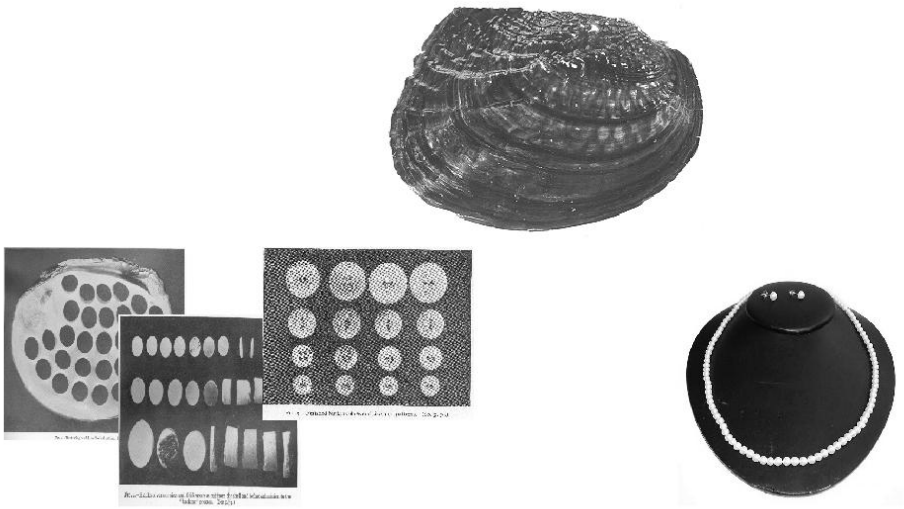
MUSSELS: Washboards, Buttons and Pearls



"The story of the freshwater mussel is an important and colorful chapter in the history of the Upper Mississippi River. It is a tale of treasure hunters, foreigners who spoke strange tongues, espionage, fortunes made and lost, industrial strife, rioting and even murder. Today, these animals without backbones have changed dredging practices along the Mississippi, have altered bridge construction plans, and have become involved in international trade." ***(Pam Thiel, USFWS)***

History of Human Uses of Mussels

The world of freshwater mussels is fascinating once you discover the wonders of these secretive, and often overlooked, creatures. A common question asked regarding freshwater mussels is, "Where is the pearl?" It is true that mussels do produce pearls, often referred to as freshwater pearls. In fact, in the mid to late 1800's, it was common to find folks out **"pollywogging"** for mussels to look for pearls.

Some historians have compared this lust to find easy money from pearls to the gold rush in California. The fever to find a pearl in some rivers was so intense that people literally killed millions of mussels to find a pearl, and in some areas entire **mussel beds** were eliminated. But the impact of the pearl rush on mussel populations was minor compared to what was to come. It is at this point in history that buttons, a common yet seemingly insignificant item, enter the picture.

To most people, buttons are just an item to keep clothes from falling off their body. However, buttons are a part of the history of the upper Mississippi River. Buttons are also the beginning of a story that is all too common in the world today. A story about an animal teetering on the brink of **extinction**…

The story begins in Germany with a craftsman named John Boepple. Boepple made buttons from seashells and the horns and antlers of animals. One day, Boepple's father gave him some mussel shells sent to him from the United States with a note that in essence said, "…the bottom of many rivers are covered with clams…" John Boepple found the buttons made from the freshwater mussels were comparable to buttons made from seashells. However, Boepple was in no hurry to leave Germany and obtaining mussels from the United States was too expensive due to shipping costs.

A few years later, Boepple fell on personal and professional hard times. A sudden illness took the life of his wife. Additionally, a high tariff was put on the horns, antlers and seashells that were the raw material for his business. One day, as he was contemplating his future, he remembered the shells sent to his father years ago. In 1887, John Boepple left Germany and came to the United States.

