



Sturgeon

What should we know?

Species tool

Sturgeon:

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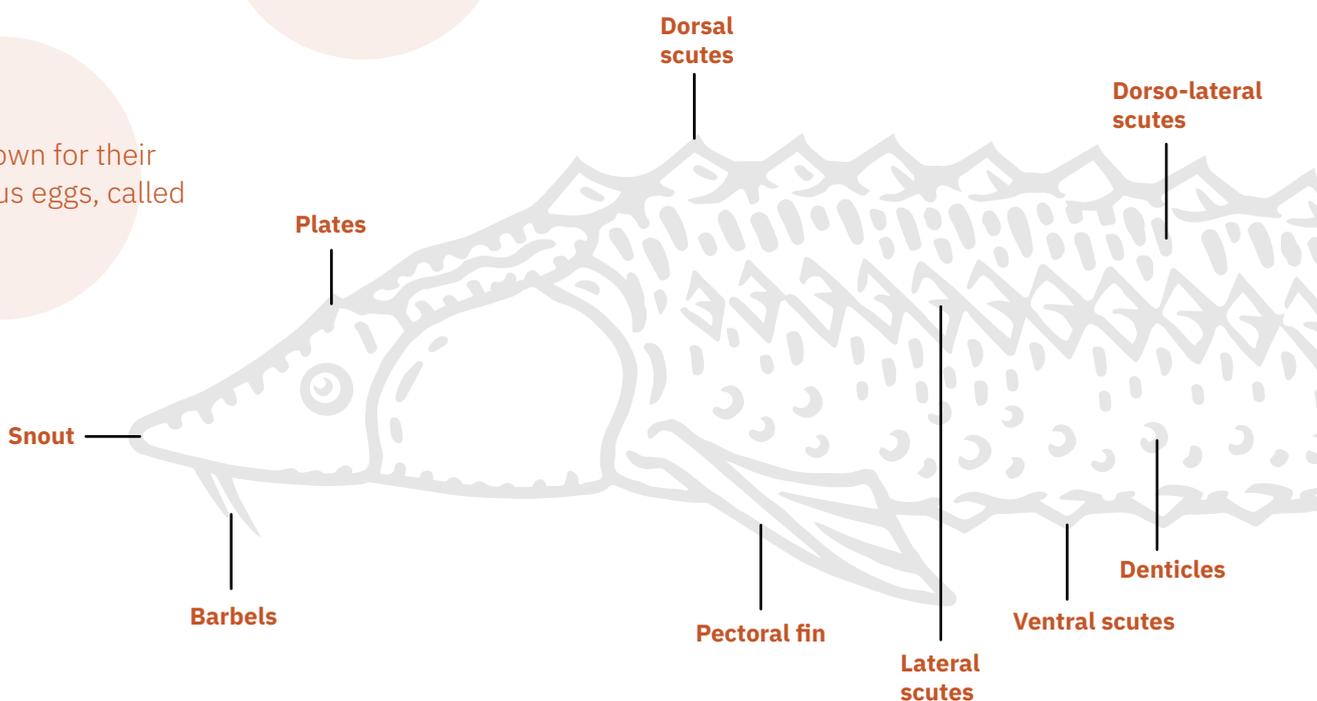
In the 1800s, when sturgeon became entangled in commercial fishing nets, the fish were discarded as a worthless nuisance. Today, the sturgeon is recognised as one of the world's most precious commercial fish, mainly prized for its caviar but increasingly for its meat and as an ornamental fish. Sturgeon are long-living and late-maturing fish belonging to the *Acipenseridae* family, which comprises 27 species. The earliest fossils of sturgeons can be traced back to more than 200 million years ago. This fish belongs to a particular group called *chondrostei*, characterised by the cartilaginous nature of their skeleton, with only a small degree of ossification. Instead of scales, they have scutes that form a strong exoskeleton.

