ВОДНЫЕ БИОРЕСУРСЫ И ИХ РАЦИОНАЛЬНОЕ ИСПОЛЬЗОВАНИЕ

WATER BIORESOURCES AND THEIR RATIONAL USE

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Current state of fisheries in the Volga-Caspian subarea

E. N. Ponomareva[1], P. A. Balykin[2]✉, A. V. Startsev[3], A. A. Korchunov[4], S. S. Savitskaya[5]

[1]Astrakhan State Technical University, Astrakhan, Russia

[1–5]Federal Research Center Southern Scientific Center of the Russian Academy of Sciences, Rostov-on-Don, Russia, balykin.pa@rambler.ru✉

Abstract. Analysis of the current state of fisheries in the Volga-Caspian subarea has been carried out. The processes of deformation of aquatic biological resources of the Caspian basin have been assessed. Modern catches of commercial fish have decreased by one order of magnitude compared to the last century. At the beginning of the 20th century the stocks of semi-anadromous and river fish species were significant, the catches reached 200-300 thousand tons. In recent years, the catch of the fish has stabilized at the level of 36.0-43.3 thousand tons. In recent years the catches of vobla, carp and zander were the lowest in the history of the Caspian fisheries. The catch of carp, compared with that in the 1980s, decreased by more than 5 times, vobla – by 6 times, zander – by 4 times. Since 2003, there has been a decrease in the catch of bream up to 7-10 thousand tons. A sharp decrease in catches is primarily explained by the collapse of kilka stocks. There is an acute problem of limiting and even a complete ban on fishing vobla. According to the results of the correlation analysis (comparison of the values of natural factors with the value of catches in the studied subareas), it was found that fish production in the Volga-Caspian subarea does not show any relationship with any of the listed natural factors. An analysis of the species composition of semi-anadromous and river fish caught by various fishing gear in the Lower Volga was carried out. The species composition of catches by secrets is more diverse than by cast nets and gillnets. Most abundant species in the catches are bream, vobla, pike, catfish, rudd. A forecast is given for a further fishery reduction in the Caspian basin including the Astrakhan region.

Keywords: Volga-Caspian basin, fishing, catch, catch composition, fishing gear, commercial stock

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Научная статья

Современное состояние рыболовства в Волго-Каспийском подрайоне

Е. Н. Пономарева[1], П. А. Балыкин[2]✉, А. В. Старцев[3], А. А. Корчунов[4], С. С. Савицкая[5]

[1]Астраханский государственный технический университет, Астрахань, Россия

[1–5]Федеральный исследовательский центр Южный научный центр Российской академии наук, Ростов-на-Дону, Россия, balykin.pa@rambler.ru✉

Аннотация. Выполнен анализ современного состояния рыболовства в Волго-Каспийском подрайоне. Дана оценка процессам деформации водных биологических ресурсов Каспийского бассейна. Современные уловы промысловых рыб снизились на порядок по сравнению с прошлым столетием. В начале XX столетия запасы полупроходных и речных видов рыб были значительными, уловы достигали 200–300 тыс. т. В последние годы вылов таких рыб стабилизировался на уровне 36,0–43,3 тыс. т. Уловы воблы, сазана и судака в течение последних лет были самыми низкими за всю историю каспийского рыболовства. Вылов сазана, по сравнению с выловом в 1980-е гг., снизился более чем в 5 раз, воблы – в 6 раз, судака – в 4 раза. С 2003 г. наблюдается снижение вылова леща до 7–10 тыс. т. Резкое снижение уловов обусловлено, прежде всего, коллапсом запасов килек. Остро стоит вопрос о лимитировании и даже полном запрете промысла воблы. По результатам корреляционного анализа (сравнение значений природных факторов с величиной уловов в исследуемых подрайонах) установлено, что добыча рыбы в Волго-Каспийском подрайоне не обнаруживает связей ни с одним из перечисленных природных факторов. Проведен анализ видового состава полупроходных и речных рыб, выловленных различными орудиями лова на Нижней Волге. Видовой состав уловов «секретами» более разнообразен, чем закидными неводами и жаберными сетями. Основу уловов составляют лещ, вобла, щука, сом, красноперка. Спрогнозировано дальнейшее сокращение рыбного промысла в Каспийском бассейне, в том числе в Астраханской области.

