indicators of fish in 2001-2004. In 1970, in the first half of the year GSI of Russian sturgeon males were 5.79 ± 0. 21% and in the 2000s was 3.8 ± 0.18%. In the second half of the year the indicator GSI of Russian sturgeon males in 1970 was lower (4.36 ± 0.07%), than in the first half of the year, and in relation to the Indicator for the period 2001-2004. (3.8 ± 0.18%) is higher (Fig. 6).

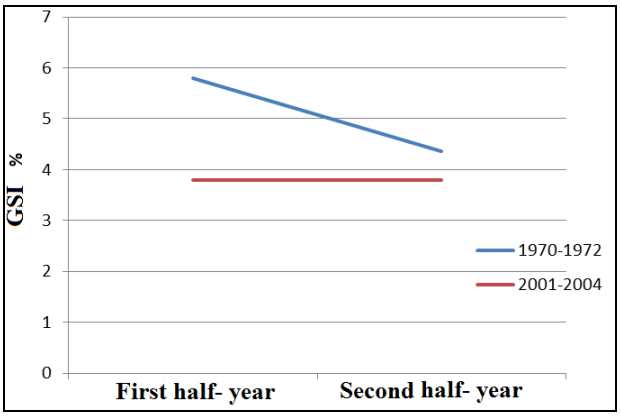

Fig 6: Comparative characteristics of seasonal changes in GSI of males in III, III - IV, IV stages of maturity of Russian sturgeon in the river period of life

Amplitude of mass oscillation of the gonads (GSI) of Russian sturgeon males caught in 2001-2004, was 0.9-7.0%, and in individuals 1970-1972-1.13-10.61%. This indicates that in the

1970[ths], the amplitude of oscillations of the males' gonads of Russian sturgeon was greater than in the 2000s, and is associated with the size of population.

GSI of migrated females in 2001-2004 was higher compared to the males, and the average for the season was amounted 9.7 ± 0.31% and 4.14 ± 0.3%, respectively. Gonads index during season ranged from 0.83 to 8.97% in males and 5.93 to 14.50% in females. When compared to 1970-1972, it noted that the GSI of Russian sturgeons' males and females has decreased sharply.

The average cardio-somatic index in of migrated males caught in 1970-1972, during season ranged from 0.12 ± 0.005% to 0.16 ± 0.01%, and for females-from 0.11 ± 0.003% to 0.12 ± 0.005%. The maximum average of CSI of migrated male was observed in specimens caught in June, and the minimum - in September. It should be noted that the relative heart weight in females was approximately the same level during the whole season. Maximum CSI of migrated females registered in June, and the minimum-in September. In comparison with the data of the sturgeon caught in 2001-2004, CSI was almost at the same level (in sturgeon in the 2001-2004 slightly less than that of sturgeon in 1970-1972) (Figure 7).

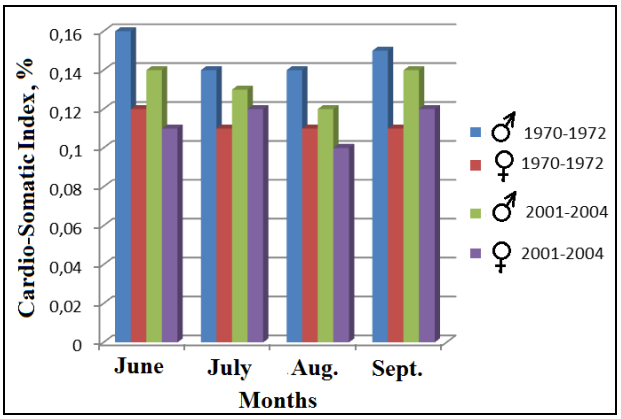

Fig 7: Seasonal variability of cardiosomatic index of Russian sturgeon in the river period of life

Comparing HSI was of Russian sturgeon catch in different years showed that the largest HSI was in females and males caught in 1970-1972, while in 2001-2004-the smallest (Figure 8).

