

Ecosystems and territories



● Sturgeon

Restoring an endangered species



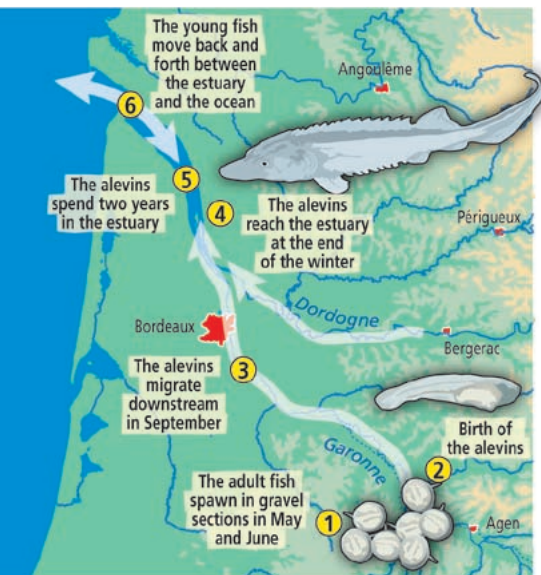
●●● For the past 30 years, Cemagref has observed the extinction process of the European sturgeon and invested heavily in research efforts to avoid that outcome. Critically endangered in the 1980s, the European sturgeon is no longer seen by fishermen in the Gironde river, its last habitat. There remain only some 50 individuals at the Cemagref research centre and the scientists hope to master its breeding over the next two to three years, otherwise all hope to reintroduce the species will be lost. Its breeding is more difficult to master than that of the Siberian sturgeon, which is now farmed in Aquitaine to produce caviar, thanks to the research work done at Cemagref. For the sturgeon, the scientists set up and experimented a preservation protocol that can be applied to other species faced with the same problems, e.g. eels or species threatened by overfishing or development work in rivers.

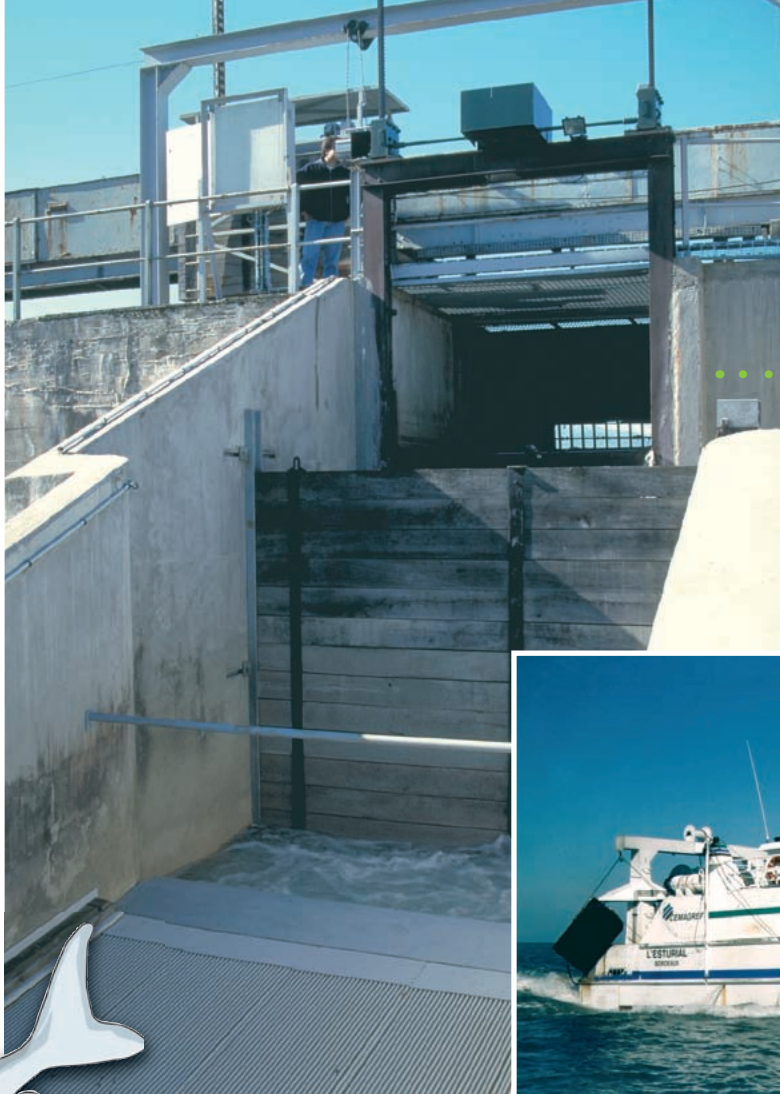
At the end of the 1970s, the Cemagref scientists in Bordeaux launched a program to save the European sturgeon. In the 1800s, this mythical fish was present in most river basins in Western Europe, but today there are probably only a few thousand remaining sturgeon, all from the Gironde basin. The research carried out in the lab, often on the Siberian species used as a biological model, made it possible to create a true sturgeon fish-farming sector in Aquitaine and produced a number of scientific breakthroughs. In spite of these efforts, the situation for the European sturgeon worsened to the point that since 2005, it has benefited from the highest level of protection in the framework of the European convention that has initiated action in the field and research in the concerned countries.