Ключевые слова: Волго-Каспийский бассейн, рыболовство, вылов, состав уловов, орудия лова, промысловый запас

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Introduction

Even in the first half of the 20th century, the southern seas were Russia's "fish breadbasket". So, catches made from 1 375 to 1 493 thousand tons, and the share of the Volga-Caspian basin was 25% at the end of the second five-year plan (1937) [1]. Modern catches are an order less and in 2021 they amounted to 100.5 thousand tons, or 2.01% of the total Russian catch [2].

The deformation processes of the aquatic biological resources of the Caspian Basin developed as follows: firstly, sturgeons practically disappeared, then the turn came to other valuable species, finally the most of the ichthyomass began to be small pelagic planktophage fish, the number of which is subject to sharp fluctuations, as a result of a short life expectancy, and because of vulnerability from external causes, such as the introduction and reproduction of the Mnemiopsis ctenophore.

Recently, there has been an acute issue of banning or limiting the catch of such an important commercial object as the roach *Rutilus rutilus caspicus* (Linnaeus, 1758). Information appeared on the website of the Volga-Caspian Territorial Directorate of the Federal Agency for Fishery and in the media about the ban until December 31, 2022 on the industrial fishing of roach (vobla) on the Volga River and its watercourses in Ikryansky, Kamyzyaksky, Volodarsky, Limansky, Krasnoyarsky, Narimanov and Privolzhsky districts of the Astrakhan region [3], which became the reason for numerous publications about the deplorable state of the fishing industry in the Astrakhan region [4-6].

The current state of Russian fisheries in general and the commercial importance of vobla in the above fishing area are the topical issues.

Materials and methods

Published results of the hydrological state [7] (Hydrometeorology and hydrochemistry of the seas of the USSR, 1992), [8-10], the size and composition of catches in the Caspian Sea [11-15], as well as information on the fishery available on the official websites of the Ministry of Agriculture of the Russian Federation [16] and the Federal Agency for Fishery [17] were used. The Excel software package for PC was used for processing the data.

Results and discussion

In the present century, the Caspian Sea provides 70% of the world's sturgeon catch. Apart from sturgeon, bream, pike perch, carp, catfish are caught here, which is about 30%, and roach – 75% of the catch of the Russian Federation [13]. The lower reaches of the Volga and the northern Caspian remain the main supplier of semi-anadromous and river fish in the Russian Federation, providing more than half of their catch in the country [9]. Russian catches in the 21st century changed from the largest 68.6 in 2001 to the smallest – 23.2 thousand tons in 2008 (Fig. 1).

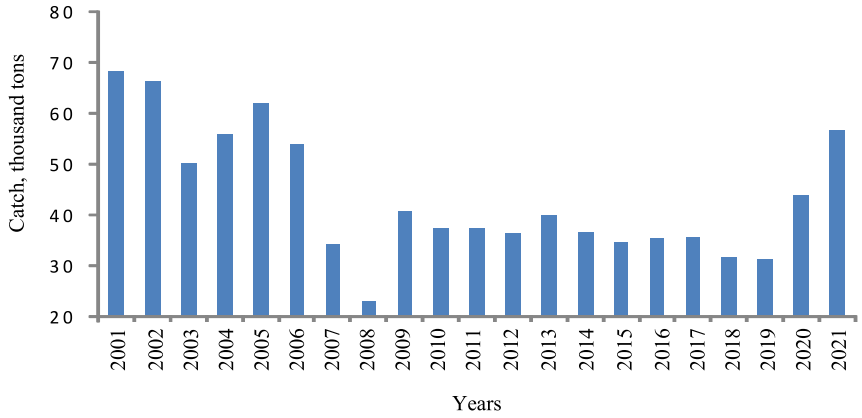


Fig. 1. Russian catches in the Caspian Sea in the XXI century

At the beginning of the XXI century, a sharp decrease of the caught fish was noted, primarily due to the collapse of kilka stocks. Within 3 years the total catch in the Caspian basin decreased by 3.5 times, while the share of kilka decreased by 2.5 times [18], however, in recent years the production of these fish has increased markedly due to the involvement of fishermen from other Russian regions in the development of marine fish in the Caspian, because the catches were limited not by the deficiency of fish, but by the lack of the specialized fleet.

