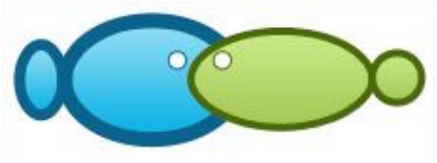

The recreational fishing in Kazakhstan: modern level of knowledge

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Abstract. The materials of the state of knowledge about the development and impact of recreational fishing on fish communities and ecosystems of water bodies in Kazakhstan are presented. The level of attendance of important fishery watershed by anglers is estimated. Their popularity depends on the density of the population, promotion of these water systems between anglers and the traditions of the people, who live near them. Estimates of the catch by anglers are quite variable depending on the approaches to their assessment. In general, according to the authors' estimates, in some water bodies, recreational fishing can be from 40 to 67% of the annual allocated total catching quota.
Key Words: anglers fishing, catching, ecosystem, fish's fauna, recreation.

Introduction. Recreational fishing is a fairly unique phenomenon within human society with its own unwritten rules and traditions. The activity of fishermen is directed not so much to obtain a food product, but for satisfying aesthetic needs (Post et al 2002; Gentner & Sutton 2008; Policansky 2008; Hickley 2009; Arlinghaus et al 2016; Barrella et al 2016; Carr-Harris & Steinback 2020). Although, consumer interest is certainly present.

Although, in general, Kazakhstan is in a water-deficient zone (Water resources 2004), the state has several significant fishery watersheds (Mitrofanov et al 1986; Petr & Mitrofanov 1998; Graham et al 2017).

The Yli-Balkhash watershed is located in the southeastern part of Kazakhstan and includes the transboundary Yli River with the large Kapchagay Reservoir, the Balkhash, Alakol, Sasykkol, and Koshkarkol lakes.

In the south is the Aral-Syr Darya watershed. The Aral Sea crisis is widely known in the World. It continues to this day. But, the northern part at the confluence of the Syr Darya is cut off from the former sea. In this water body, called the "Small Aral", a multi-species stock of fish sufficient for use has already been formed. However, the main recreational fishing goes not in the Small Aral, but along the Syr Darya and on the Chardara and Koksarai reservoirs.

Eastern Kazakhstan is occupied by the Irtysh watershed, which includes the Irtysh River, Lake Zaisan, the Bukhtarma, Shulba, and Ust-Kamenogorsk reservoirs. In the same system is located the pearl of the Altai Mountains - Lake Markakol, which is currently under the strong state's protection.

Another large watershed of Kazakhstan - the Ural-Caspian includes the Caspian Sea and the Ural River, the Kigach River in the Volga Delta, as well as the Emba and Uyl rivers that no longer reach the sea.

In addition to these large and significant watersheds, in the north of Kazakhstan, there are several more – the Ishim, the Tobol, belonging to the Ob-Irtysh system, and

many drainless ones, among which the largest are the Nura and the Turgay. To the south of them, there are also drainless water systems close to the Aral basin – the Sarysu, the Chu, and the Talas.

The fish resources of Kazakhstan are quite attractive for sport fishing due to the high diversity of fishing objects (Mitrofanov et al 1986, 1992; Dukravetz et al 2016) from typically northern forms, such as whitefish (Coregonidae), to heat-loving species, such as grass carp *Ctenopharyngodon idella*, catfish *Silurus glanis* and snakehead *Channa argus*. Also, some species of the Mountainous Asian ichthyofauna (marinkas *Schizothorax* and osmans *Dyptichus*) live here, which are a certain "exotic" for Northern Eurasia. At the same time, recreational fishing develops mainly in natural reservoirs. Special fish farms for anglers are poorly developed.

The basic principle of fishing in Kazakhstan is its scientific validity. Catch quotas are calculated by scientific organizations and approved by the Government. Fishery waters are divided into several categories, among which there are specialized water bodies for sports and recreational fishing. However such fishing can also be carried out on water bodies from some other categories. Accordingly, based on the tasks of the fishery, the catch quota is either partially or completely distributed for recreational fishing. The right to fish catching in such water bodies is given by the purchased license. On water bodies that are not assigned to fish users (lessee), according to the current legislation, any fisherman can catch up to 5 kg free of charge. The fish catches above this amount must be paid to the state budget at sufficiently low rates.

