

Topic/Lesson:	History of Sturgeon Fishing on the East Coast
Subject:	Sturgeon fisheries management
Author:	Rob Yeomans
Time Duration:	Two 90 minute blocks or two 45 minute periods and one pre-arranged class period with middle school students.
Overview:	Students are to read the article, “The Decline of the North American Species,” by Inga Saffron which is located in the book, <u>Sturgeons and Paddlefish of North America</u> . Students are to use the article to create a visual presentation of the history of sturgeon fishing. Presentation styles can be poster, PowerPoint, song, Google Earth Tour, etc. The presentations will be used to educate students in younger grades (middle school) as to the plight of the sturgeon to increase public awareness concerning this species.
Objectives:	Students will be able to: <ul style="list-style-type: none"> • Trace the decline of the sturgeon over time. • Identify reasons for the decline. • Explain the role key players had in this fishery. • Contrast the past and present attitudes of people toward sturgeon. • Educate young people concerning sturgeon.
Materials:	<ul style="list-style-type: none"> • Inga Saffron’s article, “The Decline of the North American Species” in <u>Sturgeons and Paddlefish of North America</u> • Computers • Poster Paper • Various art supplies on hand that the students may need
Procedures:	<p>Day 1</p> <p>Near the end of class, ask the students what they know about sturgeon. Write all their responses on the board. Pass out the article to the students to read and take notes as a homework assignment. Tell the students they will be using the notes to create group presentations.</p> <p>Day 2</p> <p>Tell the class they will get into groups and create presentations that will be shown to middle school children concerning the plight of sturgeon. The</p>

	<p>presentation can be a poster, PowerPoint, Google Earth Tour, song or some other style that the group has. The presentation should:</p> <ul style="list-style-type: none"> • Be visually appealing. • Be age appropriate. • Tell the story of the history of the sturgeon. • Illustrate the importance of this species to humans over time. • Describe how people are working to bring the species back. • All members of the group must speak. Note cards are acceptable, but the students should make eye contact with their students at all times and not use their presentation as their source of information on which to speak. <p>Students have this entire class period to get into groups, decide their style and start creating their presentation.</p> <p>Day 3</p> <p>At the start of class, ask the students to list the important historical highlights of sturgeon. The teacher should write them on the board. Teacher should raise questions to direct the students towards any important points that the class missed. When complete, have the students divide into their groups to finish their presentations.</p> <p>Day 4</p> <p>Conduct presentations in middle school classes at pre-arranged time.</p>
Conclusion:	<p>The day after presentations, ask the class:</p> <ul style="list-style-type: none"> • How they felt about presenting • If they think their presentation informed their students • What they would do differently if they had to teach this topic again
Massachusetts Frameworks:	<p>High School English</p> <p>3.14: Give formal and informal talks to various audiences and for various purposes using appropriate level of formality and rhetorical devices (grades 9 and 10)</p> <p>3.17: Deliver formal presentations for particular audiences using clear enunciation and appropriate organization, gestures, tone, and vocabulary (grades 11 and 12).</p> <p>High School Biology</p> <p>6.1: Explain how birth, death, immigration and emigration influence</p>

population size.

6.2: Analyze changes in population size and biodiversity (speciation and extinction) that result from the following: natural causes, changes in climate, human activity and the introduction of invasive, non-native species.



Sturgeons and Paddlefish of North America

Edited by

Greg T.O. LeBreton
F. William H. Beamish
and
R. Scott McKinley



KLUWER ACADEMIC PUBLISHERS

DORDRECHT / BOSTON / LONDON

A C.I.P. Catalogue record for this book is available from the Library of Congress.

ISBN 1-4020-2832-6 (HB)
ISBN 1-4020-2833-4 (e-book)

Published by Kluwer Academic Publishers,
P.O. Box 17, 3300 AA Dordrecht, The Netherlands.

Sold and distributed in North, Central and South America
by Kluwer Academic Publishers,
101 Philip Drive, Norwell, MA 02061, U.S.A.

In all other countries, sold and distributed
by Kluwer Academic Publishers,
P.O. Box 322, 3300 AH Dordrecht, The Netherlands.

Printed on acid-free paper

Cover design and art by Paul Vecsei.

All Rights Reserved

© 2004 Kluwer Academic Publishers

No part of this work may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording or otherwise, without written permission from the Publisher, with the exception of any material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work.

Printed in the Netherlands.

INTRODUCTION

THE DECLINE OF THE NORTH AMERICAN SPECIES

INGA SAFFRON

isaffron@phillynews.com

*Forth upon the gitche gumee,
On the shining Big-Sea-Water,
With his fishing-line of cedar,
Of the twisted bark of cedar,
Forth to catch the sturgeon, Nahma,
Mishe-Nahma, King of Fishes,
In his birch canoe exulting
All alone went Hiawatha.*

-Henry Wadsworth Longfellow, Song of Hiawatha, 1854

When the poet Henry Longfellow dispatched his noble, Native American, savage Hiawatha on his heroic quest, it made complete sense that the object of that quest should be an equally noble, Native American beast: the sturgeon. Like Melville's whale, Longfellow's sturgeon was viewed in the popular imagination of the 19th Century as a strange and fearsome creature. Back then, the sturgeon was also a common fish in North American waters. Every spring, as throngs of sturgeon and paddlefish began their commute up the rivers to spawn, ferryboat passengers and fishermen were treated to an awesome spectacle of madly swimming fish, leaping like circus performers as they jostled for room.

Yet a mere century and a half after Longfellow's poem first inspired schoolchildren with its irresistible rhythms, it is a good bet that few non-specialists realize the sturgeon once roamed the continent's waters. Numerous as it was, the sturgeon disappeared with astonishing speed in the last quarter of the 19th Century, after fishermen discovered that big money could be made selling its salted roe to European gourmands. The story of how the sturgeon populations were wiped out so quickly is an instructive one, particularly for those who are concerned about the future of these ancient creatures in the Caspian Sea.

The tale begins some 4,000 years ago in North America. Catching a quarter-ton sturgeon was no easy thing for Native American fishermen. Their reed nets easily broke apart under the force of the sturgeons' determined swimming and its sharp

scutes. Eventually, though, they mastered the technology of building weirs out of tree trunks and branches. This innovation enabled Native American fishermen to trap the migrating sturgeon in watery pens where they could be more easily speared and landed. For American Indians, sturgeon was a great delicacy because of its meaty flesh. The Indians dried, pounded and smoked the flesh to preserve what could not be consumed immediately. They probably did much the same thing with the eggs, and some East Coast tribes are also believed to have baked the roe in maple leaves. But Native Americans never made the culinary leap of their Eurasian cousins living near Caspian Sea and figured out to use salt to preserve the sturgeon roe - creating the delicacy we know today as caviar.

The first European settlers to arrive in North America were both amused and repulsed by the Indians' quest for sturgeon. Some tribesmen working the East Coast rivers would attempt to lasso the sturgeon using ropes made of twisted grapevines. Others preferred to attach a harpoon to the grapevine rope. As often as not, the sturgeon would bolt to the bottom after being speared, leading the fisherman who was holding the rope on a wild ride. According to Robert Beverly, an 18th Century chronicler who witnessed the fishing technique in Virginia, any fishermen who succeeded in catching a sturgeon was "counted a cockarouse, or brave fellow." Less risky techniques often worked just as well. In the western rivers of British Columbia, the native fishermen liked to paddle their canoes in close formation and probe the river bottom with long poles until they sensed a sturgeon, which they would then attempt to harpoon. The extraordinary sight was described in 1864 by Sir Arthur Birch, the colonial secretary in British Columbia, in a letter to his brother:

"All the Indians now fishing and it is great fun to watch them spearing sturgeon which here run to the enormous size of 500 and 600 lbs. The Indians drift down with the stream perhaps 30 canoes abreast with their long poles with spear attached kept within about a foot of the bottom of the river. When they feel a fish lying they raise the spear and thrust it at the fish seldom missing."

Despite such amusement, the early European settlers were loath to imitate the Indians and consume either the flesh or the eggs of the sturgeon. The settlers willingly devoured Chesapeake oysters, worked the New England cod banks, enjoyed enormous amounts of shad, and happily adapted other native foods such as corn and potatoes, yet they remained deeply suspicious of the large, scute-armoured sturgeon well into the 19th Century. As for the roe, they completely ignored its gourmet possibilities until the last quarter of that century. It is unclear why this was the case.

Back home in England, the sturgeon was listed in the fishing laws as a royal fish, meaning that the king or other high official was entitled to claim the catch. While caviar was rarely available in Great Britain before the 19th Century, its reputation as a high-falutin' ambrosia had already seeped into literature. Shakespeare famously used caviar as a metaphor for something was over the heads of the general public. In theory, the reputation of the sturgeon and its eggs should have made it a highly desirable source of food in the New World. Indeed, in an effort to lure potential settlers, some 17th Century shipping advertisements made a point of mentioning the abundance of sturgeon in American rivers. The James River in Virginia, one of these posters boasted, had a "deep and bold channel so stored with sturgeon and other sweet fish as no man's for time hath ever possessed the like." But when the colonists actually came face to

face with the storied sturgeon in the wilds of America, and saw its enormous, rooting snout and rough armoured plates, they lost any desire to make a meal of it.