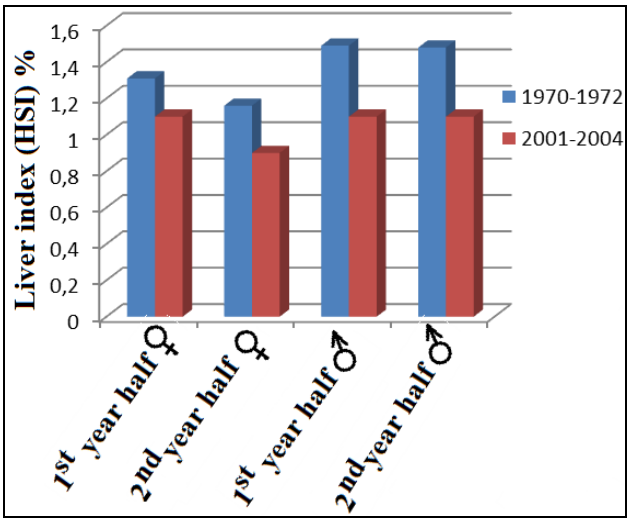

Fig 8: Comparative characteristics of seasonal changes in HSI of males and females of Russian sturgeon in the river period of life

The amplitude of the fluctuations of the HSI as well differs in different catch years. In 2001-2004 in females of sturgeon in maturity stage III, III-IV, IV fluctuations of HIS reached 0.67-1.3%, while its fluctuations in females, caught in 1970-1972 was significantly wider (0.53-2.86%) compared to females in the same stage of maturity caught in 2001–2004 [13, 14].

In males HSI was higher than that of females. HSI in fish caught in 2001-2004, constituted 1.1 ± 0.03%, while in 1970-1972 period, the HIS was 1.49 ± 0.03%. The amplitude of the variations of HSI in 1970-1972 is also wider (1.47-3.04%) than in the 2001-2004, (0.73-1.3%).

HIS of migratory males varies from June to September, while the highest observed in producers caught in July; the minimum was in June. The seasonal ranges of HSI in females was 0.52 - 2.12%, in males-0.82-3.89% (Table3). The average SSI in migratory males from June to September in 2001-2004, ranged from 0.26 ± 0.01 to 0.35 ± 0.03% and the highest was in July. The average seasonal SSI in males was 0.3 ± 0.02%, females – 0.25 ± 0.03% (Table 3).

Table 3: Comparative morphophysiological indexes of Russian sturgeon, caught in the Volga River in different years

Organs	Years	Sex	June	July	August	September
CSI, %	1970-1972	♂	0.16±0.01	0.14±0.006	0.14±0.005	0.15±0.002
		♀	0.12±0.005	0.11±0.003	0.11±0.003	0.11±0.008
	2001-2004	♂	0.14±0.02	0.13±0.02	0.12±0.02	0.14±0.01
		♀	0.11±0.01	0.12±0.01	0.10±0.01	0.12±0.01
HSI, %	1970-1972	♂	1.60±0.07	1.65±0.03	1.61±0.03	1.45±0.03
		♀	1.30±0.05	1.25±0.03	1.18±0.02	1.02±0.03
	2001-2004	♂	1.35±0.09	2.24±0.3	1.99±0.24	1.17±0.04
		♀	1.20±0.24	1.50±0.16	1.35±0.12	1.16±0.02

SSI, %	1970-1972	♂	0.39±0.03	0.33±0.01	0.35±0.01	0.36±0.01
		♀	0.32±0.02	0.32±0.01	0.3±0.01	0.32±0.01
	2001-2004	♂	0.29±0.026	0.35±0.03	0.28±0.02	0.26±0.01
		♀	0.28±0.03	0.22±0.02	0.25±0.01	0.24±0.02
GSI, %	1970-1972	♂	3.44±0.31	4.29±0.20	6.50±0.16	4.78±0.27
		♀	13.48±0.34	15.84±0.38	17.88±0.34	22.27±1.99
	2001-2004	♂	4.75±0.33	3.66±0.43	3.43±0.60	4.72±0.26
		♀	9.40 ± 0.37	10.02 ± 1.1	9.50±0.35	11.20±0.28

Figure 9 clearly shows that the SSI in males and females of Russian sturgeon caught in 1970-1972 greater than that of Russian sturgeon caught in 2001-2004.