According to estimates (Arlinghaus et al 2015, 2016), about 11% or more of the world's people population is involved in some form of non-commercial fishing. By the beginning of the 21st century, amateur catches of fish were estimated from 2 million tons per year (Coates 1995; Cowx 2002) to 10.6 million tons (Cooke & Cowx 2004). In addition to the direct benefit to human society from fish products, this type of activity has many spillover effects on the economy and society (Cowx 2002; Cooke & Cowx 2006; Arlinghaus & Cowx 2008; Lewin et al 2008; Nepomnyastchikh & Makeyeva 2020; Rusyaev 2021). So far, no attempts have been made within Kazakhstan to understand and evaluate the impact of recreational fishing on fish populations and their habitat.

Recreational fishing should also be considered in several anthropogenic factors that lead to changes, more often negative ones, in ecosystems, ichthyocenoses and populations (McPhee et al 2002; Welcomme et al 2010; Barabanov et al 2016; Cahill et al 2018; Boznak et al 2019).

This article is the first attempt to assess the currently available dates on the intensity of recreational fishing and the volume of fish withdrawal by anglers, which is part of the assessment of the recreational load on the water bodies of Kazakhstan.

Material and Method. The collection of research data was carried out in various water bodies of Kazakhstan using various approaches in the 2021 year. Initially, information was requested on the reports of fish users. These reports indicate the number of fish caught, both by commercial fishing methods and by anglers with valid licenses.

Almost all rivers, except the Ural River in the Atyrau region, where there is commercial fishing, are intended exclusively for recreational fishing. Most of these waters are not assigned to nature users and not all areas on other large water bodies are also leased.

Under these conditions, accounting of fishers and their catches will either not be possible or not complete. Usually, in this case, a multistage algorithm is used, including the determination of stations suitable for recreational fishing, the intensity of fishing, and, finally, a load of recreational fishing on the ichthyofauna. This technique has been thoroughly discussed in more papers (Kostyurin et al 2014; Barabanov et al 2016, 2017).

The first stage of research determines the degree of suitability of the water body for recreational fishing, which was calculated by the formula:

$$U = d \div / L \times U == U = \infty = \sim \times \emptyset \equiv \div \cup$$

$$U = \frac{d}{L} \times 100\% \quad (1)$$

where: U is the coefficient of the suitability of the water body for recreational fishing, expressed as a percentage, d is the length (area) of coastline sections suitable for recreational fishing in km, and L is the total length of the coastline of the water body.

The study of the length of sections of water bodies suitable for recreational fishing was carried out on route detours of a water body using the Garmin Eho150 satellite navigator and the GoogleEarthPro online service.

The number of recreational anglers in the sites was determined by direct counting, in the sites visited by anglers at least 3 times a month on different days of the week, including weekends during periods of permitted fishing in the 2021 year. The intensity of visiting fishing places was analyzed by questioning the fishermen (Figure 1).

Figure 1. Survey of anglers on Lake Balkhash.

The calculation of the total catch of fish by anglers in the water bodies was carried out according to simple proportions according to the formula:

$$C = d \times N \times q \times p \quad (2)$$

where: C is the total catch of fish by the angler for the any time on the water bodies; d is the length (area) of coastline sections suitable for recreational fishing in km; N is the density of anglers per 1 km; q - frequency of trips per 1 angler per anytime; p - average catch per 1 angler.

The obtained data were compared with the official data of the state agency.

Results. An assessment of the suitability of water bodies for recreational fishing showed that the Chardara Reservoir is the most suitable for this type of activity (Table 1). The Syr Darya and the Kigach River, as well as Lake Balkhash, have a high proportion of suitable places for fishing - more than 50% of the coastline. The smallest share of areas suitable for fishing is determined for the Shulba Reservoir, created on the Irtysh River for hydropower purposes, which has a poorly suitable topography and a long exclusion zone.

The angler density indicator (Table 2) depends on three aspects: 1) water bodies' location near densely populated areas, 2) the popularity of the reservoir among anglers, and 3) the fishing traditions of the region.