Given the emphasis on the sturgeon fishing in the official advertisements, it is especially strange that the first Jamestown colonists arrived in the Virginia wilderness with neither without fishing nets nor supplies of salt - sort of like arriving at the base of Mt. Everest without fleece and boots. During the first year in America, the Jamestown settlers made no attempt to fish at all. By 1607, however, their corn was exhausted and they were facing starvation. Hunger finally got the better of the colonial gentlemen. At the urging of Captain John Smith, the colonists made their first primitive efforts to fish for sturgeon: They waded into the James River brandishing frying pans and swords in the hope of spearing a meal. As ridiculous as they must have looked, they somehow managed to catch a few sturgeon in shallow water using this method. The fish the Europeans loved to hate kept them from starving that season.

Writing in his diary, Smith recounted: "Wee had more sturgeon than could be devoured by dogge and man." To concoct an edible dish, Smith's party dried and pounded the sturgeon meat, then mixed it with roe, sorrel and other herbs. Encouraged by their modest success at fishing, the London Company, which had dispatched the group to America, requested that the colonists send a few barrels of salted roe home to be sold in the Baltic, where the local demand for caviar was growing. By this time, the colonists must have acquired salt, and they were able to assemble something that passed for caviar. The salted eggs were packed and loaded onto boats for the long journey back to Europe in 1608. But by the time the caviar barrels arrived on the London dock in 1609, the stench of decay was evident. Somewhere along the way, the Jamestown colonists had messed up the recipe.

Meanwhile, in Jamestown, conditions deteriorated. Fed up with their patrons and preoccupied with their own survival, the colonists refused to spend any more time developing a caviar business for the London Company. As soon as the famine passed, so did their taste for sturgeon. Nothing that came close to resembling caviar would be made in North America for another 200 years.

The Jamestown experience set the tone for other colonists. While settlers in North America did occasionally consume sturgeon, it was always reluctantly, when there was no other food available. One explanation is that the English colonists were not really familiar with the fish, despite its high esteem in royal law or the enthusiasm expressed in sailing advertisements. Sturgeon landings were rare in British waters, so it is likely that few ordinary Englishmen had actually encountered the fish before sailing across the Atlantic. It also appears that the European settlers were repulsed by the sturgeon's strong, oily smell, which clung to the Indians who gorged themselves on its meat. Sturgeon, for them, was a food for more primitive people. The newcomers initially felt the same way about salmon and lobster, two sea creatures that were equally beloved by Indians. As the Europeans struggled to make their way in the wild land, it seemed that eating such a grotesque bottom-feeding fish as the sturgeon would be the equivalent of sinking into barbarism. If a sturgeon did wander into their fishing nets, they usually bashed the fish on the head, tossed the carcass on the offal heap and fed the roe to their pigs. Their resistance to the meaty fish baffled the explorer Henry Hudson. "There are plenty of sturgeon which the Christians do not make use of, but the Indians eat them greedily," he wrote in a report to the East India Company in 1609. The days of the American caviar rush were still a long way off.

In time, the American colonists did find a profitable use for sturgeon flesh: feeding slaves. Sturgeon meat was cheap and filling, nobody else seemed to want it. The sugar plantations that occupied almost all the arable land in the Caribbean had large labour forces that needed to be fed. The plantation owners were always struggling to keep their costs down. Indeed, that was one of the main justifications for slavery in the first place, and they were continually on the look out for low-cost, high-protein foods. Slaves in the West Indies needed to consume large amounts of salt to endure the crushing work of chopping cane in the broiling tropical sun. Salt cod, and then salt shad, became staples of the plantation diet. Indeed, shad fishing was big business in North America at that time. Sturgeon fishermen felt there was room in the market for their product, too. In 1753, a New Jersey merchant named Edward Bradfield started a business processing Delaware River sturgeon, which he hoped to market to the Caribbean trade. The meat was packed in barrels and transported by ox team to New York and Philadelphia before being shipped to the plantations. Jonathan Richmond soon set up a rival sturgeon business in Trenton in 1770, which he advertised in the *Pennsylvania Gazette*:

“CHOICE PICKLED STURGEON, cured in the Baltick manner, by JONATHAN RICHMOND, at Trenton Falls; WHO, by his experience these seven years in the business, and not trusting to hired servants or slaves, who often spoil, by not putting up the proper part of the fish, as many so curing neglect. By observing the following directions, to preserve the fish, draw the cork or bung of the keg, and pour out the pickle in a clean basin or pan, then knock up the hoops, and take out the head that is branded, and take what fish you want out, then harden on the hoops, and put the cork in as before; then pour in the liquor into the keg, if not enough to cover the fish, add a little of the vinegar to it, and take a coarse double cloth, and spread it over the head, then put the head on the cloth, and a stone or weight over the head, to keep it close from the air, and it will keep good in the warmest climate, and warrant it good.”

Jonathan Richmond struggled with the same problem that had vexed the ancient Greeks, the medieval Venetians and the Jamestown colonists: how to keep sturgeon from going bad on its way to market. Because the 18th Century sturgeon business was directed at the slave market, the early entrepreneurs didn't even bother to export the delicate roe. Perhaps if there had been a bigger domestic market for sturgeon, as there was for cod and shad, the fledgling sturgeon merchants might have considered such a boutique product. But almost 200 years after the Jamestown colonists turned up their noses at sturgeon, virtually no middle class people in America ate the fish. Sturgeon remained a food for the great unwashed - for Indians, servants and slaves.

Despite the distaste for sturgeon, the fish was an object of curiosity. On the Delaware River, 19th Century shad fishermen reported seeing thousands of Atlantic and Shortnose sturgeon heading toward Philadelphia and the spawning grounds beyond. They were compelled to pull in their nets to prevent the crazed sturgeon from tearing them apart. As early as the 1650s, William Penn had fretted that the huge beasts would capsize a fisherman's boat. We don't know how often that occurred. But one day in the early 1800s, while the steamboat *Sally* was heading north from Philadelphia, witnesses standing near a porthole saw, “a large sturgeon in jumping made such a leap that it passed clear through one of these windows and landed in the vessel, where it was killed.”

In the 1840s, a small article appeared in a Philadelphia newspaper reporting that a Russian immigrant had settled on Ridley Creek, a Delaware tributary a few miles

below Philadelphia, and was offering fishermen a dollar for each live sturgeon they brought him. What is notable is that he kept the sturgeon in a river pen, much as the Russian sturgeon fishermen do today, so the roe could be taken at its peak from a live fish. This Russian, whose name is not recorded, sold the meat in New York and made oil from the heads. Unlike his predecessors in the sturgeon business, he did not throw away the roe. It was salted, packed in tin cans, and exported to France, Germany and Russia. The anonymous Russian had started America's first successful caviar business.

*

A Russian may have figured out how to prepare good caviar from American sturgeon, but Germans made an industry out of it.

Bendix Blohm, the first of these German caviar dealers, could not have been more ill prepared for the role. Born in Holstein, the region north of Hamburg, he immigrated to America in 1852 intending to start a business exporting pickled sturgeon back to Germany, where it was prized. He set out without knowing the first thing about making caviar.

Blohm, who was already 41, headed for New York's Hudson River. He had no doubt heard that American fishermen thought so little of the sturgeon that they tossed them on the trash heap. In reality, Blohm's information was already out of date. The efforts of Jonathan Richmond had begun to pay off. By the 1850s, the influx of poor immigrants from Europe had created a potential new market for cheap sturgeon meat. Immigrants were accustomed to eating a wider range of foods than the squeamish Americans of English descent eat. Smoked halibut had been the immigrants' favourite fish, but when halibut prices shot up, they had no qualms about switching to sturgeon. Some maintained that sturgeon even tasted better than halibut. Hoping to cash in on the new demand, a New York smokehouse began in 1857 to process sturgeon, which street peddlers sold door-to-door in immigrant neighbourhoods. Hudson River fishermen nicknamed the cheap sturgeon meat “Albany Beef.”

The development of a profitable domestic market for sturgeon meat finally gave American fishermen an incentive to go after the fish. They also began to look for ways to maximize their profits. Boiling down the head and other waste for oil was one way. Sturgeon yielded an oil that was less smoky than sperm oil from whales and lasted longer. Isinglass gelatine could also be made from the sturgeon's swim bladder. Before the discovery of isinglass in the early 19th Century, gelatine had been derived from boiling beef bones, a time-consuming and expensive process. The availability of cheap sturgeon gelatine coincided with the new middle-class fad for jellied concoctions, made with fruit or meat.

Fishermen now began to think about doing something with the roe besides using it for pig feed. In 1849, a Boston entrepreneur named N.K. Lombard, attempted to set up a caviar business in Woolwich on Maine's Kennebec River. He bought about 160 tons of sturgeon - roughly 1,000 fish - and extracted the meat, oil and roe. The meat and oil sold well, but the caviar was a disaster. Lombard had apparently undersalted it and the entire batch spoiled. The following year Lombard did not spare the salt. Another disaster. He abandoned the business in 1851.

