Kazakhstan Aquaculture

The historical development, status and potential of aquaculture in Kazakhstan has been well documented. Aquaculture began before independence in the 1970s and by the early 1990's it was reported that there were 47 fish farms covering over 5,000 ha. First after independence there was a decline in aquaculture production, but from 2014 to 2022 aquaculture production grew at a rate of 46% per year. By 2023, the number of fish farms have been reported to double since 2021, reaching 502, with production increasing from 7,000 to 17,000 MT tons.

FAO Global Fishery and Aquaculture Production Statistics v2019.1.0, published through FishStatJ (March 2019; www.fao.org/fishery/statistics/software/fishstatj/en).

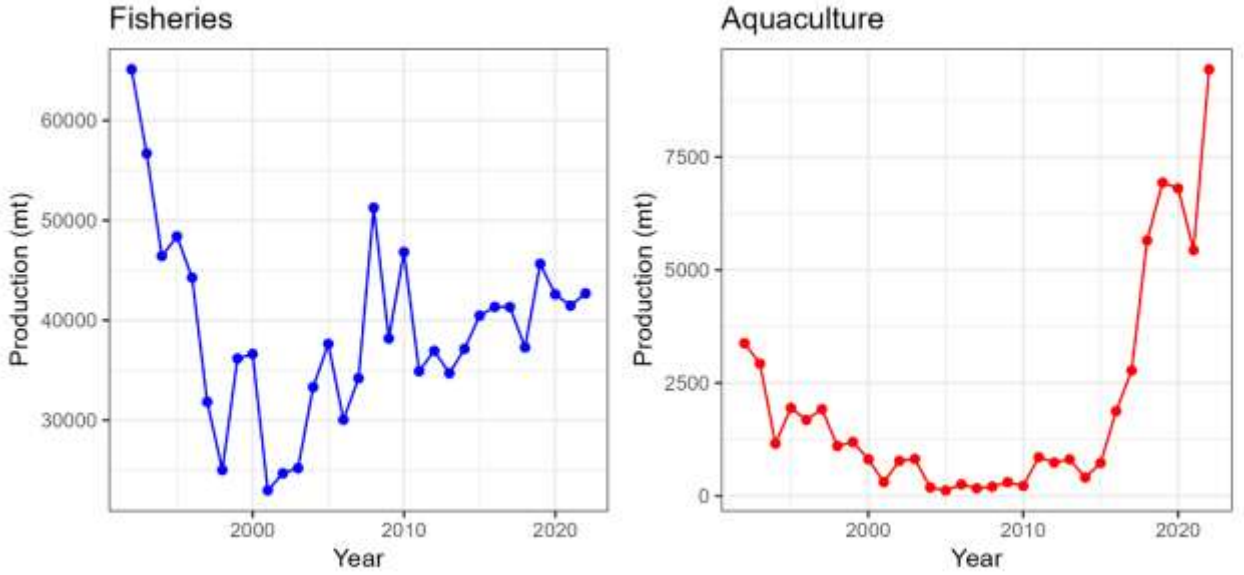

Figure 1. Fish production in Kazakhstan from capture fisheries and aquaculture. Source: FishStat.

Table 1. Aquaculture production in Kazakhstan in 2022. Source: FishStat.

Species	Production (MT)
Pike-perch	2078
Common carp	1910
Wels(=Som) catfish	1316
Whitefishes nei	1250
Peled	1212
Silver carp	69
Grass carp(=White amur)	440
Crucian carp	148
Sturgeons nei	143
European perch	92
Roach	72
Northern pike	39

Sterlet sturgeon	34
Beluga	13
Total	9438.32

Status – Aquaculture Species

There are four typologies of aquatic food systems - capture fisheries, capture based aquaculture, aquaculture enhanced fisheries, and full cycle aquaculture (Costa-Pierce et al., 2022). Kazakhstan has three of these – capture fisheries, aquaculture enhanced fisheries, and full cycle aquaculture.

Sturgeon (*Acipenser spp.*), carps (common carp (*Cyprinus carpio)*, crucian carp (*Carassius carassius*) and imported Chinese carp (grass carp (*Ctenopharyngodon idella*)) and trout (*Oncorhynchus mykiss)*, are the main species produced. A smaller volume of roach *(Rutilus rutilus) and* pike-perch (*Sander lucioperca*) are produced. Culture methods and systems for all these species are very well known.