Thus, the southern reservoirs - the Chardara Reservoir and the Syr Darya are located on the territory of the Turkestan and Kyzyl-Orda regions, near them is the city of Shymkent. The total population of these administrative-territorial units is more than 4 million people or 21% of the population of Kazakhstan. The average density of anglers here ranges from 5.6 to 11 people per 1 km coastline.

Table 1

Indicators of sites suitable for recreational fishing in the studied waters

Water	*Total length, km L*	*Incl.: suitable plots for recreational fishing, km, d*	*Suitable plots for recreation, % U*
The Syr Darya	1326	739	55.7
The Chardara Reservoir	105.8	93	87.9
The Alakol & Sasykkol lakes	138.9	48	43.9
The Kapchagay Reservoir	114.1	35	33.0
Lake Balkhash	225	121	53.7
The Yli Delta	62	27	43.5
The Ural River, incl.:	1337	475	35.5
Atyrau province	576	175	30.4
West Kazakhstan province	761	300	39.4
The Kigach River	312	160	51.2
Lake Zaisan	375	125	30.7
The Bukhtarma Reservoir	252	80	31.7
The Shulba Reservoir	441	75	17.0
The Karatomar Reservoir	105.2	34.4	32.7

Table 2

Attendance of water bodies for the purpose of recreational fishing and catches

Waters	*Estimated indicators of recreational fishing*				*According to the fisheries authorities*	
	Anglers density per 1 km	*Frequency of trip per 1 angler*	*Average catch per angler, kg*	*Estimated catch volume, kg*	*Number of licenses sold*	*Total catch, kg*
The Syr Darya	5.6	5.5	1.0	22761	1713	8565
The Chardara Reservoir	11.0	6.0	2.8	17176	8349	45460
The Alakol & Sasykkol lakes	5.0	5.8	3.1	4315	693	3221
The Kapchagay Reservoir	4.2	5.7	0.9	754	146	617
Lake Balkhash	3.0	4.7	5.1	8701	272	1399
The Yli Delta	5,5	6.8	10.0	22066	774	2645
The Ural River, Atyrau province	0.76	4.3	2.5	1430	10320	25846
The Ural River, West Kazakhstan province	9.0	4.0	0.9	9720	2727	19089
The Kigach River	0.53	6.4	1.3	706	6587	8695
Lake Zaisan	2.9	5.6	3.8	7714	1220	814
The Bukhtarma Reservoir	2.8	5.0	4.8	5376	3242	877
The Shulba Reservoir	2.5	4.0	4.2	3150	94	723
The Karatomar Reservoir	4.3	1.2	1.56	277	1820	2838

The Yli Delta is a very popular place for fishing and recreation, although it is located at a distance from large centers in a desert area. But, the appearance of the primordial tugai (floodplain forest), almost untouched by man, the abundance of fish, and high biodiversity in general, attract many tourists here, most of whom are amateur fishermen. There is also a high concentration of anglers here.

The Ural River flows through the territory of two regions - Atyrau province and West Kazakhstan province. If in the first, preference is given to commercial fishing, where a sufficiently large number of people are employed, then in the West Kazakhstan

province, with the complete absence of fishing on the river, recreational fishing dominates. In the Western Kazakhstan region, consumption and demand for fish products are higher than in other regions of Kazakhstan. In this case, the traditions of fish consumption primarily affect.

It is also necessary to indicate that, both in the West of Kazakhstan and in the South of Kazakhstan, there is a shortage of water bodies suitable for recreational fishing.

For the waters of the North and East of Kazakhstan, there is a rather low density of fishermen. But, this is due to the absence of a shortage of such water bodies. Often, amateurs prefer small-area large water bodies. Diffuse distribution of anglers is formed along the water area of the complex of inland water bodies of the region.

The average catches for the studied water bodies mainly range from 0.9 to 5.1 kg with one exception (the Yli Delta) - 10 kg. It depends to a sufficient extent on the productivity of fish communities, their species composition, and fishing traditions in the use of fishing gear and lures. But, it can also depend on purely psychological factors. This assessment, based on a survey of anglers, may be critical in assessing the impact of recreational fishing on commercial populations. However, in general, the observed fluctuations in the range from 1 to 5 kg will correspond to reality.