When Bendix Blohm began fishing on the Hudson the following year, he was just as clueless as Lombard was about preparing the roe. The sturgeon that Blohm managed to catch were sent directly to New York City to be turned into Albany beef. Fishing on the Hudson proved much less profitable than Blohm expected. The strong tides limited the amount of fishing he could do. From the city of Troy, south to Manhattan, the

Hudson is really an extension of the sea, an estuary with powerful tides that wash up from New York harbour. The mildly salty estuarine waters are ideal for sturgeon but terrible for fishermen. There are only a few hours during the day when the water slackens enough to let out a seine net. Blohm fished this way for a decade, catching just enough sturgeon to survive, but never producing any caviar. When the country went into an economic slump following the Civil War, Blohm decided to take his boat and nets to Penns Grove, New Jersey and the calmer waters of the Delaware.

Penns Grove is an old-fashioned small town located on the western shore of New Jersey where the state bulges into the Delaware. It has straight shady streets and sprawling Victorian houses. Because the Delaware coast is so marshy, most towns in the area are located a few miles inland on the higher ground. But Penns Grove developed in one of the few places where the fast land extends right to the Delaware, making it a convenient port. Steamers from Philadelphia docked right at the foot of West Main Street, depositing families eager to spend a few weeks away from the city.

Whatever its other attractions, Penns Grove's main business was fishing. When the shad and herring started running in March, the men would cast off in their dories and not come home until the fish was piled up to the sails. The local people still viewed sturgeon with the same disdain as most American fishermen, despite the growing market for Albany beef among the inhabitants of New York's tenements. Blohm was delighted to with the situation. He was the only fisherman working the rich sturgeon grounds south of Penns Grove. The fish coursed up the Delaware in huge numbers, far more than in the Hudson, and in the calm waters, the advancing horde could be virtually skimmed off the bottom with seine nets.

Blohm still knew nothing about making caviar. But determined to expand his business, he invited a couple of Germans from New York to come down and teach him the process. Blohm rented an old sawmill where they could work, and by the spring of 1870, they were shipping caviar by the barrel back to Hamburg.

With his new foolproof recipe and his German connections, Blohm began to turn caviar into a commodity. Men all over America were eager to try new enterprises now that the ravages of the Civil War were finally over. Blohm hired six Penns Grove fishermen to fish exclusively for sturgeon, paying them a generous \$25 to \$35 a month. On the opposite bank of the Delaware, the bustle of the times could be gauged by the plumes of black smoked wafted over Philadelphia from its many factories. The city took pride in being the workshop of the world. Philadelphia was now the second-biggest city in America. Men who had been ordinary soldiers in the Civil War were making their fortunes by turning out locomotives, men's hats, and carpets, and they hungered for emblems of their newfound status. In the past, socially prominent Philadelphians had disdained extravagant shows of wealth, but new entrepreneurs had different tastes. The Caldwell jewellery store found it hard to keep up with orders for diamonds. An exotic food like caviar appealed to this ambitious business set.

As his caviar business grew, Blohm dug a pond near the river so he could hold live sturgeon until the roe was ripe and could be packed for its trip across the ocean, just as his Russian predecessor had done at Ridley Creek. Transatlantic steamships now ran regularly from Philadelphia to the continent. The idea that a wealthy family in Hamburg could enjoy sturgeon roe packed in New Jersey didn't seem as fantastical as it had just a few years earlier. Blohm could also send the sturgeon meat up to New York on the Pennsylvania Railroad train. The telegraph lines that had been installed in the 1850s made it possible to wire orders in the morning and have the goods on the

train the same day. Instead of pickling the sturgeon meat as he had sometimes done in the past, Blohm decided there was a stronger market for smoked fish. Blohm's caviar business, which had seemed like an eccentric gamble before the war, seemed to be part of America's growing optimism as the centennial celebrations of 1876 approached. Increasingly Philadelphia's new middle class found the time to ride the ferry across the Delaware to spend a summer day in Penns Grove. Thomas Eakins, one of the greatest painters of the era, and a Philadelphia native, scoured many Jersey fishing towns for subjects. He painted a series of canvases depicting men working the shallow-bottomed shad boats and hauling in large seine nets. The equipment used to catch shad was virtually identical to that used for sturgeon. Penns Grove's shad men couldn't help but notice Bendix Blohm's success. Pretty soon, they stopped throwing away the sturgeon trapped in their nets. The American Caviar Rush had begun.

*

Like the Gold Rush out in California, the Caviar Rush was short, intense and made relatively few people rich. The Caviar Rush also produced its own boom town, a jumble of crudely built wooden structures on the New Jersey side of the Delaware, at the point where it stops being a river and starts to become a brackish bay. Fishermen were soon calling the town Caviar.

For a brief time during its brief existence, Caviar was the Astrakhan of America. The little New Jersey boomtown shipped more of the world's caviar during the 1880s than any single place on earth. It had a hotel, post office, restaurant, ice house and its own rail line, which reportedly sent 15 train cars packed with caviar up to New York every day. Nearly all of it was transferred to steamers bound for Europe. Some of New Jersey's caviar even went to Russia. Caviar's advantage over Penns Grove was that it was some 20 miles closer to the sturgeons' main spawning grounds at the head of the bay. The land at Caviar spilled right down to the water, as it did in Penns Grove, so fishermen could easily pull up to the docks and unload their catches. Recalling the town's bustle a few decades later, a fisherman named George Pyle penned a nostalgic ballad to Caviar:

"I saw great fleets of fishing skiffs.
Come down before the gale,
Like a great flock of sea gulls,
So snow-white was each sail."

Today, the town of Caviar is no longer visible. The opportunistic phragmites has run amok, carpeting the rotting foundations of the processing sheds and dormitories with a high cover, which stretches in every direction, all the way to the milk-bottle tower of the Salem nuclear power plant hovering on the horizon. Not a single one of the dozens of buildings remains. The tracks of the railroad have been asphalted over. Even the town's name has been eclipsed, replaced by the generic Bayside. Only the Delaware remains as it was, a broad, implacable, greenish expanse.

The sole evidence of Caviar's bustling port are a few wooden pilings poking their wrinkled necks out of the water near the mouth of Stow Creek, and some black-and-white photographs filed in the local historical society. They show a regiment of wharves projecting from the shore, each one thronged with activity. In one image, a group of bowler-hatted men hover at the edge of a pier, waiting to greet a skiff loaded with sturgeon. Nearby, a workman stands next to a hoist as he prepares to lift a huge

fish out of the boat. Behind him in the distance you can make out the shanties where fishermen lived during the season. Fishing nets are draped like hammocks to dry on the piers. Some belong to Wyatt Miller, a descendant of slaves, who made enough money repairing nets to open a restaurant in Caviar. In one of the open-air processing sheds, the sturgeon are stacked like logs. A workman in high boots rips open a fish's belly to reveal a bulging clump of eggs. In another picture, three men tentatively massage the sturgeon eggs over a sieve. A few steps behind them, women in high-necked blouses and ankle-length skirts smile in delight as the eggs are transformed into caviar.

In 1895, Boyd's Cumberland County directory listed 22 caviar and sturgeon wholesalers with offices in the town. During the fishing season, Caviar's population swelled from a few dozen to 400 people. Fishermen bedded down in dormitories, ready to jump into their boats whenever the tides commanded. These were usually 26-foot skiffs equipped with both sails and oars, but some fishermen had the misfortune to work from houseboats. These were foul-smelling barges with a single cabin where fishermen slept, ate, gutted fish, and made caviar.

*

In 1865, when the Civil War shuddered to an end, caviar the food and Caviar the town were still unknown.

While sturgeon fishing had become an important industry on the Hudson by the late 1850s, the Caviar Rush did not hit the Delaware River until two decades later, when returning Civil War soldiers and newly freed slaves were searching for ways to make a living. One of the men looking for work was Charles A. Dolbow, a Penns Grove fisherman descended from Swedes who had settled on the Jersey side of the Delaware during the time of William Penn. The Dolbows made their livings as farmers and fishermen.

After the war ended, Charles Dolbow was lucky enough to find a job with Bendix Blohm and his new caviar enterprise, as captain on a sturgeon boat. He would have much preferred to work for himself. But like many of the town's fishermen, he lacked money and connections, not to mention experience at making caviar. If he hoped to start his own operation, Dolbow would need to save enough money to buy his own set of boats and nets.

His luck began to change in 1873, when two more Germans from Hamburg arrived on the Delaware coast. They were the sons of Dieckmann & Hansen, the big German dealer that produced caviar from European sturgeon caught in the Elbe River. Peter Hansen and John Dieckmann had left Hamburg with instruction to sign up American caviar suppliers.