Many sturgeon have an anadromous lifestyle, eating largely from the bottom, where they use their barbels to find food. Ancestral and majestic in their appearance, these exceptional fish are known for their delicious eggs called caviar. This much sought-after product has led to overfishing of several sturgeon species. Some are now critically endangered. Pollution and habitat destruction play a role here too. This has led several farms to start sustainably farming sturgeon so that pressure on wild stocks is relieved. Restocking programs are also in place to stimulate the recovery of wild sturgeon stocks.

Belongs to a special group called *Chondrostei* that are characterised by the cartilaginous nature of their skeleton.

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Are known for their delicious eggs, called caviar.



Well-known sturgeon species are:

Russian sturgeon

Acipenser gueldenstaedtii



Siberian sturgeon

Acipenser baerii



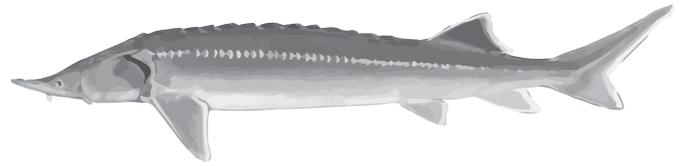
Beluga

Huso huso



Sterlet

Acipenser ruthenus



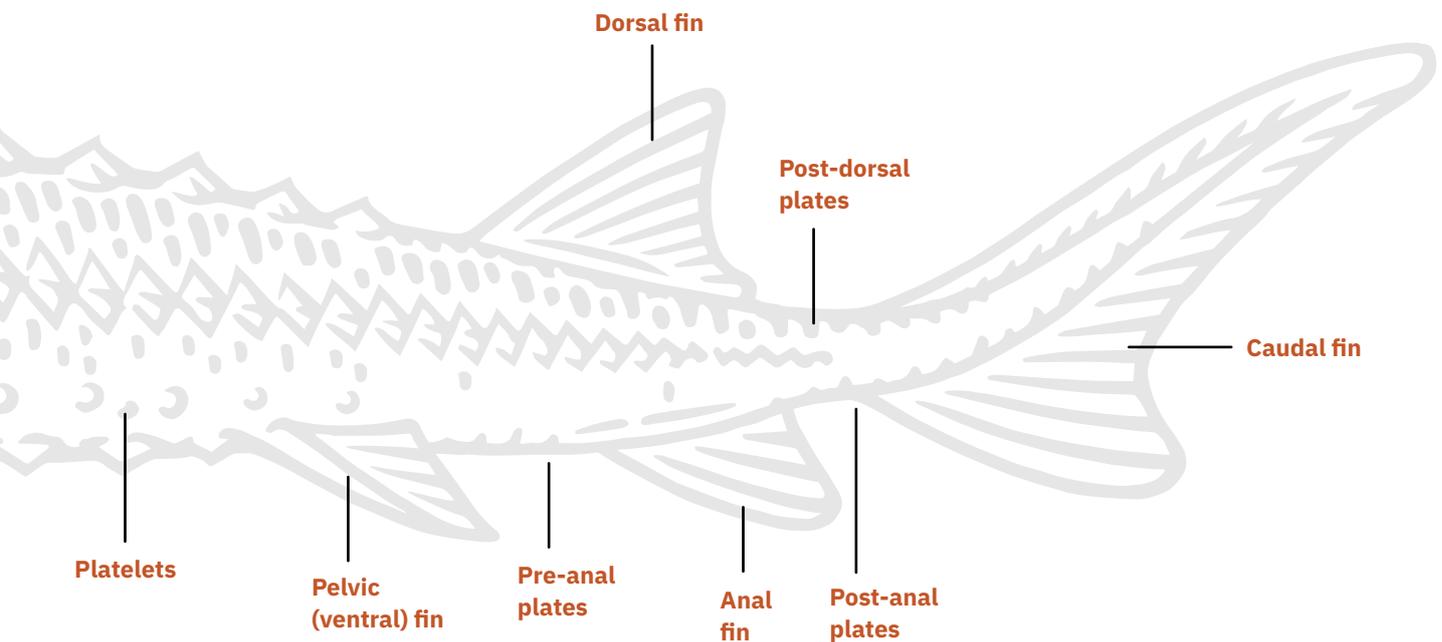
European sturgeon

Acipenser sturio



White sturgeon

Acipenser transmontanus



Sturgeon farming

Hatchery

A recirculating aquarium system is ideal for incubating eggs and rearing sturgeon larvae.