John Boepple arrived in the United States unable to speak English and out of money. Slowly he learned the language and took odd jobs as a laborer while he looked for mussel beds in local rivers. While searching for shells in a small stream in Illinois, Boepple stepped on a shell and cut his foot. The shell he cut his foot on was located in a large bed of mussels. However, the shells in this mussel bed were too thin for making good buttons. Eventually he found his way to Muscatine, Iowa. Here, at last, he found vast beds of thick shell perfect for making buttons.

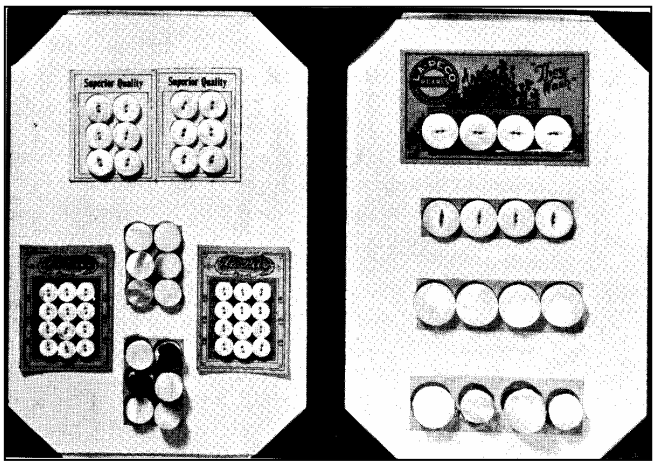
Ancient Native American Uses of Freshwater Mussels

Ancient Native Americans used freshwater mussels extensively for food, particularly since about 500 BC. Today evidence of where they harvested mussels is seen where banks of the river have eroded away, exposing middens of discarded shells.

Mussel shells, burned and ground up, were used for temper in pottery made after 1300 AD. Shells were also used for tools (such as hoes), utensils (cups and spoons) and jewelry (beads and pendants).

There is evidence of some freshwater mussel shells being traded for items from distant parts of North America.

Once again, a tariff affected Boepple's life. In 1890, the United States passed a tariff on the importation of seashells. This time, the same type of tariff that had caused him to leave Germany was now giving him the opportunity to begin a new industry in the United States using freshwater mussel shells as the raw material. By January 1891, Boepple was in business making buttons. But John Boepple was a craftsman and shunned mass production. He was also very protective of the secrets of his trade. Undeterred, others saw the financial potential of making buttons from freshwater mussels and soon "recruited" some of Boepple's staff who knew the secrets of the trade. Soon there were many button factories on the Mississippi River. By 1899, there were sixty button factories in Illinois, Missouri, Iowa, and Wisconsin. Forty-one of these factories were in Iowa, eleven in Illinois, six in Missouri and two in Wisconsin, employing 1,917 people. Eventually, competition drove John Boepple out of the business he started (For a description of the button making process, see Page M-44 to M-46).



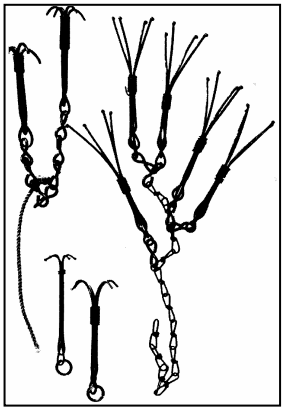
Cards of buttons made for the shells of mussels.

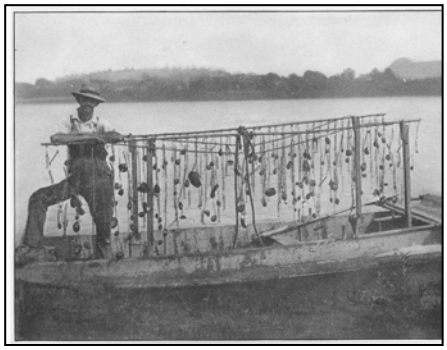
The button industry quickly placed a great demand on the freshwater mussels of the Midwest. A **clammer** could make about ten dollars a week (and possibly more if he found a pearl) compared to a dollar a day for the average laborer in 1899. During this same year, clammers harvested over sixteen million pounds of shell in Wisconsin alone. Harvest of freshwater mussels was in the tens of millions of pounds a year. By 1908, a significant decline in mussel populations was noticed. Mussels beds that once carpeted miles of river bottom from bank to bank were reduced to just a few shells per mile.