But they quickly discovered that, other than Bendix Blohm, none of the American fishermen knew the first thing about making the delicacy in 1873. The Germans realized they would have to start from scratch if they wanted American caviar suppliers. They spent the year travelling along the East Coast, handing out nets and sieves to fishermen and teaching them the fine points of salting sturgeon roe. Charles Dolbow eagerly signed on with Dieckmann & Hansen, and in exchange the Hamburg firm lent him \$500 to purchase the equipment he needed to start his own business. In 1876, Dolbow was able to leave his job with Blohm and establish his own fishing camp in Caviar. He shipped 1,300 sturgeon to New York his first year, and invested some of the profits in a schooner-full of ice from Boston. The ice, which arrived the following spring, would fill a refrigerated storehouse for caviar and sturgeon meat. In a matter of a few years, Charles Dolbow and his son Harry would become Dieckmann & Hansen's

most important supplier in America. The two Penns Grove fishermen were so successful that by the 1880s, there was a good chance that a dish of caviar appearing on a German table had originated in New Jersey and was packed by a Dolbow.

Other German caviar merchants followed Dieckmann & Hansen to America. P. Feddersen, a Berlin dealer, found his way to the tiny island of Solomons on the Chesapeake in southern Maryland, where he contracted with a prominent oyster fishermen named Joseph C. Lore. Feddersen provided Lore with barrels, strict instructions about salting and a good supply of Germany's renowned Luneburg salt. Along the Atlantic seaboard, sleepy fishing ports went to work to satisfy Europe's caviar hunger: Chester in Pennsylvania, Port Penn in Delaware, and Savannah in Georgia. A decade after Dieckmann & Hansen arrived in America, there were more than 900 watermen trawling for sturgeon along the Atlantic coast.

Most of the American caviar was sent to Europe, but sometimes second-rate batches were sold domestically. A few New York bars began handing out free caviar sandwiches, in the hope that the salty snack would increase drink orders. The Denver and Rio Grande railroad offered caviar in its dining car, for the same price as a plate of olives and celery, two other novel delicacies. Most of the caviar was processed with a salt ratio of nine to ten percent, double today's standard, in an effort to prevent spoilage. The Dolbows also offered a better grade with five-percent salt, but only for the European trade.

The Delaware was where America's caviar industry began, and it was Delaware fishermen who dominated fishing up and down the East Coast. Because the sturgeon started spawning earlier in the warm, southern rivers, the northerners shipped their boats by rail to Georgia around February to meet the first runs of sturgeon. Working their way north river by river, the Delaware fishermen followed the sturgeon until they reached the town of Caviar. They started in the Savannah River, put their skiffs on a flatbed train for Virginia, moved on to the James River, hopscotching up the coast from the Potomac River, to the Patuxent, Chesapeake and Delaware, where the season lasted until the end of June.

Chasing the sturgeon north, a fisherman could earn good money, more than if he stayed home to wait for the shad run. It was tough work, though. Sturgeon nets weighed 200 pounds even when empty, and quite a bit more after they were pulled up wet and loaded with fish. Fishermen spent nearly the whole day on the river when the sturgeon were running. A single ripe female brought \$2 at the wharf. That was a hefty sum when a workingman's weekly salary might be \$10. By 1897, the price for a female sturgeon swollen with eggs had jumped to \$30.

Not every sturgeon was of equal value. American fishermen learned to rank sturgeon in the 19th Century much as Russians do today, saving their highest regard for egg-laden "cows." Most fishermen had no qualms about salting the roe from "runners," female fish caught before their eggs were hard and ripe, even though the caviar was second-rate. It could be sold as sandwich caviar. As for the male "bucks" and the female "slunkers," which had already given up their burden of eggs, they were good only for meat. The juvenile "mammoses" were nearly worthless. After fishermen had paid their expenses, they could take home \$500, enough to spend the rest of year sitting around, telling stories and mending nets.

For ambitious fishermen like Charles Dolbow, who processed the fish himself, the profits were even higher. He arranged to sell everything separately, the caviar, meat, isinglass, and oil. Caviar naturally commanded the most money. German dealers were

paying \$9 for a 135-keg of caviar in 1885, but fifteen years later the cost shot up to \$100 a keg. Fishermen had never seen such prices for any other fish. In 1908, a professor at the University of Pennsylvania named Walter Tower, published a short history of the sturgeon fishery. "Nowhere else in the whole annals of commercial fisheries," he concluded, "is there a parallel to this case of sturgeon, rising as it did in less than a quarter of a century from a fish despised and ruthlessly destroyed...to the highest rank of commercial value." Most fishermen expected the prices to keep rising.

With all that money being made off the sturgeon, fishermen failed to notice that they were catching fewer of them. In the 1870s, fishermen caught an average of 65 sturgeon each time they hauled their heavy nets out of the water. A decade later, the average had fallen to 30. At first it didn't matter if there were fewer sturgeon struggling in the gill net because the price for a cow was doubling every year. The Delaware, always the most fruitful of the east coast rivers, saw its total catch drop by half between 1890 and 1897, from five million pounds down to two and a half million, yet fishermen's incomes remained stable, or even increased.

By then Dieckmann & Hansen was firmly established in America. Ferdinand Hansen, a grandnephew of the company's founders, arrived in 1886 to run the firm's New York office and oversee operations in Penns Grove and Caviar. Although Hansen was just 17, he had enough experience in the caviar trade to recognize what the falling catches meant. It had taken barely 30 years to pick the Elbe River in Germany clean of sturgeon. In 1899, exactly 29 years after Bendix Blohm made his first batch of caviar in Penns Grove, Delaware fishermen averaged only eight sturgeon in a net. Dealers scrambled to find enough American caviar to satisfy Europe's appetite. Some fishermen made crude attempts to pass off other fish roes as sturgeon caviar. The Berlin wholesaler P. Feddersen wrote to his Chesapeake supplier Joseph Lore in June 1899 to vent his frustration, and to beg for the real thing:

The season, "is pretty well done.... There is a big lot (of) Chesapeake caviar in the market. Where does it come from? One man wrote me he had 25 kegs and another party had 150 kegs in N.Y. I went there, but I like to buy caviar made out (of) sturgeon roe, but not dirt - shad roe - put up. I tell you there is some bad stuff in the market."

The season of 1900 marked the 30-year anniversary of the American caviar industry. After three decades of relentless fishing along the East Coast, vast numbers of spawning sturgeon had been taken out of the reproductive pool. The fish that should have been spawning for the first time in 1900 had never been born. Their eggs had long ago been eaten. That year, sturgeon stocks crashed in every river along the East Coast. In the James, in the Chesapeake, in the Delaware, fishermen pulled up empty nets. Some years later, Charles Dolbow's son Harry, who had taken over the business and changed his family name to 'Dalbow,' would recall bitterly that, "caviar never got a decent, respectable price until the failure of 1900." European dealers closed their American operations. Others moved west, to the Great Lakes and the Pacific coast. Dieckmann & Hansen did not give up their American operation entirely, but the firm's attentions were now focused on the rich Russian fishing grounds. In 1895, they started making caviar on Siberia's Amur River, and then moved to Astrakhan in 1902. The supplies from Russia more than made up for the decline in American production. Harry Dalbow continued to fish the Delaware, and Ferdinand Hansen continued to buy from him. But everyone sensed it was the end of something. The start of the 20th Century

marked a watershed for the Volga as well as the Delaware: Astrakhan produced 29,800, tons of sturgeon in 1900, a record that would never again be surpassed.

*

Harry Dalbow wasn't ready to believe that caviar was over. In 1891, he had formed a partnership with one of his relatives, Joseph "Yaller" Dolbow. They started with a pair of sailboats moored at Caviar, but were confident enough in the future to invest in the new gasoline-power engines. Eventually they built a fleet of twenty boats.

Many fishermen came to believe that the sturgeon fishery needed regulation to survive, and made attempts to police the bloody free-for-all. In 1904, fishermen from Caviar, Chester and Port Penn gathered in the Davis Hotel in Philadelphia to form the Sturgeon Fisherman's Protective Society. The first item on the agenda was a proposal to throw back any sturgeon measuring less than four feet. Such young fish could not possibly have ripe eggs. But some fishermen contended the effort was pointless; most of the fish would be dead or injured before they could be separated from the nets. Ferdinand Hansen pursued another tack. He appeared before the legislatures of New Jersey, Pennsylvania and Delaware and tried to convince them to fix a season for sturgeon fishing. By cutting off fishing on May 15, he suggested that a portion of the sturgeon population would be spared and given a chance to spawn. His plan was rejected, and years later, he complained that the lawmakers sided with the fishermen, who "preferred to kill the goose that laid the golden eggs." In a way, the crash of 1900 acted as a brake on fishing, thinning the ranks at Caviar. Even Yaller Dolbow gave up fishing in 1901. But Harry had been raised on sturgeon, and like the fish he stubbornly returned to the river he had always known.