Such a system could consist of two or more aquaria of 250–500 litres, a sedimentation filter, a biofilter or a high surface open structure filter material, preferably a UV installation and well-aerated, clean, fresh water; an aerator; a pump and a heater. The water is recycled at least 1.5 times per hour to maintain good water quality. Daily, 10–20% of the total water volume is exchanged. A guideline for water quality requirements of sturgeon in the hatchery is outlined in the following table.

Recommended water quality parameters for the sturgeon hatchery:

Parameter	Recommended value
Ammonia (NH ₃)	< 0.0125 mg/L
TSS	< 10 mg/L
Dissolved oxygen	≥ 90%
pH	6.5–8.0
Nitrite (NO ₂)	< 0.1 mg/L
Nitrate (NO ₃)	< 50 mg/L
Carbon dioxide (CO ₂)	< 20 mg/L
Temperature*	16–21 °C



Nursery

9–11 days after hatching, when the yolk sac is absorbed, the larvae should be given their first food. With each life stage, various body parts (anatomy) and life functions (physiology, immunology) develop, requiring specific nutrients.

Meeting the nutrient requirements helps to ensure healthy development and high survival throughout the fish's life. Building a solid foundation at the start is essential to achieve sustainable results.



Ongrowing

Sturgeon can be grown in raceways, circular tanks, large pools in intensive farming, ponds and cages.

More and more sturgeon are farmed in RAS because the conditions can be controlled. In RAS facilities, water quality is the basis for healthy fish and optimal performance. Sturgeon eat and grow well, provided the water quality parameters are kept at consistent optimal levels.

Sturgeon farming in RAS requires a high initial and operational capital investment. The profitability depends on the productivity (kg/m³/year) of the system, and, therefore RAS require a relatively high stocking density and growth rate to have superior results.

Continuous monitoring of water quality parameters and feed uptake provides close control of the process. The values should be recorded and used to assess the performance of RAS water treatment components. Accurate record-keeping is necessary in order to respond immediately in case water quality values deviate from their optimum levels. Especially in RAS it is crucial to manage the whole system accurately.

Sexing - From 2–8 years old, depending on the species, sturgeon can be identified as male or female by ultrasound. From then on, the females can be marked individually with a tiny microchip. This works as an identifier so that the egg development can be monitored to produce the highest quality of caviar. But it is not all about the caviar. The meat is also used and processed into delicious products. The males are used for this purpose, as well as females that no longer produce caviar.



Broodstock

Using wild broodstock is still a common practice in sturgeon reproduction and cannot yet be avoided. Sturgeon is relatively slow to reach sexual maturity and some females may not produce eggs until after thirty years or more in the wild. The majority of the spawners are caught during migration or on the spawning site. This practice will remain useful in specific cases, like for conservational purposes or avoidance of inbreeding. However, capturing wild broodstock is often restricted by regulations of fisheries agencies and an increasing amount of broodstock is now reared in captivity.

Broodstock raised in captivity

The advantages of sturgeon raised in captivity are that they adjust more easily to the tank or raceway environment and they are more versatile with respect to the moment of reproduction. Furthermore, captive rearing of broodstock allows better control over the fish and its environment, and cultured sources are less variable than those in the wild. Under proper aquaculture conditions, with good quality nutrition at the right amount and slightly increased (but constant) water temperature, sturgeon could reach maturity in **75%** of the time span needed in the wild.

Before induction of spawning, the fish must undergo seasonal temperature and daylight variations in order to trigger gonadal development. Gonad maturation requires one–two months at a water temperature below 10 °C. The preparation of the final ripening is mediated by an increase in water temperature to above 14 °C. A slight increase in day length can support this process. However, the process is also dependent on the species, the temperature regime before the increase and the duration of the increase.