Analyzing data on relative weight of the organs in the migratory Russian sturgeon caught in 2001-2004, and 1970 - 1972, it should be noted that there are clear sex differences. Index of heart, liver and spleen is higher in males; however in females Gonadosomatic index, agrees well with data of Raspopov (1982, 2001) [13, 14].

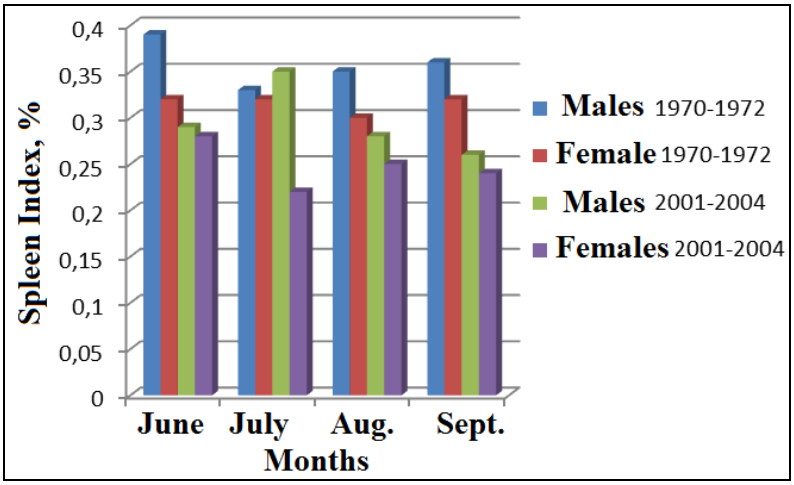

Fig 9: Seasonal variability of spleen of Russian sturgeon in the river period of life

When comparing individuals about the same age it was noted, that all morphophysiological indicators (CSI, HSI, SSI) in Russian sturgeon caught in 2001 - 2004 was lower than in fish caught in 1970-1972 (Table. 4, 5).

Table 4: Morphophysiological indices of migratory Russian sturgeon females depending on the age of individuals in Volga River – 1970-1972 and 2001-2004 years

Age, year	Period	Weight, Kg	CSI, %	HSI, %	SSI, %
12-15	1970-1972	15.80 ± 0.14	0.16±0.03	1.23 ± 0.05	0.34 ± 0.02
	2001-2004	12.3 ± 0.4	0.13±0.02	1.12 ± 0.17	0.27 ± 0.03
16-19	1970-1972	21.9 ± 0.15	0.17±0.01	1.32 ± 0.03	0.33 ± 0.01
	2001-2004	17.3 ± 0.8	0.14±0.02	1.16 ± 0.04	0.26 ± 0.02
20-21	1970-1972	24.94 ± 0.18	0.15±0.04	1.23 ± 0.03	0.34 ± 0.02
	2001-2004	21.6 ± 0.64	0.12±0.01	1.2 ± 0.09	0.22 ± 0.03

The leading places among the anthropogenic factors that have a negative effect on the biological productivity of fishery water bodies occupy chemical water pollution. Even a minor concentration of pesticides and heavy metals leads to violations of functioning of the different biochemical systems [15, 16]. Modern ecologo-toxicological monitoring of the Volga-Caspian basin showed that heavy metals and hydrocarbons in water, sediments and tissues, ns of fish are constantly observed in amounts exceeding the maximum allowable concentration [17-19].

