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THE CAVIAR CONNECTION

With the help of a Soviet defector, Californians are
breeding fish that lay precious eggs

By Peter Steinhart

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ELM BORDNER lilts a five-foot, eighty-pound sturgeon out of a holding tank at the University of California at Davis. In so doing, he may be raising the beginnings of yet another odd California trend. It is a trend set in motion by the defection of a Soviet official and nurtured by changing tastes in food in America. But it depends upon an increasing understanding of a strange and troubled fish.

The fish is huge, gray and prehistoric looking. It has rows of silvery bony knobs down its back. Four pink wormlike barbels dangle in front of its mouth, which is hidden deep under its face. No one would call it pretty. But the fish, a white sturgeon from the Sacramento River, is a prodigious egg layer. !t is about to yield to Bordner. a researcher in the University's aquaculture program, thousands of shiny black eggs. And that makes it an object of keen interest.

There are at least 20, and perhaps as many as 80, private efforts underway in California to establish a breeding stock of sturgeon. The University's program is the first and probably the most advanced. It was designed to help replenish sturgeon fisheries in state waterways. But like the other eflbrts, it is also attempting to restore an industry that once thrived in the Golden State:the production of caviar, one of the world's two or three most expensive luxury toods.

You find caviar on the menus of most expensive restaurants and on the sideboards at catered parties and political fund raisers:crisp dark fish eggs to spread on thin, oven-toasted bread. It is so expensive that it sells by the ounce, and it is expensive because it is rare.

America produced some 60,000 pounds of sturgeon caviar last year, primarily from paddlefish caught in Mississippi River tributaries, or from white sturgeon caught in the Columbia River. Iran produces a similar amount and China a small quantity. But the lion's share, about 90 percent

of the world's production, comes from the Soviet Union. The heart of the industry is on the Caspian Sea, where a single Soviet station once harvested 15,000 sturgeon in a day. One pregnant sturgeon can yield as much as 40 pounds of roe. In recent years, though, increased pollution and dams blocking fish migration Russian rivers have reduced sturgeon numbers and, in the process, the Soviet's caviar harvest.

Today, the Russians export only 20 percent of what they produce. And only 5 percent of that is beluga, taken from the beluga sturgeon, the finest caviar--a shiny black roe that sells for as much as $800 a pound in this country. "The good beluga," observes a proprietor of a New York gourmet shop, "has a certain aftertaste, a little sweetness and elegance, that makes it special."

Californians have produced and exported caviar before. In 1872, commercial interests were harvesting as many as 5,000 sturgeon a month from California waters. But by 1917, overfishing had taken its toll; state authorities closed the fishery to both sport and commercial fishermen. The sport fishery reopened in 1954, but by then the caviar industry was forgotten. There were too few fish to induce commercial production, and no one knew anything about wild sturgeon. No scientific research had been conducted in this country on their breeding biology, explains Robert Rawstron of the California Department of Fish and Game, because "they are a hard fish to work with." A sturgeon may take 20 years to mature, and then may live more than 150 years. "By the time you've seen two generations of fish," says Rawstron, "you're talking about a scientist's career." So, adds Bordner, "Sturgeon was a resource that nobody was interested in."

In 1977, however, Sergei Doroshov, a Russian aquaculturist with broad experience in the Soviet caviar industry, defected. When he came to California in 1980, he brought with him to the University a knowledge of the natural history and biology of sturgeon.

Doroshov was attracted to California because of the white sturgeon. It yields a caviar comparable to Soviet beluga. Says Mats Engstrom, a San Francisco aquaculturist and wholesaler who is trying to develop his own domestic sturgeon stock, "The quality is such that it should be equal in price."

Caviar comes from one of the world's strangest families of fish. There are 25 different kinds of sturgeon, 8 of which live in North America. Most are anadromous, living part of their lives in seawater but migrating to freshwater to spawn. The creatures survived almost unchanged in our rivers and bays for some 200 million years.

Sturgeon have no bones or teeth. They are all cartilage. Instead of a backbone, they have a notochord, a flexible cartilaginous rod running down the back. The asymmetrical tail is also a primitive characteristic, once seen in ancient fishes that lacked swimbladders to help them float. Those creatures needed the lift provided by a tail to help them move through the water.

Some of their other qualities are simply strange. Sturgeon can, for instance, evert their mouths into funnels to siphon up clams and crabs from bottom muds. And some species grow to enormous sizes. There reports of sturgeon caught in European rivers that were 28 feet long and weighed more than a ton. Even today, eight-foot fish are occasionally taken from the Sacramento River.

After the Civil War, as the nation developed its own class of millionaires, it also developed a taste for caviar. Unfortunately, the growing caviar market put enormous pressure on the sturgeon, and all of the American species were plundered almost to extinction.

Today, the creatures are still harvested in the Columbia River and in Mississippi River tributaries, and there are small fisheries for Atlantic sturgeon in New York and South Carolina. But elsewhere, dams and pollution have added to the fish's troubles. The shortnosed sturgeon of the East and the lake sturgeon of the Midwest are both on the federal Endangered Species List.

The taste for caviar, however, persists and so does a black market trade in the delicacy. In California, the commercial harvest of sturgeon is prohibited, but sport fishermen can legally catch the fish, remove the eggs and sell them. Some people do so far beyond legal limits. In California, state undercover agents bought more than 600 pounds of illegal sturgeon meat early in 1985, and they believe that the poachers may have sold the caviar to restaurants. Says Duane Johnston of the California Department of Fish and Game, "You can buy 100 pounds of caviar from a sports fisherman for $100. The processing of it is real cheap. You can put it up in jars and sell it for $40 an ounce." Since legal meat and caviar can be brought from Oregon, and since sports fishermen may possess meat and roe, catching poachers in California is difficult.