As a result of the calculations, the volumes of potential fish catch by anglers in the studied water bodies were obtained. It is especially interesting and revealing to compare them with official data on fishing by anglers, based on reports from nature users.

For a small part of water bodies, these data coincide in the first approximation (the Alakol and Sasykkol lakes, the Kapchagay Reservoir). In most cases, the calculated data show a picture of large catches compared to the official ones. In the waters of Western Kazakhstan, as well as in the Karatomar Reservoir (the North) and the Chardara Reservoir (the South), they are smaller (the Ural and Kigach rivers).

For the Yli Delta it is probably necessary to focus on the figures obtained by calculation. This water, as noted above, is popular and frequently visited. In this connection, amateur catches of 27 tons do not seem unrealistic. The same estimated 8.7 tons for Lake Balkhash are more realistic than statistics. In the Kapchagay Reservoir, both calculations and statistics show extremely low catch volumes. Average catch volumes are typical for the Alakol and Sasykkol lakes. In general, for the studied water bodies of the Yli-Balkhash watershed, in our opinion, the calculated data are more realistic.

The same can be said about the Irtysh watershed. Low statistics do not logically correlate with a large population and quite abundant fish resources, so we consider the calculated data to be more realistic.

The calculated data for the Aral-Syr Darya basin is more realistic, even though for the Chardara Reservoir the statistical indicators are more than 2.5 times higher than the calculated ones.

An uncertain picture is noted for the Karatomar Reservoir. Here, due to the insignificant catches for both methods, it is difficult to assess the relevance of the approaches.

Regarding the data obtained for the Ural-Caspian basin, it is worth pointing out the probably greater reliability of the statistical reports. In this case, the notorious psychological factor had an impact. The region is known for both its fishing and poaching traditions. In this light, likely, one-time catches in the questionnaires were greatly underestimated.

Discussion. Recreational fishing has received the greatest development in the last 10-15 years. This is due to the adoption of Article 26, paragraph 2 of the Law of the Republic of Kazakhstan “On the Protection, Reproduction and Use of Wildlife”, which allows recreational fishing in the reserve fund of fishery water bodies with the withdrawal of up to 5 kg per angler per trip, without any license.

This was largely facilitated by the fact that most anglers have good equipment, and experience and are often focused on the maximum withdrawal of fish resources, which is not always associated with vital needs. Based on this, the volumes of fish caught

by this type of fishing have a fairly significant impact on the state of fish communities in water bodies.

It is important to note that recreational fishing is largely spontaneous and practically unregulated. This is especially true for fishing in the reserve fund (not assigned to lessees) of reservoirs. The catch volumes of recreational anglers are not covered by fishing statistics, which is a problem for state regulatory organizations in the field of making managerial decisions on biodiversity conservation and sustainable use of bioresources.

As can be seen from the above research results, the grounds for assessing the existing impact of recreational fishing on commercial fish populations are quite empirical, fluctuating in the range of “more - less” categories.

Statistical reporting by fish users is quite arbitrary and is based on the number of licenses sold and the need to "write off" some amount of the allocated quota, so these data are not entirely accurate. The calculation of the catch by anglers in the watersheds is also complicated by the joint existence of fixed and non-fixed water bodies (or their sites). It also makes it difficult to analyze any type of calculation concerning the allocated total catch quota.

In cases where a comparison of anglers’ catches and the total quota is possible, the share of recreational fishing is, according to statistics, from 0.002 to 2.12%, according to calculated data, from 0.01 to 19.98% (Table 3).

Table 3

The share of recreational fishing in the total quota of fish catch

Waters	*Fishing catching quota, tons*	*Share of recreational fishing from the total quota, %*	
		According to calculated data	*According to statistics*
The Chardara Reservoir	2148.9	0.80	2.12
Lake Balkhash	81851	0.01	0.002
The Yli Delta	138.04	19.98	1.92
Lake Zaisan	7028.1	0.11	0.01
The Bukhtarma Reservoir	2584.35	0.21	0.03
The Shulba Reservoir	611.1	0.52	0.12

In our opinion, the estimated catches are between half and one-third of the total annual catch. Here, firstly, it must be taken into account that in the spring months, fishing in all reservoirs of Kazakhstan is severely limited or prohibited. Accordingly, the period from March or April to May, and in some places even to June, can be excluded from the analysis. Winter amateur fishing is no less developed than summer fishing. This period is longer. However, here it is necessary to take into account the fact that the activity of fish during this period is lower.

