

STURGEON CULTURE

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Sturgeons have been around for over 250 million years. They outlived the dinosaurs and over twenty major species are still with us today. The most well-known sturgeon is the Beluga sturgeon *Huso huso*, which is the source of caviar. The beluga sturgeon is the largest freshwater fish the largest one measured was 1,300-1,600 kg and 3-4 m long. Five species of sturgeons live in Turkish waters and one species is very rare. In and around the Black Sea, only a few species remain and the populations are so depleted that there is little or no fishery for them.

All sturgeon species are more or less endangered, and because they cross many international boundaries, their management needs international cooperation and investment. Conservation of sturgeons requires many actions, including publicizing the necessity to protect them and their habitats; studies on catches and probable spawning grounds; and developing methods for artificial propagation. Trade in the beluga sturgeon has been governed since 1998 by an international treaty called the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which limits shipments and requires import and export permits. Despite this protection, the number of beluga sturgeons continues to decrease, creating imminent peril for what the Interior Department calls the 'most economically valuable fish in the world.'

Most sturgeons migrate to the sea, but some species live only in rivers or lakes (these fish as known as freshwater sturgeons). The migratory sturgeons live in brackish or salt water up to 150 m deep, but return to fresh water for spawning. Most sturgeons migrate upstream to spawn in the spring at water temperatures of about 16°C. Sturgeons can live about 100 years and can spawn many times throughout their lives. They adapt to a wide range of environmental conditions; the delicate fry and fingerlings become very hardy adults tolerant of wide variations in water quality. In the rivers, newly hatched larvae start to feed on small zooplankton and as they grow, they feed on increasingly larger food organisms: insect larvae, worms, fish. At 10-15 cm length, they begin to migrate to the sea. Sexual maturity and fecundity vary by species.

Tasty meat and high nutritional value make sturgeons very desirable fish species in European countries. Sturgeons can be found in the market in fresh, frozen, and especially smoked forms (Table 1). The world-famous caviar is produced from sturgeons. Sturgeons also have in its swim bladder a special material called ihticol used in glue production, and another substance in its sperm pouches that is used in the treatment of burns.

Sturgeons are farmed in Russia, USA, Iran, France, Bulgaria, Ukraine, and Azerbaijan. Table 2 shows the farming methods and

Table 1. Meat quality of some sturgeon species.

Species	Meat (%)	Water (%)	Protein (%)	Oil (%)	Energy (kcal/100 g)
<i>(Huso huso)</i>	63	73.8	16.6	6.7	136
<i>(A. guldenstaedti)</i>	64	67.0	18.8	12.5	188
<i>(A. nudiventris)</i>		69.7	18.7	10.2	
<i>(A. stellatus)</i>	63	70.7	19.0	8.6	153

Table 2. Total production amount of sturgeon including fishery and cultured.

Years	1997 (tons)	1998 (tons)	1999 (tons)
Fishery	4 407	3 777	2 950
Cultured	2 025	2 034	3 706
Caviar	75 847	61 963	51 857

production of sturgeons in these countries. By the 1950's Russia's sturgeon stocks were in trouble because of dam construction on major rivers. Soviet scientists discovered that silt could be mixed with the sturgeon eggs to inhibit clumping. The same scientists pioneered the use of hormone injections to induce spawning. In the hatchery, sturgeon larvae are fed algae, Artemia, and a dry feed mix. Some sturgeons grown in ponds are marketed as food and some are released to the sea to increase the natural stocks. Market size of the fish is 1 kg or larger. If the target is caviar, it is necessary to grow the fish much larger so they produce roe. Farmed sturgeons reach sexual maturity earlier than those in the wild.

Turkey has banned the catching of all sturgeon species in all its waters. In the 1990s, CFRI conducted studies around Kızıl ırmak, Yeşil ırmak, Sakarya and Çoruh rivers and found that sturgeon stocks were depleted and it

was necessary to enhance the natural stocks. Thus was started a project in 2001 on the artificial propagation of sturgeon in the Black Sea Region. Juveniles (6-10 g) of the Russian or Karaca sturgeon *Acipenser quidenstaedti* were brought to CFRI on 7 May 2001. After 16-17 months, they grew to 250-450 g body weight. Broodstock development is on-going.



Water Temperature Affects Fish Culture and Growth in the Black Sea

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Aquaculture started along the Black Sea coast of Turkey in the 1990s. Many entrepreneurs began to raise rainbow trout in sea cages, but they had problems in the summer when water temperature increased above 20°C. Some stopped their operations but others turned to alternative species such as sea bass, gilthead sea bream, and turbot, which could be cultured in the brackish waters of the Black Sea. In fish farming, it is the aim of all farmers to grow their fish as quickly and cheaply as possible and produce a quality product to sell. Fish growth is dependent on a number of factors including species, age, food, genetic potential, dissolved oxygen and water quality, and water temperature.

The geographic distribution of sea bass and gilthead sea bream extend from the Black Sea to the Atlantic, Baltic, and even North Sea, but mostly they are caught in the Aegean and Mediterranean Sea. These species tolerate temperature of 1– 34°C and salinity of 5 – 50‰.

Optimal temperature for grow-out is 22 – 24°C. Sea bass and gilthead sea bream culture have been farmed in the Mediterranean countries such as France and Italy in the 1970s and 10 years later in the Aegean coast of Turkey. Every year, 3 000 tons of fresh and frozen sea bass and gilthead sea bream are exported to European countries from Turkey.

Salinity in the Black Sea ranges 16 – 22‰, lower than in the Aegean and Mediterranean Sea. Maximum water temperature in the Black Sea was around 30°C in July, and minimum water temperature was around 7°C in January. Water temperature will limit growth, especially in the winter when temperature drops below 10°C. But growth of fish in farms may be maximized by adjusting the rearing season and ensuring good management. Thus, cage farming of sea bass and gilthead sea bream may be practised in the Black Sea.