The Volga-Caspian fishery basin is divided into the Northern and Southern regions delimited by the dam of the Volga hydroelectric power station (Volgograd city).

According to the "Fishing Rules", the Southern fishery region includes the Caspian Sea, as well as water bodies in the territories of the Astrakhan region, the republics of Dagestan, Ingushetia, Kalmykia, North Ossetia – Alania, Kabardino-Balkaria, Chechnya and parts of the Volgograd region (Volga River with channels, arms, branches and other water bodies of fishery significance below the dam of the Volga hydroelectric power station, the reservoir of the Volga-Don navigable canal with flowing rivers). It is divided into 4 fishery subdistricts: Volga-Caspian (Astrakhan region), North-Western (Kalmykia), North-Caspian, Tersko-Caspian (Dagestan) [19] (Fig. 2).

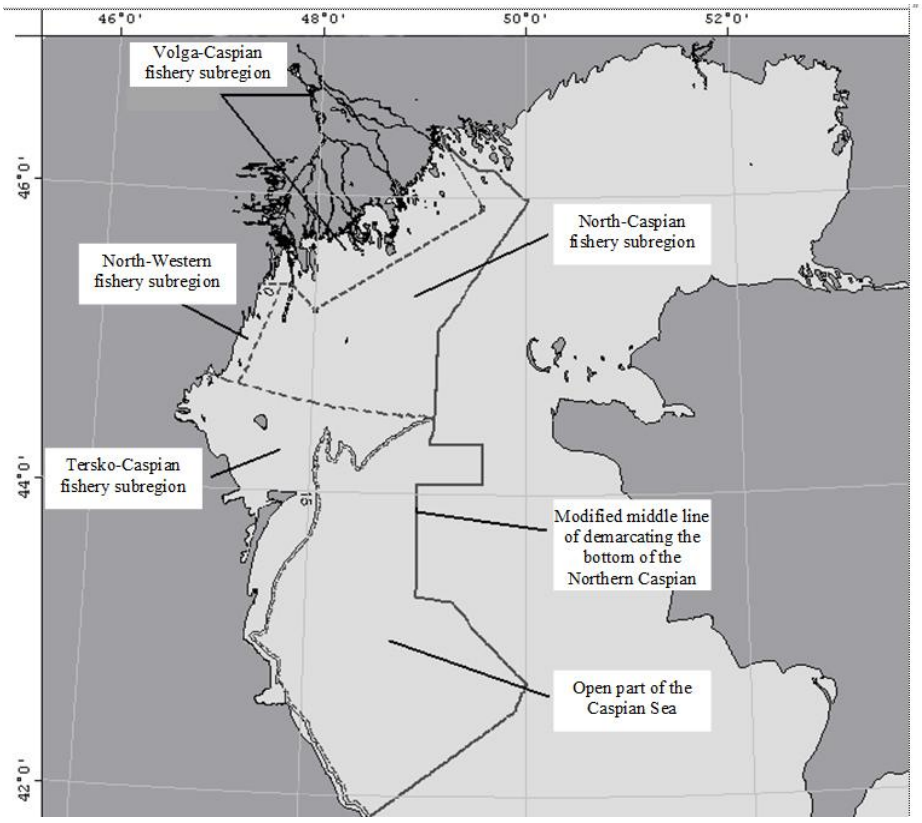


Fig. 2. Zoning scheme for the southern part of the Volga-Caspian fishery basin

It should be reported that almost all fish is caught in the Volga-Caspian, North-Western and Terek-Caspian sub-regions, and the commercial significance of the North Caspian is not great. Thus, according to the data for 2009-2019, in the first three regions, an average of 92% of the total catch was caught [20]. The main fishing gear in the Volga-Caspian subarea are cast nets, tight seines, and trap nets [10, 11, 14].

The main fishing area is the Volga-Caspian sub-area (74% of the total catch), while the North-West (Kalmykia) (7%) and Tersko-Caspian (Dagestan) (19%) are less important for fishing. In the first of these regions in the present century there are caught from 22 to 32 thousand tons of fish annually, in the second – from 2.2 to 7 thousand tons, in the third – 2.1-6.5 thousand tons [20].