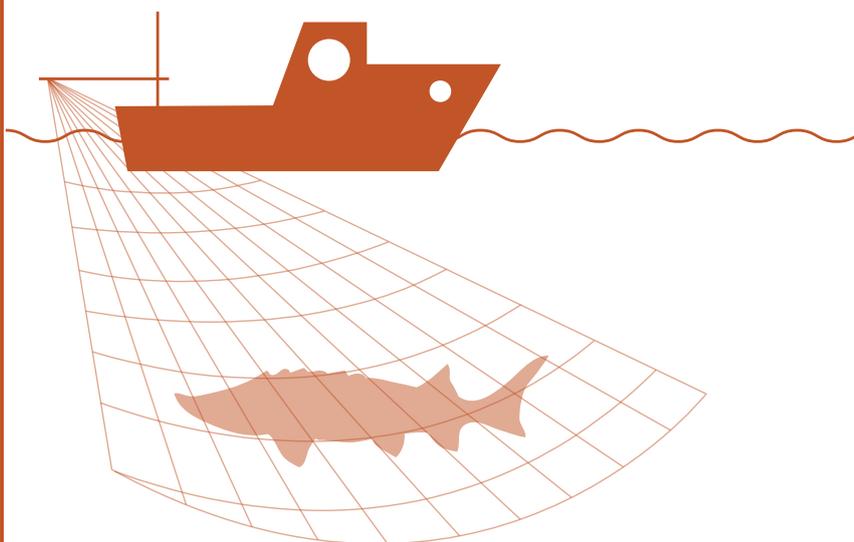
All sturgeon species develop normally when reared in freshwater only. Depending on the condition and species, males can generally spawn every year, while females every two–four years. There is relatively little information available concerning the influence of environmental conditions on sexual maturation and ovulation in domestic sturgeon broodstock, and it is expected that the current course of action will be optimized in the near future.



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Male & female spawners

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Harvest

To ensure the highest quality caviar, it is essential to harvest the eggs at the prime moment of maturity. To get it right, sturgeon are induced into a mild state of anastatic at different intervals to perform an ultrasound on each female. This is necessary to correctly time the caviar harvest. It is also essential that the female sturgeon go through an artificial winter, as this is required for the final development of the eggs. The mature females can be kept in the winter system for **four months** without feed, just like it would happen in nature. After this period, the sturgeon can be introduced to spring conditions. Now they are ready for caviar harvesting.

Depending on the sturgeon species, it can take a substantial number of years before the females are ready to produce caviar. In the RAS facility, where an optimal water temperature can be provided year-round, the sturgeon mature much quicker than in the wild. The maturation cycle of the sturgeon in RAS can be reduced by about 25% compared to in the wild. This saves costs and helps to achieve consistent, high-quality caviar that is available any time of the year. To give an example, Sterlet sturgeon may be ready to produce caviar after **three** years, Siberian sturgeon after five–six years and Russian sturgeon after **seven–eight** years. The Beluga has the longest cycle and largest caviar, taking about **10–12** years to be able to harvest caviar. This long maturation interval makes sturgeon more vulnerable in the wild.

Sterlet



3
years

Siberian



5–6
years

Russian



7–8
years

Beluga



10–12
years



Commercial products

Interest in sturgeon species traditionally focussed on caviar, which is still the most widely marketed product. However, other products derived from sturgeon are becoming increasingly sought after:

Caviar

The unfertilized eggs of mature females are, after minimal processing, transformed into caviar. Depending on the species of sturgeon, the eggs are graded according to colour, size and taste. The eggs are then salted. The designation “Malossol” on the label, which means “little salt”, has become synonymous with a high-quality product.

Smoked sturgeon

In recent years, smoked sturgeon has become increasingly popular. Eastern European countries are the primary producers.

Fresh, frozen and dried sturgeon

These three products come primarily from the aquaculture industry.