Although Harry earned \$2,000 from sturgeon fishing in some years, the money was never enough to make him rich. After the fishing ended, he would often pitch in to work on Salem County vegetable farms, the gardens of the Garden State. South Jersey's vegetable industry was in its heyday. Growers sent truckloads of tomatoes, beans and asparagus to the area's booming canning factories like Campbell Soup in Camden. In the fall of 1906, Harry was helping out on a neighbour's farm on the assembly line where the tomatoes were being packed into tin cans and sealed using a new vacuum process. As Harry tamped down the lids he had a small epiphany. Why couldn't caviar be packed in small, airtight containers and sealed shut? He did not have to go far to test his idea. South Jersey was a hotbed of innovation in the new science of food preservation. While the French chef Nicolas Appert had invented the first reliable canning and bottling methods in 1809, South Jersey farmers built on his discoveries and, in 1847, they produced the first canned tomatoes for commercial sale in Jamesburg. The acceptance of canned foods expanded during the Civil War, when Union troops were fed on canned pork and beans, canned sardines and canned succotash. The American-Can Company became one of the largest employers in South Jersey. Harry decided to ask the company to design a machine that could pack caviar just like tomatoes.

The marriage of canning and caviar could not have happened a more propitious time. America's ancient sturgeon populations, so abundant at the nation's birth 200 years earlier, were vanishing in every river. The Atlantic Sturgeon had been reduced to a few scattered populations of fish by 1900. Catches of White Sturgeon in the Sacramento River peaked in 1885, and California banned sturgeon fishing altogether in 1901. Although the White Sturgeon in the Columbia River was not fished commercially until 1888, the stocks there were exhausted there in 12 years flat. Lake

Erie, which had yielded 5 million pounds of sturgeon in 1885, sent a mere 200,000 pounds to market ten years later. Fishermen resorted to making caviar from the roe of the Mississippi Paddlefish. Dry and grainy as it was, they passed it off as Russian caviar.

The Native Americans who had the sturgeon to themselves for so long found their survival threatened by insatiable demand for caviar. "A good many whitemen are yet fishing now near Harrison River, openly stealing our fish, our only food. They want to see us starving, we cannot bear it," four Chilliwack chiefs from British Columbia complained in an 1894 petition to the Canadian government. Unless something was done soon, they warned, Indian fishermen would surely resort to violence to destroy the commercial hook lines draped across the rivers. By 1902, the sturgeon on the Harrison River were hardly worth the commercial fishermen's time. What remained was left to the Indians. But the prospects for these original Americans were almost as bad as the sturgeon's.

Greedy fishermen were not alone in killing off the sturgeon. Pollution was taking its toll. The Delaware River, which had been clean enough in the early 19th Century for ships to fill their water casks in mid-channel, was now a cesspool, so slick with oil from the Philadelphia refineries that it was known to combust into flame. The building boom that followed the surge of immigrants had also damaged the river. Silt from construction, new roads and farms poured in the Delaware and the Chesapeake, forming a cushion of silt over the hard rocky surfaces where sturgeon liked to spawn. Out west, the run-off from sawmills around the Great Lakes reduced the oxygen levels, suffocating both the rivers and the sturgeon.

As fishermen scoured America's rivers and lakes for the remaining sturgeon, it was becoming increasingly difficult to fill the standard 135-pound keg. Those wooden barrels had hardly changed from the ones used in Catherine the Great's time, and looked old and crude in an age of gasoline-powered engines and airplanes. Harry Dalbow's canning operation offered a sleek and modern successor: the little glass jar. With American-Can's help, he not only mechanized the packing of caviar, he put the delicacy into individual glass jars and tins that could be sold directly to consumers. The jars were intentionally small, two and four ounces. By packing the caviar in smaller containers, Harry was able to make his limited supplies of caviar go further. He could also charge a lot more, too, when people were buying it by the ounce instead of the keg. The canning machine turned out to be a profitable form of rationing the remaining American caviar.

Dieckmann & Hansen recognized that Dalbow's idea would change the way people thought about caviar. No longer would it be ladled out of giant barrels. From then on, caviar would be sold like precious gems in the finest shops. The vacuum-sealed jars and cans also had the advantage of extending caviar's freshness. Caviar could now be pasteurized, giving it a shelf life of a year or more. The pungent smell of decomposing eggs would become mostly a memory.

In 1912, Harry sailed to Europe on the *Lusitania* to instruct Dieckmann & Hansen's staff in the secrets of canning. He spent several months in Astrakhan, the main port on Russia's Caspian Sea coast, teaching workers at the packing house how to use the canning equipment. Soon after he arrived home, his partner Ferdinand Hansen opened America's first retail caviar shop on the ground floor of the Waldorf-Astoria Hotel in New York. Hansen, who had previously used the trade name 'Russian Caviar,' decided that the product needed a more romantic sounding name for its label than the family

names his ancestors used. He wanted something exotic, something Russian, something that evoked wealth. The obvious name was Romanoff Caviar, after the Russian royal family. With the American rivers exhausted, Hansen expected that most of the caviar in the tiny jars would soon be Russian, anyway. He was right. Unable to find enough caviar to fill a sufficient number of one-ounce jars, Harry Dalbow shut his cannery and sold his boats in 1925. Just a half-century after Americans began to make caviar, the sturgeon were virtually gone.

*

A few isolated sturgeon populations remained, however, along the Pacific coast. Recognizing the environmental damage that had been done by unchecked fishing along the East Coast, the western states gradually began to impose the kind of fishing restrictions that Ferdinand Hansen had advocated. The result was that the dominant species, the White Sturgeon, survived in more rivers and in larger numbers than its Atlantic and Midwestern counterparts. While pollution continued to take its toll on the water quality, large-scale commercial fishing fell off. Other than Indians and sports fishermen, few people had any reason to bother with North America's biggest sturgeon until the 1990s.

The collapse of the Soviet Union in 1991 changed that. For much of the 20th Century, there was simply no point to making American caviar. There were still large numbers of sturgeon in Soviet-controlled waters of the Caspian Sea, Black Sea and Amur River, and the Soviets were the world's caviar experts. The Communist government maintained total control over the market for this luxury product. Moscow determined how many fish should be caught each year, how much caviar produced, how much should be exported and at what price. Although the Soviet state was frequently unable to provide its people with adequate sausage, or design a television set that did not routinely short circuit and explode in its viewer's living room, the government managed to maintain caviar's allure as a luxury food for more than seven decades of its rule.

But when the Soviet Union collapsed, its disciplined caviar cartel soon followed. Poachers swarmed the banks of the Volga, Ural and Amur Rivers, and the caviar they made in their kitchen sinks and bathtubs was soon flooding into Europe and the U.S. New companies sprang up to distribute this bootleg caviar. With so much caviar from so many sources on the market, prices fell swiftly. For the first time in its history, caviar became cheap.

It was around this time that caviar began to seep into America's food consciousness in a big way. Caviar had always been available from gourmet shops in America, but it took a bit of effort and knowledge to locate it. That situation changed soon once the Soviet Union and its trade restrictions fell apart. Caviar stores opened in big cities across the U.S. Buying caviar became a straightforward commercial exchange. The cans and jars were stacked prominently in glass display cases. You read the price list and made your choice. A clerk would wrap your purchase in an ice pack and hand it to you in a little shopping bag, often with the store's logo printed on it. Soon you could get reasonably good Russian caviar in airport terminals, via the Internet, even in suburban supermarkets. You could also buy a lot of congealed black goo. You might hear people on the train talking about how much they were ordering for New Year's Eve or see advertisements for caviar in newspaper food sections. Middle class people began to think of caviar as an aristocratic indulgence they could afford.

North American fish purveyors also began to think of the sturgeon differently. Instead of ignoring the local varieties, they began to wonder how they could profit from them. Once again, American fishermen turned their attention to native sturgeon and paddlefish populations, and once again entrepreneurs began to make caviar from American sturgeon. But this time, much of the new caviar production occurred under the controlled conditions of sturgeon farms.

*

Chuck Edwards led me into the dark warehouse and I followed, trying not to touch anything damp or slimy. As my eyes adjusted to the moist gloom, I saw what could be a swimming pool showroom after closing. Rows of vinyl pools stretched all the way to the back of the building. There was the same steady gurgling of filters, sucking the dirty water out and pumping the oxygen in. Every once in awhile, I heard a rustling that reminded me of dry dog food escaping its bag. I made out the shadowy forms of fish inside one of the pools. They were endlessly criss-crossing its circumference. When I leaned over for a better look, a fish poked its snout out of the water and gazed at me like a puppy wanting to be petted. "Go ahead. You can touch her," Edwards said. The sturgeon's sandpaper hide grated lightly on my hand as I slid it along the fish's armoured body.

As a zoology student, Edwards dreamed of being the next Jacques Cousteau. But instead of ranging across the seas on voyages of discovery, he now covers a smaller realm, stepping from tank to tank to check on the 100,000 or so White Sturgeon that inhabit the Stolt Sea Farm in northern California. The sturgeon are grouped in pools by age and size, starting with nearly transparent hatchlings that are still living off their egg sacks, and moving in stages up to the 80-pound, eight-year-old females, in whose distended bellies resides a vault of ripening eggs. Edwards estimates there are more White Sturgeon in Stolt's tanks today than there are next door in the Sacramento River, once home to behemoths weighing half a ton.