Authorities believe the black market trade may be thriving because the demand for legal caviar is growing so rapidly. Legitimate caviar sales in the United States rose from 200,000 pounds per year in the late 1970s to about 700,000 pounds last year. Says Mat Engstrom, whose California Sunshine, Inc., processes caviar, "Our business is growing more than 100 percent per year. We can't supply enough." Restaurants are the primary customers. With two-income families, observes Engstrom, couples eat out more often and their tastes have become more luxuriant. "There's enormous interest these days in food and wine and the quality of life," he notes. "People more and more distinguish the difference between caviars."

For example, many consumers know that the Soviets produce three different kinds of caviar:beluga, the largest, crispest, shiniest and the most expensive; osetra, which is smaller, sometimes oilier and has a nuttier flavor; and sevruga, which is even smaller and less expensive. A good caviar, say experts, should have a shiny texture, not be swimming in oil nor be sticky, dry or overwhelmed with salt. It should not taste fishy, for that means it has been exposed to air too long. It should be slightly salty, delicately fresh and mild. Says Daphne Engstrom, Mat's wife and partner, "It should taste like a smooth sea breeze."

All this interest suggests that whatever caviar Californians can produce from their own white sturgeon will find an eager market. And that is one reason why Elm Bordner is holding his 80-pound sturgeon. It is one of several taken recently from San Francisco Bay.

Each winter, the researchers go into the Bay and the Sacramento River to catch wild sturgeon. Ripe females are unusually fat at that time and have swollen bellies. The scientists make an incision in the abdomen of each captive fish to confirm its sex and look for eggs. If the fish isn't ready to spawn, it is stitched back up and returned to the water. If the female is carrying eggs, the researchers take about 100 of the roe and test them with hormones to see whether they will start developing. If the eggs are promising, the fish is kept for days or weeks, until she seems ready to spawn.

On this occasion, the fish Bordner is holding has been kept in a darkened tank for several weeks. Early this morning, it began to release shiny black eggs into the holding tank. The researchers will now open tile fish surgically and remove the eggs, almost ten pounds of them. In nature, sturgeon spread their eggs around. The eggs are sticky and adhere to rocks and aquatic plants until they hatch. But if the fish spawns in the tank, the eggs will adhere to one another, and those in the center will suffocate. The researchers will remove the eggs, mix them by hand with sperm from captive bred males, roll the eggs in fine silt to absorb the sticky coating, and put them into hatching tanks where bubbling water keeps them aerated.

A single female may yield 300,000 eggs. The eggs hatch in seven or eight days into squirming, black, tadpole-like larvae. The Californians have been remarkably successful in rearing the young. In nature, less than one percent of the eggs may develop into adult fish. Predators, such as striped bass, and adverse conditions, such as sudden changes in water temperatures, take a large toll. But in the tanks, 90 percent of the larvae survive their first two weeks. They are nurtured by their egg sacks and don't need to eat.

Within 12 days they use up their egg sacks, however, and must begin to find food. Then things become more difficult. The researchers offer the hatchlings the same pellet food fed at hatcheries to young trout. It will nourish sturgeon, but 40 percent or more of the fish die because they can't or won't eat the artificial food. And that problem baffles the researchers. It also makes them worry that when they get females old enough to breed, there may be nutritional requirements that they don't understand and which must be satisfied before a mature female begins to produce eggs. Says Doroshov, "Sexual differentiation is very late in sturgeon and the mechanisms are largely unknown."

Female sturgeons don't breed in the wild until they are 12 or more years old, and then, it is thought, they may only breed every third year. Captive fish grow twice as fast as wild fish because in the constant warmth of laboratory tanks, they don't slow down their metabolic rates for winter cold. But it still takes five or six years for a female to attain the age of maturity. And the West Coast researchers are only in their fifth year of the project.

Success might launch California into the caviar race with the Russians. The Soviets have bred captive females, but they have not put the practice into commercial use. They still harvest wild fish, and that subjects their industry to wide variety in the quality of roe and requires them to catch large numbers of fish. A domesticated stock might ultimately be bred to the uniform quality most consumers seek. Those fish could produce the eggs and fish meat faster and in much greater quantities at lower cost.

The Davis researchers are now awaiting the maturation of their first captive female, which they believe should take place soon. They hope by 1986 to spawn their first wholly domestic offspring. After that, the domesticated stock may spawn an industry, producing both sturgeon flesh and caviar. "That's a dream at the moment,'' says Ken Beer, a Sacramento aquaculturist who is a former student of Doroshov's at the University and is now two years away from having his own domestic female of breeding age. "But I believe it will happen."

While the scientists are waiting, their efforts may be paying dividends

in another realm. The project produces large numbers of young fish, far more than the Davis facilities can hold. As a result, most of the hatchlings are returned to the Sacramento River to join the wild stock.

So far, the researchers have returned some 500,000 fry to the river. No one yet knows whether these releases are increasing the wild population. But similar efforts in Russia in recent years have helped to sustain the Soviet fishery. If the released fry increase the numbers of wild white sturgeon in California, the practice could be applied to help restore the badly depleted stocks of lake and short-nosed sturgeon in the East. So, the management techniques now being developed in California could be a boon to hard-pressed species in rivers all across the country.

Robert Rice
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