Sturgeon aquaculture has potential but is capital and knowledge intensive, and water use is an issue. It requires much expertise in its farming processes for caviar and/or meat. Onofri et al. (2024) give a good case study analysis in Italy of the economic consideration of sturgeon farming. But there is good potential for building a circular economy due to the many products it can yield. A European Market Observatory for Fisheries and Aquaculture Products (EUMOFA) report, according to which, for 1 MT of caviar, on average, approximately 20 MT of sturgeon meat and other by-products and waste, such as tails, heads, and entrails, are produced (EUMOFA 2023). The most economically efficient strategy for producing more or less caviar and or meat are economically important plans. New genetic research for early sex-determination may allow farmers to slaughter males at a younger age than is currently possible changing current production strategies (Onofri et al. 2024).

Trout *(Oncorhynchus mykiss) are* farmed in the mountainous areas of the Turgen and Issyk Rivers (Mamilov et al. 2024). Trout introduced to water bodies in the Balkhash basin. A wild form from Kamchatka, Russia and a cultured form from European fish farms. Presently, only triploid rainbow trout from Denmark, Poland, and Turkey are cultivated in Kazakhstan. All of the studied populations of the rainbow trout in the Balkhash basin are reported to be under intensive recreational fishing. In addition, the population in Kolsay Lakes is under pressure caused by illegal fishing (Mamilov et al. 2024).

The indigenous Caspian kutum (or Caspian white fish, *Rutilus frisii*) appears to have good potential in Kazakhstan for aquaculture development. The fish is one of the most economically important cyprinids fish species of the southern Caspian Sea due to its reportedly excellent flesh and roe, which are highly prized. Wild populations of kutum in Caspian Sea have decreased dramatically due to water level changes, river flow reductions,

increased agricultural and industrial pollution, all leading to the degradation of its spawning areas, especially in Iranian waters. Artificial breeding and restocking programs have been successful. A substantial portion of Caspian kutum stocks in the southern basin of the Caspian Sea are reported to originate from artificial reproduction (Kashiri et al., 2018).

The indigenous salmonid species such as the Caspian Sea salmon and the Caspian trout both belong to the *Salmo* genus. It is unclear to what extent these are separate species, but there may be possibilities of growing them in cages using similar technology as employed for rainbow trout and Atlantic salmon. There is already interest in Kazakstan in the culture of this/those species, but this will require some preparation and research.

Projections of Growth

Overall, seafood production goals are to increase annual fish production to 270,000 MT by 2030 (https://primeminister.kz/en/news/reviews/fish-population-to-grow-by-7-by-2030-yerlan-nysanbayev-26255?utm_source=chatgpt.com). The government aims to raise domestic fish consumption to 134,000 MT/year by 2030, promoting fish as a nutritious dietary component. (https://timesca.com/kazakhstan-takes-bold-steps-to-revive-caspian-sea-fishing-industry/?utm_source=chatgpt.com)

Per capita total protein intake in Kazakhstan is high and has increased from 91.1 g/day to 113 g/day, with the share of animal protein to total dietary protein having increased from 43.6% to 59.2%. Per capita annual fish consumption has increased from 3.7 kg in 1993 to 4.78 kg in 2013; however, the share of fish in the diet is very low (increased from 1.3% to 1.6%). The average fish consumption (in 2022) is 3.6 kg/capita/dat according to FAO. Sources from Kazakhstan indicate that this may be higher or A study of university students revealed that approximately 9% of participants never consumed fish, and 77% eat fish and seafood less than once per month. Only 8.6% reported consuming fish 2-3 times per week, aligning with dietary recommendations. However, there are traditional fish dishes that are enjoyed widely in the country such as “koktal” (“willow” in English) where carp, is smoked over willow branches, imparting a unique flavor.

Total fish consumption declined from 59,628 MT (1993) to 22,943 MT (1998) but recovered to 81,406 MT (2013) due to an increase in imports: 81,406 MT (total), 35,503 MT (domestic sources), 45,903 MT (imports). The current domestic supply of fish in Kazakhstan (production+imports-export Is75,000 MT.