The most well-known and frequently cited indicators of the state of the waters of the Caspian Sea are its level, the annual flow of the Volga, which gives about 80% of the inflow of river waters, and the volume of its spring flood [7, 8, 21]. The actual values of the listed indicators are given in the scientific literature, Internet resources of the Hydrometeorological Service and the government of the Astrakhan region ("State report of the environmental situation in the Astrakhan region..." in 2009-2019) [22]. The performed correlation analysis (comparison of the values of natural factors with the value of catches in the studied subareas) showed that fish production in the Volga-Caspian subarea does not reveal any relationship with any of the listed natural factors.

The fishing industry of the Astrakhan region is represented by 167 enterprises employing 14.5 thousand people [6, 23]. The main commercial aquatic biological resources of inland water bodies of the Astrakhan region are fluvial anadromous and river fish species. At the beginning of the 20th century, their stocks were large, the catches reached 200-300 thousand tons. Over the last few years, the catch of such fish has stabilized at the level of 36.0-43.3 thousand tons. *Sander lucioperca* (Linnaeus, 1758) has been the lowest in recent years in the history of the Caspian fishery. The catch of carp, compared with the catch in the 1980s, decreased by more than 5 times (from 5.5 thousand tons to 1.0 thousand tons); roaches – 6 times (from 8-9 thousand tons to 1.49 thousand tons); pike perch – 4 times (2-3 thousand tons to 0.53 thousand tons). Since 2003, there has been a decrease in the catch of the bream *Abramis brama* (Linnaeus, 1758) to 7-10 thousand tons [24].

These facts call for continuous ichthyological monitoring of fluvial anadromous and river fish resources.

The Southern Scientific Center of the Russian Academy of Sciences contributes a fair share to the solution of this problem. In 2008-2016 ichthyological researches were made in fish-processing plants and at fish receiving points of the Kaspryba Astrakhan Association of fishing and fish processing enterprises, as well as from catches with research tools.

In accordance with the current "Regulations of Fishing...", fishing for fluvial anadromous and river fish on the lower Volga is allowed from March 25 to May 25 and from September 25 until ice formation.

At the fish receiving points of the Kaspryba fish for research was taken from catches of secrets (trap nets of a special design) and less often from gill nets. Information about the species composition of catches was obtained by studying registers and receipts at fish acceptance points and enterprises. In March – the first half of April fishing is carried out by secrets. With the beginning of the spawning run of the roach, and then the bream, the fishery moves to the river fishing grounds, where tight (cast) seines are used. Accordingly, the most diverse species composition is observed in the first case, and on river fishing, the main part of the catch is roach or bream. The timing of transition from one fishing method to another varies somewhat from year to year and falls usually on the 2nd decade of April [25].

The species composition of the secret catches is quite diverse (Fig. 3).

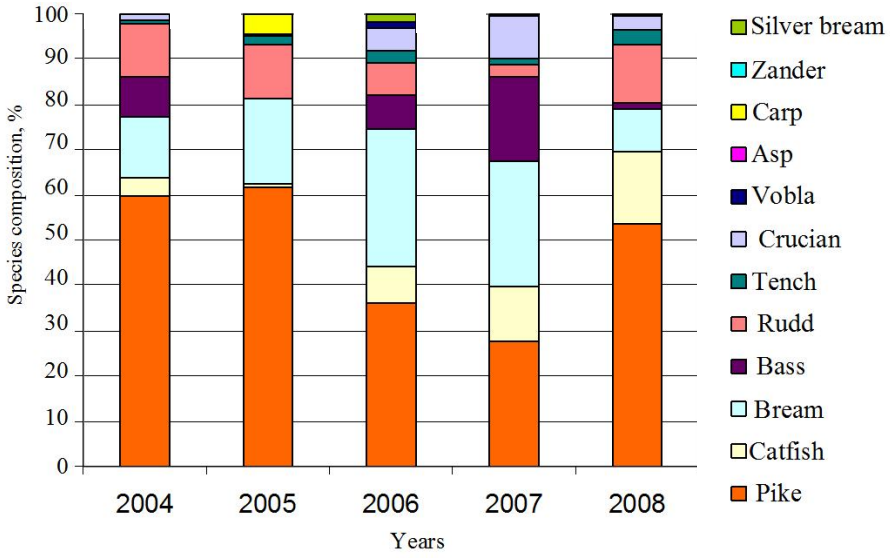


Fig. 3. Species composition of catches by secrets in spring [25]