While the farm may lack the diversity and mystery of the oceans, Edwards and his staff consider themselves fortunate to be presiding over this hermetic sturgeon world, tucked among the flooded rice paddies of the San Joaquin valley. In its own way, raising sturgeon on farms is as much uncharted territory as the ocean depths. Sturgeon farming still hasn't proven itself a profitable business, despite more than a decade of trial and error, and millions of dollars in investment. Whether the farm succeeds has less to do with the fish biologists who work there, or the deep pockets of its owner, and everything to do with what happens to the sturgeon in Caspian. Stolt is betting that the future of caviar lies on the farm, although Edwards knows that the farm's success will be secured only when it is no longer worth catching sturgeon in the wild.

When I met him, Edwards was in his early 40s, with the lanky build and pensive calm of a fly-fisherman. He told me that he had moved around the aquaculture business a bit before settling down with sturgeon on the Stolt farm in Elverta, ten miles north of Sacramento. The Norwegian-owned company is one of the largest fish farmers in the world. A significant portion of the non-wild Atlantic salmon sold in the world's supermarkets is grown on Stolt farms. The company has diversified into other species like Salmon Trout, Atlantic Halibut, Turbot, and Sea Bream. These are often sold in portion-size pieces under the brand name Sterling. Raising those fish in captivity has become routine. But when Stolt first became involved with sturgeon in 1987, Edwards said, no one really was really sure that caviar was something that could be successfully produced on a farm.

To show me some of the problems the company faced, Edwards took me into another dark, warehouse building that was known around the farm as the "500" building, because it can hold 500,000 pounds of fish. The sturgeon here were bigger than in the first building, about three feet in length, and they swam around large in-ground tanks. We could see thousands of sturgeon darting in all directions in the black water. Despite their size, they were only three years old – mere grade-schoolers in sturgeon years. Edwards told me that it takes eight to ten years in captivity before the eggs of a female White Sturgeon are mature enough for caviar. This means that Stolt must feed and care for those 500,000 pounds of sturgeon, and all the rest of its fish on its farm, for almost a decade before it can realize any profit from them. In contrast, farm-raised tilapia go to market in six months, salmon in about three years. There is hardly a business in the world in which an investor will wait for ten years before he realizes any revenue, never mind a profit. One sturgeon-farming entrepreneur I interviewed compared the business to planting a forest in order to make paper. Stolt's farm had been in existence in various forms for 18 years, and it was only just anticipating its first year in the black in 2000, when I visited.

Sturgeon farming has turned out to be trickier than Stolt expected. Although the process of fertilizing sturgeon eggs was first developed in Russia in the 1860s, there were always too many fish in the sea to bother with farms. Hatcheries were built in Russia and Iran after World War II, but these were intended for restocking the sea, not for bringing up sturgeon babies. When Stolt's farm was started, no one was sure what to feed the growing sturgeon, or how many could live comfortably in a tank. They didn't know precisely how to distinguish the worthless males from the valuable females, or when the females would be ready to give up their roe. In the wild, female White Sturgeon don't spawn for the first time until they are in their late teens. Stolt has reduced the age of maturity by almost half through selective breeding and diet, but ten years is still a long time to wait for caviar.

As Edwards and I stood in the darkness of the 500 building, we could see the complex system that Stolt had introduced to keep the sturgeon happy and healthy. Because the fish live in close quarters, the water is constantly filtered to remove fish feces, uneaten food, and other waste. Computer sensors tracked the water temperature and oxygen content. If either level should vary too much from the prescribed range, the computers sound an alarm. Computers had also mechanized the feeding of the sturgeon. A basket containing pellet feed rumbled along an overhead metal track, dropping measured portions into the tanks at timed intervals. The fish would lunge toward the surface, as if they too were computer controlled. But after a few minutes of frenzied consumption, they would lose interest and drift to the bottom along with the pellets.

Most of the sturgeon on Stolt's farm are descended from 20 wild White Sturgeon that were taken from California's northern rivers in 1982, and crossed with the brood stock that the farm had created. The company tries to follow the natural rhythms of the wild sturgeon on the farm. At the same time of year that their wild cousins would be swimming upriver to spawn, a small group of Stolt's farmed sturgeon are selected as new brood stock. The females are stripped of their eggs, the males of their milt, the ichthyologic term for fish sperm. Then these two ingredients are combined with water in something that looks like a blender, shaken for a couple of minutes, and poured into trays. The fertilized eggs are continually washed by water to imitate the natural current that brings oxygen to the developing hatchlings. After a couple of days, the babies will

be about a quarter-inch in size, big enough that you can make out the form of an adult sturgeon, with its pronounced snout and shark-like tail. The young sturgeon have a frisky cuteness that seems completely out of character with the adult sturgeon's sluggishness. Before a sturgeon's face becomes jowly and its hide thickens, it resembles an otter, especially as it splashes playfully around the tank. The sturgeon's front fins are parallel with their bodies, like airplane wings, enabling the fish to speed through the water like a torpedo.

From the time the babies are hatched, a good part of work on a sturgeon farm involves the sorting of fish. The sturgeon are measured and grouped into tanks according to size. When the fish are three years old, Edwards and his staff are finally able to determine the sex of the fish using a blood test. This is the end for the males. They will be culled for meat in order to reduce the number of unnecessary mouths that must be fed. Some females will also be slaughtered. "We keep only the best looking ones," Edwards said, winking at the joke. He was actually serious. Fish biologists believe that beautiful sturgeon produce beautiful eggs that can be made into beautiful caviar.

The day after we toured the farm, I found Edwards peering into a large vinyl pool that had been set up outdoors next to the 500 building. He appeared outwardly placid, but he was smoking, a sign of controlled nervousness. His staff would be taking roe from 200 adult sturgeon to make caviar, and Edwards was anxious for a good harvest. If the farm could produce four tons of caviar over the next few days, it would turn its first profit ever. Since early morning workers had been transferring mature eight-years-olds from Stolt's ponds to the outdoor holding pool. The water temperature had been reduced to near freezing. The cold would make the normally docile sturgeon even more submissive. Inside the 500 building, a crew in white lab coats had assembled in the processing room, their knives sharpened and ready to go.

The end came swiftly and efficiently - a mallet to the head, a swipe of antiseptic across the stomach. Then a worker raised his knife and made a clean lengthwise slit across the china white belly. As the skin was pulled back, another worker snipped out the two ovaries. The greyish sacks, which were about the size and colour of old canvas sneakers, were placed in a bowl and rushed next door to the kitchen to be turned into caviar.

Edwards followed the bowl into the kitchen. Three grown men hovered over the tiny eggs, picking out bits of tissue and dabs of blood. They rinsed the eggs in cold water and gently massaged the mass over a sieve to separate the beads. The eggs were still greyish, but with the addition of salt they seemed to ink up right before our eyes. When the salt content was judged to be about four percent, the American ikryanchiks - the Russian word for caviar master - spread the fresh black caviar over a plastic sheet for Edwards to inspect.

Taking a small plastic spoon, Edwards transported a cluster of eggs to his mouth and rolled them over his tongue. His lips barely moved. He stayed silent, deep in thought, while the ikryanchik stood by waiting for the verdict. Edwards handed me a spoon and I imitated him, scooping up a few eggs and letting them settle in my mouth. Most dealers say that caviar needs to sit a few weeks to be at its best. As the eggs absorb the salt, the individual globules plump up, the taste becomes stronger and more complex, like wine aging in oak. But at that moment, as waves of just-salted eggs pounded my tongue, I believed that the substance in my mouth were the most perfect caviar I had ever eaten. Edwards, less effusively, pronounced it merely good.

*

The history of the caviar farm had been so troubled that Stolt had never bothered to give its product a brand name. But in late in 1999, the company realized that the farm had crossed the line from an experimental operation to a commercial producer. Edwards was predicting the farm would turn its first profit in the spring. Everyone agreed that having a widely recognized name would help Stolt command a higher price for its caviar, just as Ferdinand Hansen had realized long ago when he started Romanoff. Stolt also thought about using a variation of the Romanov, the surname of the former Russian royal family, but concluded it was too close to that once-famous Romanoff label. Stolt considered the ridiculous Stoltinski, the Norwegian-sounding Nelson's, and the over-caffeinated Jacob's Choice. Edwards listened quietly while company officials bandied around those vaguely foreign-sounding names, then he launched his own argument: American caviar should have an American-sounding name.

Rather than obscure the origins of Stolt's caviar, he felt that the company should trumpet them. "I wanted to sell not only the best caviar, but the best American caviar," he recalled. It was also crucial that people knew the caviar came from real sturgeon, and not from its cousin, the paddlefish, which produced less succulent eggs. Since Stolt's other fish products were sold under the trade name of Sterling, Edwards suggested using the same name for the company's White Sturgeon caviar. Much to Edwards's surprise, he carried the debate. Along with the Sterling name, the words "White Sturgeon Caviar" were printed on the lids and tins.