Soup

Shark fin and sturgeon head cartilage soup is a product of Southeast Asia. It contains shark and sturgeon cartilage.

Live fish

Live fish are traded for sturgeon farming. Juvenile sturgeon (*A. baerii*) and Russian sturgeon (*A. gueldenstaedtii*) are also sold as an ornamental fish for aquariums and garden ponds. Sturgeon is also used for recreational fisheries.

Isinglass (collagen)

The swim bladder of the sturgeon is used for the clarification of wine and beer and for glue.

Sea ivory

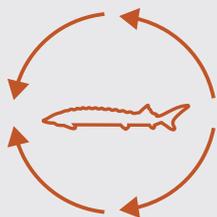
This new product recently appeared in the North American market on a very small scale. The scutes are sold on the market unprocessed or can be made into “sea ivory” jewellery.

Leather

Sturgeon skin is used as leather material for clothing, handbags and bookbinding.



Challenges in sturgeon production



POOR FCR

Optimal production

Sturgeon have a long maturation, and therefore require a high initial investment and high operational costs. Proper design and management of RAS, optimum RAS feed quality, feeding management and adequate health management are all essential for optimal caviar production. Using first-class feed with a proper feeding strategy is vital to achieving optimal performance in the sturgeon RAS farm.

Feed conversion ratio

Because sturgeon are kept in a farm for many years and grow quite old, it is even more important to supply specific sturgeon feeds with all the essential nutrients in ample amounts. In this way, the fish stay healthy and robust throughout their long lives and can provide delicious caviar.

Poor FCR indicates either physiological problems or insufficient feed quality, while inadequate pellet firmness can lead to broken pellets and dust, which cannot be optimally consumed by the fish. It can also not be removed easily by the filters, polluting the water. Dust can irritate the gills of the fish and also impair the nitrification process. These factors can adversely impact fish growth. Ultimately, feeds should be able to meet the nutritional requirements as well as minimize waste products that can be easily removed.

All Alltech Coppens, sturgeon feeds are formulated for that purpose. Since the beginning, Aquatir has chosen to work with Alltech Coppens and its tailor-made sturgeon feeds known for consistency and high quality.



Read more!

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Solutions:

Alltech Coppens sturgeon feeds include **three key components** for successful caviar production:



Minimizing deformities

As mentioned earlier, sturgeon are unlike the bony fishes like carp and trout, and therefore need a different diet. The most striking difference with other farmed fish is the lack of bones, scales and the cartilaginous nature of their skeleton. This makes sturgeon more sensitive to deformities, especially when they grow quickly. In the early days of sturgeon farming in RAS, this became quite evident when fed trout feeds that promoted fast growth. The deformity issue became quite a big and widespread problem and needed to be addressed to achieve better performance.



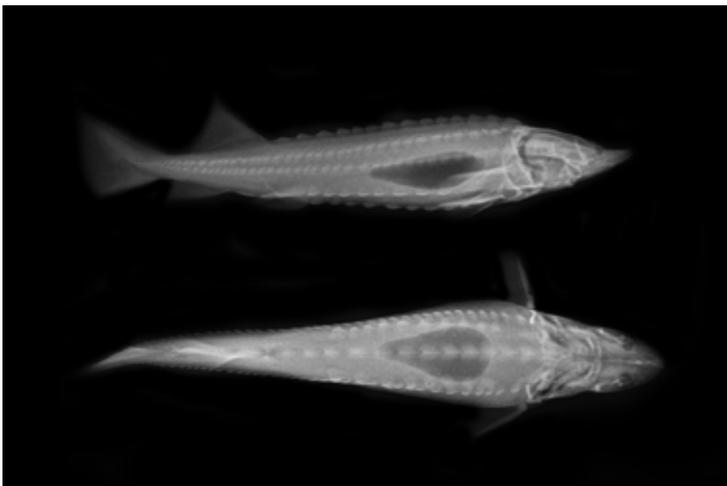
Fatty acids

Fatty acid profiles are essential for the taste and aroma of the caviar, especially the omega-3 fatty acids.