In the Gironde estuary, the research on the dynamics of migrating-fish populations began in the 1970s, when the Cemagref centre in Bordeaux launched an initial survey among professional fishermen to obtain an estimation on the quantities of fish caught. This survey revealed the rareness of the largest migrating fish in Europe, the European sturgeon, *Acipenser sturio*, a species highly appreciated for its flesh and its precious eggs, better known as caviar.

At the beginning of the 1900s, thousands of young sturgeon could be seen during their spring migration to the ocean. That represents a heavy loss for the fishing industry and the managers of the Aquitaine regional heritage.

The biological cycle includes frequent migrations in the estuary.





Adaptive infrastructure, such as elevators, enable migrating fish to overcome dams.

The Estrial research vessel used to study aquatic life in the Gironde river.



P. CAMOIN

The scientists cite two reasons for the disappearance of the European sturgeon, first overfishing and, secondly, the destruction of its freshwater habitats due to the construction of dams and the extraction of gravel.

At the end of the 1970s, Cemagref launched a vast research program. It was built up around three strategic lines of study that remain valid in 2006. The goals are to improve knowledge on the ecology of the native species, to gain experience and develop methods using other species as biological models, and finally to develop techniques in view of repopulating natural areas.

Studying populations in their natural environment

One of the priorities in the scientific program is to monitor and characterise the sturgeon population in the estuary during the delicate period when the young fish migrate. The Estrial, a ship outfitted for scientific fishing activities, was used for the initial surveys in the estuary and to count a part of the local population.

The captured fish are marked before being released in order to find the zones

Partnership with research institutes

“ In 1994, the Association for the preservation of the European sturgeon was founded in Germany. Our scientific partnership with the Cemagref team in Bordeaux started the same year. The situation for the European sturgeon was even more catastrophic in Germany than in France. The last natural spawnings dated back to the 1950s. As for captures in the North and Baltic Seas, there have been none since 1996. Using alevins born near Bordeaux, we have launched breeding tests in Germany. Whereas the Cemagref researchers are attempting to recreate in the lab the different habitats of the species during its migration, we are monitoring the development of our sturgeon in freshwater and at a constant temperature of 20°C. Today, the fish that are 11 years old are approaching their sexual maturity. Thanks to our complementary research on sturgeon physiology, we hope to soon master reproduction of the European species in captivity. This success will result in a large number of partnerships with various European scientific organisations (in Poland, the Netherlands, Italy, etc.) that are already very interested in the French and German results.