The notion of a fine American caviar appealed to many food purveyors, particularly in California, where fresh ingredients and fine cooking had been forged into a distinct cuisine. And yet, liking the idea of American caviar and actually buying it turned out to be two different things. The farm had the misfortune to harvest its first caviar in the middle of the 1990s, when the U.S. was glutted with cheap Caspian caviar. It was hard enough for farmed caviar to beat the price of the bootlegged import, but it was impossible to beat the reputation of the wild Russian eggs, even when they had been frozen and carried to market in a suitcase. The problem, Edwards complained, is that, "people think the best caviar is Russian caviar."

While Sterling's caviar drew high praise from food writers, who marvelled at how much the White Sturgeon eggs tasted like osetra, many caviar dealers remained sceptical. "Farmed caviar grows too fast. It has a sweetwater taste. Like any farmed fish, everything tastes the same," Susanne Taylor, the former head of Dieckmann & Hansen, told me. While wild sturgeon enjoy a diet that varies constantly, farmed sturgeon eat the same processed pellets every day. Farmed sturgeon live in fresh water, not the salty brine of the sea. When I asked Armen Petrossian, of Petrossian Caviar, whether he would ever sell Sterling, he said it was unlikely. Why not? "The taste," he sputtered through a grimace. (In the fall of 2002, Petrossian cut a deal to purchase half of Stolt's caviar production. It plans to sell in its shops under the species name, Transmontanus.) I frequently heard that farmed caviar was too bland, and it was always difficult to tell whether the complaint was objective, or part of the same caprice that had elevated caviar beyond mere fish eggs in the first place. One day in the fall of 2001, Edwards telephoned me to say that Sterling had come out the favourite in a blind tasting by the Wall Street Journal, beating all the Caspian varieties. He sounded overjoyed - and a little doubtful.

Despite resistance from the old-school dealers, Sterling was starting to make inroads among American purveyors by the late 1990s. After the CITES restrictions began to turn of the spigot of bootleg caviar coming into the U.S. and Europe, the price of Caspian caviar rose significantly. Edwards started getting orders from chefs who had previously refused to take his phone calls. But despite Sterling's growing popularity, the farmed caviar still wasn't able to command the same price as the Caspian roe. Chefs and dealers consented to buy Sterling because it was cheap; the fact that it was also good was secondary. Even when Russian osetra hit \$40 and \$50 an ounce, Sterling was obliged to keep its retail price fixed around \$30.

Until Sterling could compete equally with Caspian caviar, volume would help the bottom line. Edwards was hoping to harvest four tons in 2000, but the farm's sturgeon population was growing so fast that he could see the day when Sterling caviar might produce 10 or even 15 tons of caviar. In every Caspian country but Iran, CITES harvest quotas were being reduced. If Russia's quota kept falling, Edwards saw a chance for Sterling's farm-raised caviar to become a sizable part of the market. The shortages of Caspian caviar not only increased demand for Sterling, but it meant that the farmed caviar would someday achieve parity on price. That was the Holy Grail of caviar farming. His challenge now was to make sure the people believed that the quality of farmed caviar would always be as good as the wild kind.

While I was hanging around Edwards's office, Rod Mitchell, a major East Coast fish supplier, called in an order for his Browne Trading Company. Mitchell was a good customer and Edwards wanted to inspect the caviar himself before it was sent out. Grabbing a fist full of plastic spoons, he called over a couple of his men, and asked them if they would mind eating some caviar.

As we walked from the office to the 500 building, Edwards explained the farm was having a big problem with spoilage. Most producers can keep their caviar under refrigeration for a year or more, but Stolts' eggs barely lasted a couple of months in the refrigerators. He wondered whether this meant that farmed caviar had a shorter shelf life than the wild kind. Or was it the water? One year, he said, they made the mistake of using pond water in the tanks, instead of well water, and the eggs smelled of mud. In a wine chateau, this kind of tasting would be organized in a cool underground cellar. At Stolt, it was took place in the supply room next to the refrigerators, amid the shelves of empty jars, sterile gloves and plastic spoons. Edwards took several 1800-gram tins out of the fridge, most of it harvested about six months earlier, and passed around the spoons. Everyone scooped out a few eggs and swirled them around on their tongues. Edwards was the first to speak: "I'd like to flush this down the toilet."

What they're looking for, Edwards explained, was the slightest evidence of imperfection. A hint of fermentation or a bitter aftertaste. Fermentation signals that the caviar is growing mould. Caspian caviar may take a beating on its way over here, but its reputation was already solid. Sterling's quality, Edwards was convinced, needed to be superior if the company hoped to knock down the resistance to farmed eggs. People who eat caviar just once a year are unlikely to notice a bit of fizz or muddy aftertaste, but the experts surely would. Edwards felt that Sterling caviar couldn't afford one bad review.

Edwards opened another tin and bent over to smell the plateau of eggs, "I smell sour," he announced. Joe Melendez, who was known to have the best taste buds on the farm, wasn't happy either. "It tastes like fresh mortar," he proclaimed after taking a sample from another tin. Melendez, a big, jovial man who worked as processor on the

farm, also seemed to have the best descriptions for bad caviar: "Sour apples." "Dirty." "Cidery." "Roquefort." "Tastes like beer."

But after a couple of bad tins, the kidding around stopped. Edwards grimaced a lot and flicked his used spoons in the trash. Out of the 16 tins the group had sampled, 12 were deemed unsaleable. "Throw it out," Edwards ordered after the last one, and then abandoned the room while the others cleaned up.

It was after 5 p.m. and most of the office staff had gone home. Edwards had been at the farm since 6:30 in the morning, but he went to his desk to go over some papers. He did a search on the web, smoked a cigarette, and swivelled in wide arcs with his chair. While he was trying to decide whether to stay or go home, his manager Peter Struffenegger came rushing in, holding a caviar tin in the flat of his outstretched palm. Smoke was seeping from the bottom of the tin. Edwards started laughing. "Are you suggesting we should burn the place the down," he asked darkly.

But Peter wasn't concocting a practical joke. "Look at this," he said, pointing to the tin. There was a cigarette burning inside. "It would make a good ash tray," Edwards said. "Don't you see?" Peter demanded. "The smoke is leaking. This is why the caviar is going bad. It's the tins!"

Although the tins were the industry standard, the batch that Stolt bought were poorly made. There were small openings around the base, where the sides should have been sealed airtight to the sides of the cans. In Stolts' effort to follow the traditions of the caviar industry, it packed its wholesale caviar in the same kind of cans that had been used for the last century, since Harry Dalbow came up with his canning machine. Tins were one of the caviar business' enviable traditions. But Edwards saw that the tradition was pointless for Stolt. The company was losing too much caviar because of the faulty tins. But for sturgeon farming to succeed in the future, Stolt was going to have to abandon some of caviar's past.

Edwards had been looking at some new packing equipment. At a trade show, he had seen a machine that could pack fresh caviar in jars with a vacuum seal. Now that Stolt had proved that farmed caviar could be a good business, Edwards decided it was time to make the investment. Like Harry Dalbow, he would rely on the latest packing technology to save his caviar business.

*

Finding the right way to preserve and pack farmed caviar won't be enough save the wild sturgeon, however.

In the rivers leading the Caspian, the spring fishing continues with the same intensity as it did on the Delaware in the early 1900s, the last years when sturgeon fishing was conducted there on a commercial scale. There have been three places in history where such vigorous caviar industries have existed. On the Elbe in Germany; in America's East Coast Rivers, the Great Lakes and western rivers; and in the river systems flowing into the Caspian and Black Seas. It took 29 years to pick the Elbe clean of sturgeon. After Dieckman and Hansen arrived in South Jersey, the American caviar industry rose and fell within a span of three decades. Only the Russians have managed to keep their caviar industry going longer.

They did so thanks to strict rationing of their precious supplies. That rationing ended in 1991. Now, after a dozen years of unchecked fishing, there seems to be no consensus in the Caspian about how to control the assault. Time is running out. If history is any guide, there are about 18 years left.