Table 5: Morphophysiological indices of Russian sturgeon males according to the age of individuals migrating into river Volga in 1970 - 1972 and 2001-2004 years

Age, year	Period	Weight, Kg	CSI, %	HSI, %	SSI, %
8-10	1970-1972	8.85 ± 0.09	0.14 ± 0.01	1.53 ± 0.03	0.36 ± 0.08
	2001-2004	7.30 ± 0.56	0.12 ± 0.03	1.12 ± 0.07	0.25 ± 0.03
11-13	1970-1972	12.47 ± 0.01	0.135 ± 0.003	1.56 ± 0.03	0.35 ± 0.01
	2001-2004	8.80 ± 0.37	0.13 ± 0.004	1.46 ± 0.12	0.30 ± 0.02
14-16	1970-1972	14.88 ± 0.34	0.135 ± 0.004	1.64 ± 0.03	0.37 ± 0.01

	2001-2004	10.10 ± 0.25	0.13 ± 0.005	1.48 ± 0.12	0.26 ± 0.01
17-19	1970-1972	21.83 ± 0.3	0.17 ± 0.004	1.69 ± 0.01	0.39 ± 0.02
	2001-2004	11.70 ± 0,53	0,10 ± 0,01	1,10 ± 0,06	0,24 ± 0,01
20-24	1970-1972	26.12 ± 0.66	0.13 ± 0.07	1.61 ± 0.10	0.35 ± 0.04
	2001-2004	14.80 ± 1.50	0.11 ± 0.05	1.50 ± 0.19	0.26 ± 0.01

Pollution of the Volga-Caspian basin by various kinds of industrial, agricultural and domestic origin pollutants, and later oil, especially expressed themselves in 1988-1996, have contributed to the modification of the hydrochemical regime, bioproductivity of basin, physiological state of the fishes [8, 19]. These factors have reduced the survival of juvenile of beluga, Russian sturgeon, stellate sturgeon, and starlet and contributed to an increase the amount of abnormalities in the developing larvae and juveniles. Furthermore chronic pollution in the period 1991 to 2005 and a sharp increase in intensity of illegal fishing in the sea and the rivers contributed to rapid decline in sturgeon stocks [20, 21].

Our data (length, weight, condition factor by Fulton, age) collected in the river Volga with a difference of more than 30 years (1970-1972 and 2001-2004) [22, 23] show that they have decreased sharply. This indicates that at the present stage the size of population of Russian sturgeon and other sturgeon species declined sharply in the last 10-15 years, practically replenishment absent, both from natural and from the artificial reproduction.

The relative weight of the most important internal organs in the migratory Russian sturgeons changed during the season. Morphophysiological indices of organs in the migratory Russian sturgeons caught in 1970-1972, shows sex differences in CSI, HSI, SSI and GSI and higher in specimens caught in 2001-2004.

Thus, the assessment of morphophysiological conversions in contemporary a Russian sturgeon, based on the use of various indicators, gives reason to speaking about the deterioration in time of the physiological state of the fish in the river period of life.

Our survey results indicated that the morphophysiological indices of producers of Russian sturgeon caught in 2001 - 2004, declined sharply in comparison with the data of Russian of sturgeon caught in 1970-1972. The oscillation amplitude of these indicators of sturgeon in 1970-1972 were much wider than that of the Russian sturgeons in 2001-2004 as the anthropogenic factor in the past 30 years has had a negative effect on the Russian sturgeons inhabiting the river Volga, including their physiological condition [24]. The value of morphophysiological indicators allows capturing the reaction of the population on modification of certain terms of habitat, and characteristics of physiological state at different periods of the annual cycle. This demonstrates that over 30 years the size of population of Russian sturgeons in the river Volga decreased sharply. The increasing of pollution in recent years (2002-2012) due to the elaboration of hydrocarbons in the Volga-Caspian basin, in combination with other anthropogenic factors (regulation of river flow, hydrological regime deformation, excessive high levels of irrevocable withdrawal of freshwater flow, etc.) has led sturgeons in a highly complicated, we can say, catastrophic situation [23, 25].

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