The most abundant is pike *Esox lucius* (Linnaeus, 1758), which is of considerable interest to fish processing enterprises, because its roe is in high demand. The proportion of bream remains quite stable and high (10%). Other species do not play a significant role, and their share varies significantly from year to year. For example, perch *Perca fluviatilis* (Linnaeus, 1758) accounted for 0 to 21% of catches (see Fig. 3). In addition to those species indicated in Fig. 3, carp and asp *Aspius aspius* (Linnaeus, 1758) are also caught in small numbers. The fishery reports do not indicate the species of crucian, however, judging by the literature source [26] and our own observations, this is the crucian carp *Carassius auratus gibelio* (Bloch, 1782).

The composition of the catches on the river fishing grounds is more uniform (Fig. 4) – either roach or bream dominate in them.

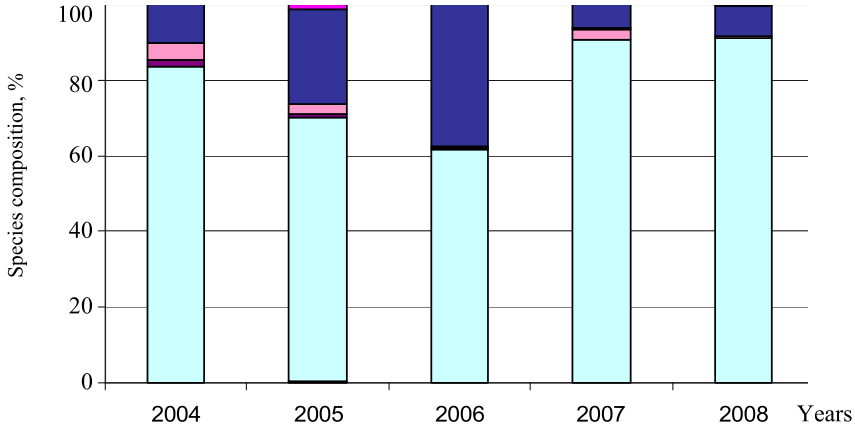
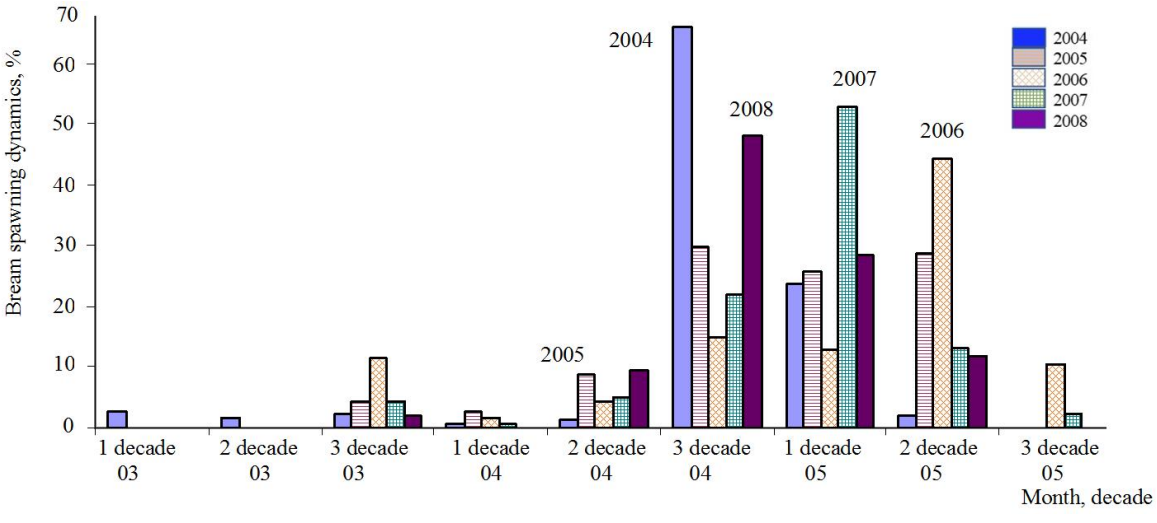


Fig. 4. Species composition of the catch on river fishing grounds in spring [25] (see designations in Fig. 3)