References

- Author's Note: I was able to locate original newspaper articles recounting the ebb and flow of South Jersey's caviar history in the archives of the Salem County (N.J.) Historical Society, the Greenwich Township (N.J.) Historical Society, and the Calvert Marine Museum (Solomons Island, MD). The corporate histories provided by Romanoff Caviar and Dieckmann & Hansen Caviar were invaluable. Research for this article was also obtained through personal interviews and site visits.
- The quote from Arthur Birch, which appears elsewhere in this volume, was taken from Terry Glavin's book, *A Ghost in the Water*.
- Allen, Brigid, ed. *Food: An Oxford Anthology*. New York: Oxford University Press, 1994.
- Beck, Henry C. *More Forgotten Towns of Southern New Jersey*. New York: E. P. Dutton and Co. 1937.
- Beebe, Lucius. "The Costliest Food." *Holiday*, September 1955.
- Bemelmans, Ludwig. *La Bonne Table*. Boston: D. R. Godine, 1989.
- Birstein, Vadim J., Waldman, John R., and Bemis, William E., eds. *Sturgeon Biodiversity and Conservation*. Dordecht/Boston/London: Kluwer Academic Publishers, 1997.
- Birstein, Vadim J. ed. *The Sturgeon Quarterly*. Vol. 5, No. 1-2. June 1997.
- Borodine, Dr. N. "The Ural Cossacks and their Fisheries." *The Popular Science Monthly*, October 1893. No. 6, p. 767.
- Boss, Kit. "The Great Northwest Caviar Caper." *Pacific*, March 13, 1994.
- Boyd's Cumberland County, N.J. Directory, 1895-96. Published by C.E. Howe Co. 236 S. 8th St. Philadelphia.
- Burk, John. *The History of Virginia, From its First Settlement to the Present Day*. Petersburg, Va.: Dickson and Pescud, 1805.
- Cobb, John N. *The Sturgeon Fishery of Delaware River and Bay*. Report of the Commissioner. Washington: U.S. Commission of Fish and Fisheries publication. June 1899.
- Coleman, Charles Washington. "Sturgeon Fishing in the James." *Cosmopolitan*. 1892.
- Connor, Bud. *Great White Sturgeon Angling*. Frank Amato Publications, 1996.
- De Meulenaer, T. and Raymakers, C. *Sturgeons of the Caspian Sea and The International Trade in Caviar*. Cambridge: TRAFFIC International, 1996.
- De Rohan-Csermak, Geza. *Sturgeon Hooks of Eurasia*. Chicago: Aldine Publishing, 1963.
- Dieckmann & Hansen, 125 Years, 1869-1994. Hamburg, 1994.
- Dodds, Richard J. *Solomons Islands and Vicinity: An Illustrated History and Walking Tour*. Solomons: Calvert Marine Museum, 1995.
- Dorsey, Hebe. *The Age of Opulence*. London: Thames and Hudson, 1986.
- Feddersen, P. *Correspondence between P. Feddersen and M.J.C. Lore, 1898*. Property of Calvert Marine Museum Archives, Solomons Island, Md.
- Friedland, Susan R. *Caviar: A Cookbook With 100 Recipes, A Guide to All Varieties*. New York: Charles Scribner's Sons, 1986.
- Gemelin, Samuel. *Travels in Russia in Three Domains, Cherkass to Astrakhan, 1769 to 1770*. St. Petersburg Academy of Sciences. 1773.
- Georgacas, Demetrius J. *Ichthyologic Terms for the Sturgeon and Etymological Terms for botargo, caviar and congeners: a linguistic, philological, and historical study*. University of North Dakota Press, 1978.
- Glants, Musya and Toomre, Joyce. eds. *Food in Russian History and Culture*. Bloomington: Indiana University Press, 1997.
- Glavin, Terry. *A Ghost in the Water*. Vancouver: New Star Books, 1994.
- Godecken, Horst. *Der königliche Kaviar*. Hamburg: Heinrich Siepmann Verlag, 1969.
- Goode, George Brown. *The Fisheries and Fishing Industry of the United States*. Washington: Government Printing Office, 1884.
- Grigson, I. *Fish Cookery*. London: Penguin Books, 1973.
- Hildebrand, Samuel F. and Schroeder, William C. *Fishes of the Chesapeake Bay*. U.S. Bureau of Fisheries. Bulletin 53.
- Holmes, William Richard. *Sketches on the Shores of the Caspian, Descriptive and Pictorial*. London: R. Bentley, 1845.
- Hosmer, Dorothy. "Caviar Fishermen of Romania," *National Geographic*, March 1940.
- Ivanov, V. P. *Biological Resources of the Caspian Sea*. Astrakhan: KaspNIRKH, 2000.
- Kraft, Herbert C. *Lenni Lenape: archaeology, history, and ethnography*. Newark: New Jersey Historical Society, 1986.
- Kurlansky, Mark. *Salt: A World History*. New York: Walker and Company, 2002.
- , Cod: A Biography of the Fish That Changed the World. New York: Walker Publishing Company, 1997.
- Lazlo, Pierre. *Salt, Grain of Life*. Trans. Mary Beth Mader. New York: Columbia University Press, 2001.
- Mathisen, Ole A. and Bevan, Donald E. *Some International Aspects of Soviet Fisheries*. Columbus: Ohio State University Press, 1968.
- May, Col. John. *Journals, relative to a journey to the Ohio Country*. Archives of the Pennsylvania Historical Society, 1789.
- Molokhovets, Elena. *A Gift To Young Housewives*. trans Joyce Toomre. 1897. Reprint, Bloomington Indiana University Press, 1998.
- Norman, Barbara. *Tales of the Table: A History of Western Cuisine*. Englewood Cliffs: Prentice Hall, 1972.
- Popkin, Susan A. and Allen, Roger B. *Gone Fishing: A History of Fishing in River, Bay and Sea*. Catalogue of Exhibition, Philadelphia Maritime Museum, 1987.
- Putnam, Peter. *Seven Britons in Imperial Russia, 1698-1812*. Princeton: Princeton University Press, 1952.
- Radcliffe, William. *Fishing from Earliest Times*. Chicago, ARES Publishers, 1921.
- Ramade, Frederic/(accent). *L'Univers du Caviar*. Paris. Editions Solar, 1999.
- Riddervold, Astri and Ropeid, Andreas. eds. *Food Conservation, Ethnological Studies*. London: Prospect Books, 1988.
- Romanoff Caviar Company History. *A Story of Intrigue: The 150-year history of Romanoff Caviar*. With a historical overview.
- Royle, J.F. *On the Production of Isinglass along the Coast of India*. London: Wm. H. Allen and Co. 1842.
- Rundquist, Jane. "Fishing and Utilization of Sturgeon by Aboriginal Peoples of the Pacific Northwest." Private Paper prepared for Sierra Aquafarms, Inc., 1994.
- Ryder, John A. *The Sturgeons and Sturgeon Industries of the Eastern Coast of the United States, with an Account of Experiments bearing upon Sturgeon Culture*. Pgs. 231- 328. Bulletin of the U.S. Fish Commission, 1888.
- Sebold, Kimberly R. and Leach, Sara Amy. *Historic Themes and Resources within the New Jersey Coastal Heritage Trail*. U.S. Department of Interior publication, 1995.
- Secor, D.H. and Waldman, R. *Historical Abundance of Delaware Atlantic Sturgeon*. Transactions of the American Fisheries Society. 1999.
- Shephard, Sue. *Pickled, Potted and Canned, How the Art and Science of Food Preserving Changed the World*. New York: Simon and Schuster, 2001
- Sim, Mary B. *Commercial Canning in New Jersey: History and Early Development*. Trenton: New Jersey Agricultural Society, 1951.
- Skinner, John E. *A Historical Review of the Fish and Wildlife Resources of the San Francisco Bay Area*. California Department of Fish and Game publication, June 1962.
- Spear, Lisa, Lauck, Lisa, and Pikitich, Ellen. *Roe to Ruin: The Decline of Sturgeon in the Caspian Sea and the Road to Recovery*. Publication of the National Resources Defense Council, Wildlife Conservation Society and SeaWeb. December 2000.
- Sternin, Vulf and Dore, Ian. *Caviar: The Resource Book*. Moscow: Cultura, 1993.
- Stockard, Charles R. "Our New Caviar Fisheries." *Century Magazine*, July 1908.
- Stutz, Bruce. *Natural Lives, Modern Times: People and Places of the Delaware River*. New York. Crown Publishers Inc., 1992.
- Tannahill, Reay. *Food in History*. New York: Stein and Day, 1973.
- Taylor, William W. and Ferreri, C. Paola. Eds. *Great Lakes Fisheries Policy and Management: A Binational Perspective*. East Lansing: Michigan State University Press, 1999.
- Thomazi, Auguste. *Histoire de la Peche, des ages de la pierre a nos jours*. Paris: Payot, 1947.
- Toussaint-Samat, Maguelonne. *A History of Food*. Trans. Anthea Bell. Cambridge, Ma.: Blackwell, 1992.
- Tower, Walter Sheldon. "Passing of the Sturgeon." *Popular Science Monthly*, October 1908
- Vaisman, A. and Gorbatovsky, V. eds. *Wild Animals and Plants in Commerce in Russia and CIS Countries*. Moscow: TRAFFIC Europe. 1999.
- Waldman, John R. and Secor, David H. "Caviar Trade in North America: An Historical Perspective." Proceedings of the Symposium on the Harvest, Trade and Conservation of North American Paddlefish and Sturgeon. Washington: TRAFFIC North America, World Wildlife Fund, 1999.
- Weigley, Russell F. ed. *Philadelphia: A 300-year History*. New York: W.W. Norton & Company, 1982.
- White, William C. "Fishy Breezes From Soviet Astrakhan." *Asia*, October 1931.
- Wildes, Henry Emerson. *The Delaware*. New York: Farrar & Rinehard, 1940.
- Williamson, Douglas F., Benz, George W. and Hoover, Craig M. eds. *Proceedings on the Harvest, Trade and Conservation of North American Paddlefish and Sturgeon*. Washington: TRAFFIC North America, World Wildlife Fund, 1999.