Frank Kirschbaum

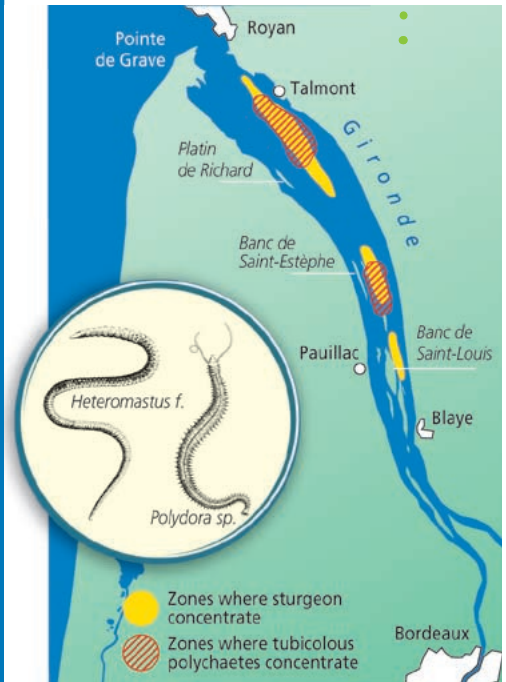
Institute of ecology and freshwater fisheries (IGB), Berlin

in the estuary where the fish are most present and to monitor the growth of the young.

At the beginning of the 1990s, the researchers developed a technique to estimate the age of the sturgeon. The technique consists of removing and analysing the first ray of the pectoral fin. From then on, it was possible to distinguish between the age groups (individuals born in a given year) and to monitor their growth over time. Declarations of accidental captures by fishers fill out the information on the population of young and adult fish offshore.

It is now known that adult sturgeon inhabit the relatively shallow waters along the coast, from the Gulf of Gascogne to Scandinavia. It is in

Tubicolous polychaetes are present in the zones where sturgeon concentrate.



these coastal areas that the pressure from fishing is the strongest. Research on the eating habits of young sturgeon in the estuary recently revealed that the fish feed on small worms found only in certain parts of the estuary.

Siberian sturgeon to assist the European

Despite its protected status in France since 1982 and in Europe since 1998, the population continues to decline. In a context of dropping captures of European sturgeon in both the estuary and in the ocean, it is urgent to improve our knowledge on the physiology of the species.

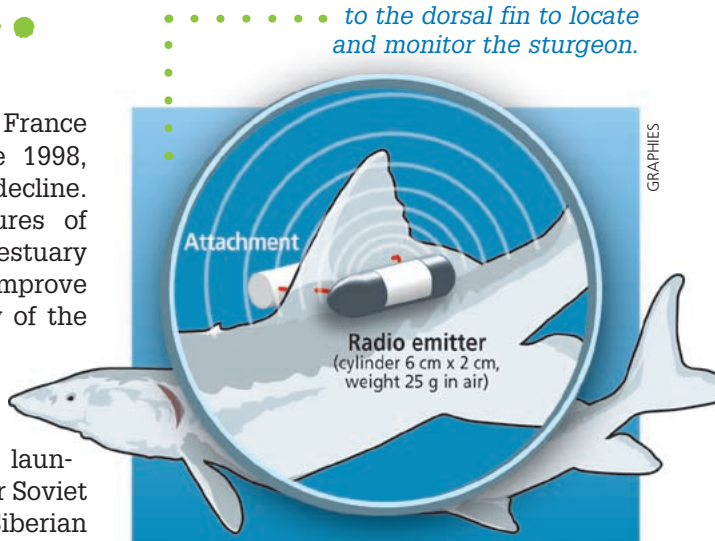
Confronted with the small number of individuals available for study, the Cemagref researchers launched a partnership with the former Soviet Union to carry out work on the Siberian sturgeon, *Acipenser baerii*, a species that lives its entire life in freshwater. The reproduction process of the Siberian sturgeon and management of the larvae were rapidly mastered. In Aquitaine, fish farmers were interested in the Siberian sturgeon and the breeding techniques developed by Cemagref were transferred to the commercial operations at the end of the 1980s.

During this period, a large number of partnerships were set up in France (University of Bordeaux I, INRA Saint-Pée-sur-Nivelle) and abroad (Russia, Ukraine). Some are still in effect, others have been set up in the meantime.