Thus, the maximum anglers’ catch according to this estimate can be about 40-67% of the total scientifically substantiated fish catch, although it is much lower for the bulk of water bodies.

It is obvious that it is necessary to improve the collection and analysis of dates for the statistics of fish catch by anglers. It should be taken into account that the lack of reliable data on the catches of recreational fishermen in many water bodies undermines the foundations of fish stock management, leads to a decrease in their numbers, and poses a threat to the conservation of the biological diversity of water bodies in Kazakhstan.

With the existing system of management and control of biological resources in Kazakhstan, it is possible to introduce scheduled reporting using methods similar to those used by us in this work. The collection of information, in this case, will be the responsibility of state regulatory bodies, and its analysis will be the responsibility of scientific organizations.

Conclusions. At the present stage, the level of our understanding of the role of recreational fishing in Kazakhstan is at the initial level. In fact, this work is the first. In this regard, the results obtained in the future are subject to adjustment and addition.

Most of the studied waters have a high degree of adaptability for recreational fishing. The density of their attendance by anglers depends mainly on three factors: population density, promotion of water bodies among amateurs, and fishing traditions of the territories, coming from the depths of centuries.

Within the main fishery watersheds, there is a significant difference in the statistical data and our calculations, associated with the imperfection of the accounting system for recreational fishing.

The maximum estimated share of fish caught by anglers in the total quota can be from 40 to 67%.

In general, these studies should be carried out in the future, including with the use of administrative resources.

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References

Arlinghaus R., Cowx I. G., 2008 Meaning and relevance of the ecosystem approach to recreational fisheries management: emphasis on the importance of the human dimension. In: Global challenges in recreational fisheries. Ass O. (ed), Blackwell Publ., Oxford, pp. 56-74.

Arlinghaus R., Tillner R., Bork M., 2015 Explaining participation rates in recreational fishing across industrialized countries. Fisheries Management and Ecology 22:45-55.

Arlinghaus R., Cooke S. J., Sutton S. G., Danylchuk A. J., Potts W., de M. F. Freire K., Alós J., da Silva E. T., Cowx I. G., van Anrooy R., 2016 Recommendations for the future of recreational fisheries to prepare the social-ecological system to cope with change. Fisheries Management and Ecology 23(3-4):177-186.

Barabanov V. V., Tkach V. N., Prosvirin D. N., 2016 [Comparative evaluation of dimensional structure of fish of sport and commercial fishery catches in the Astrakhan region]. [Bulletin of Astrakhan State Technical University, Part: Fisheries] 2:34-42. [in Russian]

Barabanov V. V., Shipulin S. V., Kanatiyev S. V., Tkach V. N., 2017 [The results of scientific researches works on recreational fishery study area in Volga-Caspy system (Astrakhan oblast)]. Fisheries (Russia) 2:70-74. [in Russian]

Barrella W., Ramires M., Rotundo M. M., Petrere Jr. M., Clauzet M., Giorando F., 2016 Biological and socio-economic aspects of recreational fisheries and their implications for the management of coastal urban areas of south-eastern Brazil. Fisheries Management and Ecology 23(3-4):303-314.

Boznak E. I., Zakharov A. B., Tereshchenko V. G., 2019 Effect of the increasing intensity of recreational fishing on the fish assemblage of a watercourse in an economic development zone. Inland Water Biology 12:88-95.

Cahill C. L., Mogensen S., Wilson K. L., Cantin A., Nilo Sinnatamby R., Paul A. J., Christensen P., Reilly J. R., Winkel L., Farineau A., Post J. R., 2018 Multiple challenges confront a high-effort inland recreational fishery in decline. Canadian Journal of Fisheries and Aquatic Sciences 75(2):1357-1368.

Carr-Harris A., Steinback S., 2020 Expected economic and biological impacts of recreational Atlantic striped bass fishing policy. Frontier in Marine Science 6:814.