Seafood as a share of food balance in 2022. Source FAOstat.

Item	Quantity	
Production quantity	52580	MT
Import quantity	64180	MT
Export quantity	41750	MT
Domestic supply quantity	75000	MT

Average fish consumption	3.6	kg/capita/yr
Daily calories from fish	8	kcal/capita/day
Daily protein supply from fish	1.1	g/capita/day
Daily energey consumption	3440	kcal/capita/day
Daily protein consumption	112.76	g/capita/day
Daily energy from animal products	994	kcal/capita/day
Daily protein from animal products	63.64	g/capita/day

The World Bank and FAO have projected the needs for seafood growth and aquaculture growth to 2030 from a 4.78 kg/capita baseline of seafood consumption and population growth. Overall, it is projected that a total seafood production of 98,696 MT will be needed to satisfy the demand of Kazakhstan's 20.6 million people by 2030, which is 12,237 MT higher than the current 86,459 MT of seafood demand.

FAO and World Bank state that aquaculture production could reach approximately 4,408 MT by 2030 if current trends (5-year linear trend from 2012 [1,563 MT] to 2017 [4,408 MT]) continue. Kazakhstan's aquaculture production would need to grow 18%/year from 2017 to 2030 to generate enough fish supply to cover fish demand driven by population growth at the baseline of 4.78 kg/capita/year consumption. The additional 2,845 MT seafood supply generated by the trend aquaculture growth even if entirely directed to the domestic market, would be insufficient to cover the 12,237 MT of extra seafood demand driven by population growth; thus, a negative supply-demand gap of 9392 MT would exist. If Kazakhstan increased per capita seafood consumption in 2030 to10 kg (half of the world average, the shortage would be 117,087 MT. With this per capita goal, Kazakhstan's aquaculture production would need to grow 40%/year between 2017 and 2030 to generate enough seafood supply to cover seafood demand driven by population growth together with the increase in per capita fish consumption to 10 kg/capita/year.

Potentials of Aquaculture Development and Current Efforts

Kazakhstan has abundant inland water resources and reservoirs to expand aquaculture, especially in the Balkhash basin. Today, Kazakhstan fisheries are primarily located in the Ural-Caspian Basin, the Balkhash-Alakol Basin, and the Bukhtarma and Kapchagay Reservoirs.

The government has set ambitious targets to expand aquaculture. By 2027, plans to increase the number of fish farms to 700 and boost annual fish farm production to 50,000 MT and to 2030 to reach 270,000 MT/year through aquaculture expansion. To support these objectives, Kazakhstan's parliament approved an "On Aquaculture" bill, which aims to expand state support for fish farming. The legislation includes provisions for allocating reservoirs and

ponds to large investors and subsidizing water supply costs. Additionally, the government is providing subsidies for purchasing young fish, fodder, and medicines, as well as reimbursing 25% of investment costs for establishing fish farms and acquiring equipment.

The government has an ongoing Fisheries Development Programme for 2021–2030 that aims to increase aquaculture, domestic consumption of fish and fishery products, and exports. Kazakhstan is improving farmer access to high-quality, cost-effective feed and fingerlings, and support services (e.g. management and governance frameworks, fish health and veterinarian services etc.). In 2023, an FAO workshop as part of "Capacity Development for Sustainable Fisheries and Aquaculture Management in Central Asia, Azerbaijan, and Türkiye – FISHCap" (FAO-Türkiye Partnership Programme on Food and Agriculture [FTPP II]) was held in partnership with the Fisheries Committee of the Ministry of Ecology and Natural Resources and the fish breeding school "Balyq Mektep" LLP.
Details of aquaculture production systems for carp, sturgeon and trout, aquatic animal health management and freshwater fish diseases were presented and visits to fish farms done.

Challenges Identified

The 2030 production target has challenge: insufficient infrastructure, low per capita fish consumption, and administrative barriers deterring potential investors. Fisheries face environmental challenges. The Caspian Sea, a vital resource for Kazakhstan's fishing industry, has been experiencing a rapid decline in water levels, with a 2 m drop since 1995. This decline has been attributed to climate change and regulations on river flows; declines have affected sturgeon species, fishing, maritime transport, tourism, and oil and gas industries.