Today, over 17 tons of caviar are produced each year in the region on farms breeding Siberian sturgeon. The profits made by transferring the breeding techniques

were invested in building the research centre at Saint-Seurin-sur-l'Isle. The Aquitaine regional council contributed to funding the work. In 1991, the scientists had at their disposal experimental basins for research on the husbandry and fundamental biology of the different sturgeon species.

A radio emitter is attached to the dorsal fin to locate and monitor the sturgeon.



GRAPHIES

Mastering sturgeon farming

Reproduction requires more information on the conditions in the natural environment that result in maturation of the sexual glands. This is all the more important because the fish reach puberty between the ages of 10 and 15. Even today, a great deal of information required to create good farming conditions is still not available, notably concerning temperature, salinity, light, feeding, densities, etc. Hormonal injections are required to obtain sexual products. The time of the injection is optimised by anatomic observations on the males and on the ovarian follicles of the females.

Partnership with companies

“ As early as the 1970s, the European sturgeon started to decline in the Gironde river. The Cemagref researchers sounded the alarm and contacted regional fish farmers to have them raise a few individuals in their basins. My father was one of them. Ten years later, an impact study on the estuary was the occasion to work again with Cemagref. At that time, the scientists focussed on raising the Siberian sturgeon to obtain biological and physiological data applicable to the local species. The experimental results were most promising. In 1988, I started to raise the Siberian sturgeon in order to produce caviar. Today, French companies produce over 17 tons of caviar and employ approximately 100 people. Our products are competitive with wild-grown caviar in terms of both quality and price. We have placed great hopes in the research carried out by Cemagref on the European sturgeon. Its reintroduction would be a strong symbol in favour of our region. What is more, success in breeding it would enable us to increase production, because French laws on farming the Siberian sturgeon are very restrictive.

Laurent Sabeau
Prunier Manufacture

Research on the Siberian sturgeon resulted in the production of caviar in Aquitaine.

Unexpected results are occasionally obtained. For example, in attempting to determine at an early age the sex of the fish using vitellogenine, a molecule synthesised by the females, the researchers noted with surprise that the molecule is also present in male sturgeon.

Further in-depth studies revealed the link between the synthesis of this protein and the type of artificial feeding. Another interesting line of study developed by the scientists concerns the beneficial, short-term effects of stress on the reproduction of captive sturgeon.



P. CAMOIN

*The reproduction process of the Siberian sturgeon (*Acipenser baerii*) has been mastered, contrary to that of the European sturgeon (*Acipenser sturio*).*



Repopulating the estuary ●●●●●

Although there have been over 100 spawnings in research centres for the Siberian species, the scientists have succeeded in producing only three for the European sturgeon. That low number is due to the rareness of wild, sexually mature fish, the non-simultaneous capture of the two sexes and the physiological condition of fish that are often not suitable for reproduction. The last spawning dates back to 1995 when 23 000 alevins were born in captivity. A majority of the fish were marked and released to rivers. Some were captured over the following two years, thus proving the effectiveness (at least partial) of the process.

For a number of years, the researchers have attempted to constitute a stock of future reproducers in Saint-Seurin-sur-L'Isle and in Germany, where 40 sturgeon were shipped in 1996 to the Institute of ecology and freshwater fisheries in

Berlin, in the framework of a scientific partnership. The goal is to reintroduce the species in the North Sea.

In 2005, thanks to efforts by the WWF, the Bonn convention recognised the European sturgeon as a critically endangered fish in Europe, about to become extinct worldwide. An action plan was implemented to alert and inform the concerned governments. The expected results are important not only for the species, but for the entire ecosystem revolving around the estuary. The goal is to protect and rehabilitate the upstream habitats of the European sturgeon, which should also be beneficial for other fish species threatened with extinction over the mid to long term, notably the eel. The teams in Bordeaux are thus in the front lines because the results of their work could well be applied to all European catchment basins.

*With the collaboration of
Patrick Williot
and Éric Rochard*