Coates D., 1995 Inland capture fisheries and enhancement: status, constraints and prospects for food security. International Conference of Sustainable Contribution of Fisheries to Food Security, Kyoto, Japan KC/FI/95/TECH/3, FAO, Rome, pp. 82.
Cooke S. J., Cowx I. G., 2004 The role of recreational fishing in global fish crises. BioScience 54(9):857-859.
Cooke S. J., Cowx I. G., 2006 Contrasting recreational and commercial fishing: searching for common issues to promote unified conservation of fisheries resources and aquatic environments. Biological Conservation 128(1):93-108.
Cowx I. G., 2002 Recreational fishing. In: Handbook of fish biology and fisheries. Bart P. J. B., Reynolds J. D. (eds), volume 2, pp. 367-390.
Dukravetz G. M., Mamilov N. S., Mitrofanov I. V., 2016 [The fishes of Kazakhstan: annotated list, corrected and expanded]. Selevinia 24:47-71. [in Russian]
Gentner B., Sutton S., 2008 Substitution in recreational fishing. In: Global challenges in recreational fisheries. Aas O. (ed), Blackwell Publ., Oxford, pp. 150-169.
Graham N. A., Pueppke S. G., Uderbayev T., 2017 The current status and future of Central Asia's fish and fisheries: confronting a wicked problem. Water 9(9):701.
Hickley P., 2009 Recreational fisheries - social, economic and management aspects. In: Fisheries, sustainability and development. Royal Swedish Academy of Agriculture and Forestry. Hickley P., Tompkins H. (eds), Wiley-Blackwell, pp. 169-189.
Kostyurin N. N., Barabanov V. V., Prosvirin D. N., Aseynov D. D., 2014 [Methodological solutions for assessing the total number of recreational fishermen, their catches in the Volga-Caspian fishery sub-area (Astrakhan region). Fishery reservoirs of Russia]. Fundamental and applied research: International scientific conference dedicated to the 100th anniversary of GosNIORKh. Sanct Peterburg, pp. 435-445. [in Russian]
Lewin W. C., McPhee D. P., Arlinghaus R., 2008 Biological impacts of recreational fishing resulting from exploitation, stocking and introduction. In: Global challenges in recreational fisheries. Ass O. (ed), Blackwell Publ., Oxford, pp. 75-92.
McPhee D. P., Leadbitter D., Skilleter G. A., 2002 Swallowing the bait: is recreational fishing in Australia ecologically sustainable? Pacific Conservation Biology 8(1):40-51.
Mitrofanov V. P., Dukravetz G. M., Peseridi N. E. et al, 1986 [The fishes of Kazakhstan]. Alma-Ata, Nauka, 272 pp. [in Russian]
Mitrofanov V. P., Dukravetz G. M., Sidorova A. F. et al, 1992 [The fishes of Kazakhstan]. Almaty, Ghylym, 464 pp. [in Russian]
Nepomnyaschii V. V., Makeyeva Y. G., 2020 [Features of recreational impacts on aquatic complexes: methodological aspects]. [Bulletin of Altai Branch of Russian Geographical Society] 4(59):5-12. [in Russian]
Petr T., Mitrofanov V. P., 1998 The impact of fish stocks of river regulation in Central Asia and Kazakhstan. Lakes and reservoirs: Research and Management 3:143-164.
Policansky D., 2008 Trends and development in catch and release. In: Global challenges in recreational fisheries. Ass O. (ed), Blackwell Publ., Oxford, pp. 202-236.
Post J. R., Sullivan M., Cox S., Lester N. P., Walters C. J., Parkinson E. A., Paul A. J., Jackson L., Shuter B. J., 2002 Canada's recreational fisheries: the invisible collapse? Fisheries 27(1):6-17.
Rusyaev S. M., 2021 [On the use of indicators of retail trade in recreational fishing products to assess its development (on the example of the Central Federal District)]. [Transactions of VNIRO] 183b:140-148. [in Russian]
Water resources of Kazakhstan in the new millennium, 2004 A series of UNDP publication in Kazakhstan, # UNDPKAZ 07, Almaty. LEM Printhouse, 132 pp.
Welcomme R. L., Cowx I. G., Coates D., Bene C., Funge-Smith S., Halls A., Lorenzen K., 2010 Inland capture fisheries. Philosophical Transaction of the Royal Society B 365: 2881-2896.

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