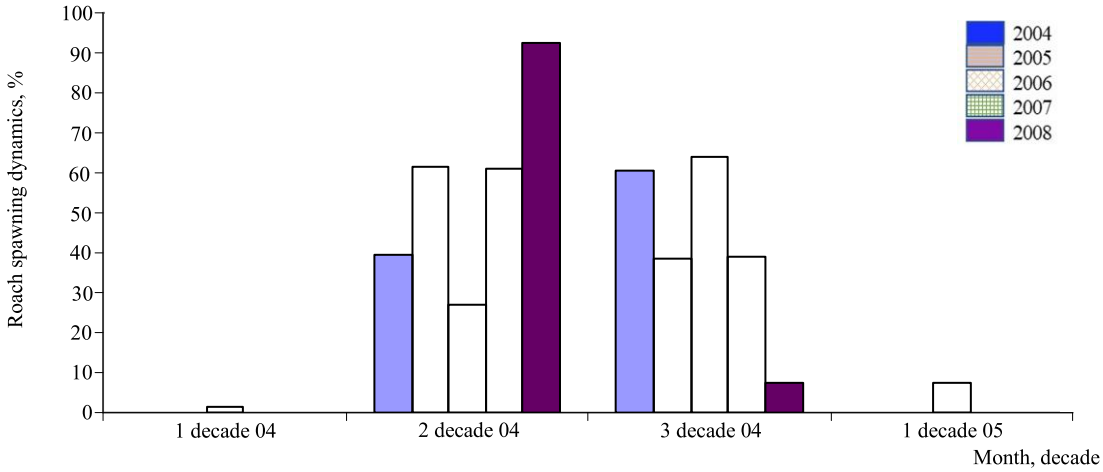
Commercial roach fishing is a highly selective type of fishing, its main fishing gear is shore small-mesh river seines. All fishing grounds are located on the central tributaries of the Volga delta [27]. Their ratio in catches is apparently related to the state of stocks and, accordingly, the duration of the spawning run. By-catch of other fish usually does not exceed 10%, and sometimes only a fraction of a percent. Usually these are perch, crucian carp, rudd *Scardinius erythrophthalmus* (Linnaeus, 1758) and silver bream *Blicca bjoerkna* (Linnaeus, 1758). Certainly, other species were also present in the catches (for example, asp), but due to the small number they were not included in the fishing reports.

Using the information from the registers of fish acceptance, we traced the dynamics of the bream and roach spawning runs (Fig. 5).



a

Fig. 5. Dynamics of receiving: *a* – bream



b

Fig. 5 (ending). Dynamics of receiving: *b* – roach [25]

The approaches of brim last from the beginning of March to the end of May. The largest amount of bream comes to fish processing enterprises in the period from the third decade of April to the second decade of May (less often – to the third decade of May) (Fig. 5), when 81-92% of the total volume is taken. The course of roach is relatively fleeting and usually comes into the second and third decades of April.

The present composition of commercial catches can be found in the reporting data on the fishery posted on the official website of the Federal Agency for Fishery (Form P-1 "Fish") and updated quarterly. If we compare the information on the size of the catch for the year and in the first half of the year within 2017-2021, it can be inferred that currently 42-56% of annual production is withdrawn in the Astrakhan region during the spring fishing season. 10 species indicated in Fig. 6 make about 99.5% of the spring catch volume.