References

Costa-Pierce BA, Thorarensen HT and Strand Å. (2022) Editorial: Ocean/aquatic food systems: Interactions with ecosystems, fisheries, aquaculture, and people. *Front. Sustain. Food Syst.* 6:1021801. doi: 10.3389/fsufs.2022.1021801

EUMOFA. (2023) *Sturgeon Meat and Other By-Products of Caviar. Production, Trade and Consumption in and Outside the EU*; European Commission: Brussels, Belgium.

FAO (2004) FAO Fishery Country Profile – The Republic of Kazakhstan. FAO Rome. https://www.fao.org/fishery/docs/DOCUMENT/fcp/en/FI_CP_KZ.pdf

FAO (2018) Fishery and Aquaculture Country Profiles – Kazakhstan. https://www.fao.org/fishery/en/facp/kaz?utm_source=chatgpt.com

FAO (2020) Aquaculture growth potential in Kazakhstan. WAPI factsheet to facilitate evidence-based policy making and sector management in aquaculture. FAO, Rome.

FAO (2023) FISHCap workshop explores the sustainable development of fish farming in the Republic of Kazakhstan https://www.fao.org/in-action/fao-turkey-partnership/news/details/en/c/1634658/?utm_source=chatgpt.com

Karimov, B. (2011) An overview on desert aquaculture in Central Asia (Aral Sea Drainage Basin). In V. Crespi & A. Lovatelli, eds. Aquaculture in desert and arid lands: development constraints and opportunities. FAO Technical Workshop. 6–9 July 2010, Hermosillo, Mexico. *FAO Fisheries and Aquaculture Proceedings* No. 20. Rome, FAO. 2011. pp. 61–84.

Kashiri, H. et a. (2018) Microsatellite DNA Marker Analysis of Genetic Variation in Wild and Hatchery Populations of Caspian Kutum (Rutilus *kutum*). Turkish Journal of Fisheries and Aquatic Sciences 18: 1101-1111 (2018) DOI: 10.4194/1303-2712-v18_9_09

Mamilov, N.S. et al. (2024). Alien Rainbow Trout *Oncorhynchus mykiss* in the Balkhash Basin (Kazakhstan, Central Asia): 50 Years of Naturalization. Animals, 14, 3013. https://doi.org/10.3390/ani14203013

Onofri, L.; Pulcini, D.; Martini, A.; Martinoli, M.; Napolitano, R.; Tonachella, N.; Capoccioni, F. (2024). Economic Analysis of Sturgeon Farming and Caviar Production: A Case Study of an Italian Fish Farm. Water, 16, 2618. https://doi.org/10.3390/w16182618

The World Bank (2022) *The Market Growth Potential for Kazakhstan Fisheries and Aquaculture Products*. The World Bank, Wash

Timirkhanov, S., Chaikin, B., Makhambetova, Z., Thorpe, A. and van Anrooy, R. (2022) Fisheries and aquaculture in the Republic of Kazakhstan: a review. *FAO Fisheries and Aquaculture Circular.* No. 1030/2. Rome, FAO. 2010. 76 pp.

Appendix – Kazakhstan Food System

Meat and meat products constitute the largest share of household food expenditures in Kazakhstan, accounting for 17% of consumer spending. Bread products and cereals follow, comprising 8%. There is a growing concern regarding diet-related health issues. As of recent reports, 25% of adult women and 21% of adult men in Kazakhstan are living with obesity, rates higher than the regional average.

Meat Dishes: Horse meat and mutton are particularly prominent. The national dish, *beshbarmak*, consists of boiled meat served over pasta sheets, accompanied by a meat broth called sorpa. Other traditional meat dishes include *kazy* (horse meat sausage) and *kuyrdak* (a dish made from roasted offal). *Dairy Products*: Fermented dairy plays a significant role in the Kazakh diet. *Kumis* (fermented mare's milk) and *shubat* (fermented camel's milk) are traditional beverages. Other dairy products include *kurt* (dried cheese balls) and *kaymak* (fresh cream similar to sour cream). *Breads and Grains*: Bread is a fundamental part of meals. *Baursak* (fried dough balls) and *tandyr nan* (traditional bread baked in a tandoor oven) are commonly consumed. Dishes like *plov* (rice pilaf) and *manti* (steamed dumplings) reflect broader Central Asian influences.