DP:DE

The sturgeon feeds have an optimal ratio between digestible protein and digestible energy, allowing for minimal waste of feed protein and optimal usage of precious feed protein for fish growth. The optimal DP:DE ratio helps prevent female sturgeon from becoming too fat when they build up their gonads and positively influences the gonadosomatic index (how much caviar can be produced per kg of body weight). Next to the DP:DE ratio, only the highest quality ingredients are selected to ensure good growth while keeping the sturgeon in optimum condition.



Sturgeon Skeleton Pack (SSP)

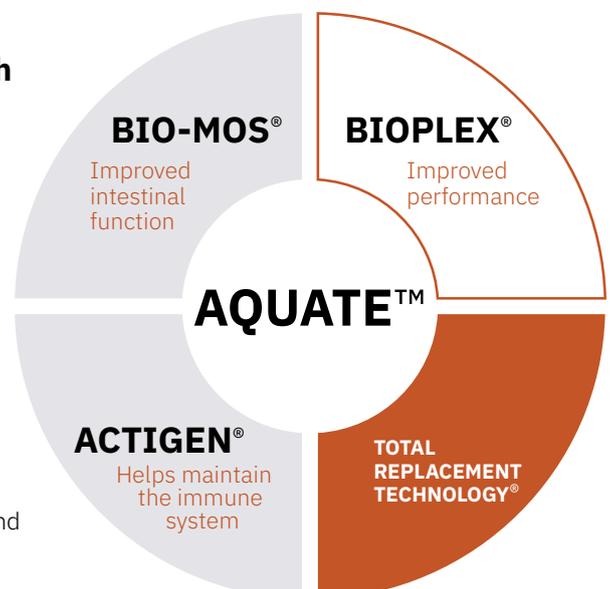
In close cooperation with customers like Aquatir, Alltech Coppens investigated this deformity issue and developed a Special Skeleton Pack including “ingredient X” at the Alltech Coppens Aquaculture Centre. The trials showed that the SSP greatly minimized any deformities.

Sturgeon farming is a long-term investment due to the extremely long lifecycle. Alltech Coppens has over 20 years of sturgeon feed production experience. Working together with sturgeon farmers has given us a significant lead in sturgeon feed development.

Aquate health pack – healthy growth from hatch to harvest

By incorporating Alltech’s Aquate technology in our Sturgeon formulations we enhance an healthy gut microbiome for an optimal nutrient digestibility and boost fish health, ultimately contributing to better farm performance. Aquate contains yeast-based products such as Bioplex®, Bio-Mos® and Actigen®

The inclusion of Aquate safeguards the healthy growth of this fish species, from hatch to harvest. The inclusion of Bio-Mos® and Actigen® within the feed premix preserves the microbial balance within the gastrointestinal system, ensuring improvement of the digestive system and nutrient absorption and utilisation. The inclusion of Bioplex® chelated minerals also guarantees the efficient uptake of dietary micronutrients that are vital to building and developing a healthy skeletal structure and robust immune system.



Research & development

With 30 years of experience researching, developing and producing high-quality sturgeon feeds, Alltech Coppens offers on-farm assistance through our dedicated sales team and technical support team, ensuring optimal farm performance.

Alltech Coppens formulates feed on the 4 Pillars of Fish Nutrition: **Palatability, Performance, Pollution Control** and **Planet**.

All four pillars are important and taken into the balance of sourcing new/alternative raw materials:



Palatability

To ensure the best growth and performance of fish, optimal feed intake is vital. Fish must be attracted to the smell and taste of the feed.

Performance

Our feeds must perform well. This means that they must generate healthy growth and ensure efficient feed utilisation. This is a decisive factor in the profits of fish farmers.

Pollution Control

To maintain water quality and secure optimal fish health and performance, it is crucial that all our feeds are highly digestible, thereby decreasing the risk of pollution.

Planet

The environmental sustainability of the feed.



For more information, please contact us:
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