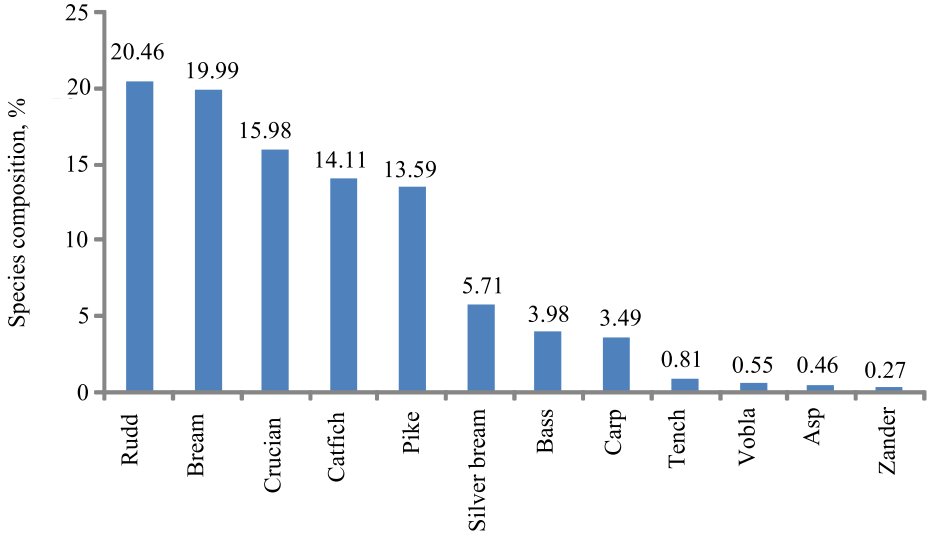


Fig. 6. Species composition of catches in the 1st half of the year within 2017-2021

The most abundant species in terms the total catch in tons was rudd, the second was bream, and the third was crucian carp. The proportion of two more fish, catfish *Silurus glanis* (Linnaeus, 1758) and pike, exceeds 10% (Fig. 6). Together, these species account for more than 84% of the total catch. All the rest (including roach) can be considered secondary objects. Consequently, the ban for fishing roach will not significantly reduce production during the spring fishing season in the Volga-Caspian subarea, especially since, as shown above, it is enough to prohibit fishing with caster seines in the 2nd and 3rd decades of April (see Fig. 5).

Conclusion

Given that the Caspian basin includes the southern regions of our country, its transport and recreational

opportunities and currently a small contribution to the Russian fisheries, there can be assumed a further reduction in fisheries, including the Astrakhan region. Fishing industry in the region should be ready for that. We should expect the development of such industries as transport infrastructure, cultivation of delicacy fish (sturgeon, trout, salmon) and shellfish (oysters, mussels), shrimp, and development of the tourist and recreational sector.

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Information about the authors / Информация об авторах

Elena N. Ponomareva – Doctor of Biology, Professor; Head of the Department of Aquatic Biological Resources of South Sea Basins; Federal Research Centre the Southern Scientific Centre of the Russian Academy of Sciences; Professor of the Department of Aquaculture and Fisheries Astrakhan State Technical University; kafavb@mail.ru

Елена Николаевна Пономарева – доктор биологических наук, профессор; заведующий отделом водных биологических ресурсов бассейнов южных морей; Федеральный исследовательский центр Южный научный центр Российской академии наук; профессор кафедры аквакультуры и рыболовства; Астраханский государственный технический университет; kafavb@mail.ru

Pavel A. Balykin – Doctor of Biology; Chief Researcher of the Department of Aquatic Biological Resources of South Sea Basins; Federal Research Centre the Southern Scientific Centre of the Russian Academy of Sciences; Balykin.pa@rambler.ru

Павел Александрович Балыкин – доктор биологических наук; главный научный сотрудник отдела водных биоресурсов бассейнов южных морей; Федеральный исследовательский центр Южный научный центр Российской академии наук; Balykin.pa@rambler.ru

Alexander V. Startsev – Candidate of Biology; Leading Researcher of the Department of Aquatic Biological Resources of South Sea Basins; Federal Research Centre the Southern Scientific Centre of the Russian Academy of Sciences; Star847@mail.ru

Александр Вениаминович Старцев – кандидат биологических наук; ведущий научный сотрудник отдела водных биологических ресурсов бассейнов южных морей; Федеральный исследовательский центр Южный научный центр Российской академии наук; Star847@mail.ru

Alexander A. Korchunov – Candidate of Biology; Senior Researcher of the Aquatic Biological Resources of the South Seas Basins; Federal Research Centre the Southern Scientific Center of the Russian Academy of Science; korchunov84@yandex.ru

Александр Александрович Корчунов – кандидат биологических наук; старший научный сотрудник отдела водных биологических ресурсов бассейнов южных морей; Федеральный исследовательский центр Южный научный центр Российской академии наук; korchunov84@yandex.ru

Svetlana S. Savitskaya – Junior Researcher of the Department of Aquatic Biological Resources of South Sea Basins; Federal Research Centre the Southern Scientific Centre of the Russian Academy of Sciences; svetlana_sav17@mail.ru

Светлана Сергеевна Савицкая – младший научный сотрудник отдела водных биологических ресурсов бассейнов южных морей; Федеральный исследовательский центр Южный научный центр Российской академии наук; svetlana_sav17@mail.ru