In response to the overharvest and declining population of freshwater mussels, the U.S. Bureau of Fisheries (now part of the U.S. Fish and Wildlife Service) established a mussel propagation program at the Fairport Biological Station in 1908. Once again, John Boepple was playing a role in the history of buttons and mussels of the Mississippi. He was hired by the U.S. Bureau of Fisheries to help study the life history of an animal impacted by the industry he started. In 1911, John Boepple cut his foot on a mussel while surveying a stream. The cut became infected and developed into blood poisoning, causing his death less than a year later.

The button industry was soon in trouble. As with most natural resources at the turn of the century, mussels were seen as an unlimited resource. But years of overharvest were now causing a shortage of the industry's raw material.

The final blow to the pearl button industry came as a result of technology. The invention of plastic and its use for making buttons brought the end to this lucrative business. The impact on mussel populations due to overharvest caused by the button industry was not over. This was partially due to the life cycle of freshwater mussels. It may take several years (2-14) before juveniles mature and can reproduce as an adult. Adults may live 60 - 70 years if conditions are right. However, recent research indicates that mussels do not reproduce successfully every





Brail hooks, or "crow foots" were invented in 1897. Several of these brail hooks were attached to a bar (6-8 feet long) and dragged along the bottom of the river. When the tips of the hooks came in contact with an "open" mussel, the mussel shut it's shell and could be lifted from the bottom.

year, further limiting their ability to replenish their numbers. *Note: For a more detailed description of the mussel life cycle, see* Freshwater Mussels: Biology *beginning on page M-5.*

In the 1960's, a new use was discovered for the shell of freshwater mussels. A Japanese pearl farmer, Kokichi Mikimoto, found that small beads formed from the shell of freshwater mussels were the best nucleus for cultured pearls. The shell of a freshwater mussel is cut and polished into a bead which is then implanted into an oyster as the nucleus, or center, of a pearl. After a few years inside the oyster, a pearl is formed. This new technique for the culturing of pearls renewed the interest and the profitability of harvesting mussels.

THE ROLES FRESHWATER MUSSELS PLAY IN THE ECOSYSTEM

Muskrats will often use mussels as a food source. Piles of mussel shells are sometimes found on the shore near mussel beds muskrats have been feeding on. These piles of shell are called **middens**.

Mussels play important roles in the Mississippi River's environment, from acting as "anchors" holding the bottom of the River in place to providing food for fish and wildlife. From the perspective of the river's food web, mussels convert energy from phytoplankton into a form usable by other animals. Muskrats in particular depend on mussels as a food source. Mussels are also eaten by fish, mink, otter, raccoon, and turtles.

The Mississippi River's "Coral Reef"

An often overlooked role of mussels in the ecosystem involves the complex web of life which occurs wherever mussel beds are found. Mussels usually occur here in densities that provide for a firm, natural structure amidst shifting and amorphous substrates of sand, silt, and clay. The mussel shells in these beds provide stable microhabitats at the sediment-water interface that support a diverse assemblage of other native benthic fauna, including net spinning caddisflies, snails and other invertebrates that feed and lay eggs on them. Algae growing on mussels provide food for invertebrates and small fish that live in the spaces between mussels in a mussel bed. These invertebrates and small fish are then eaten by larger fish. Additionally, some species of fish will even spawn on mussel beds, adhering their eggs to the shells of mussels. In turn, these mussels depend on the fish of the river for successful reproduction in their life cycle. Mussels require a fish host for their young, or **glochidia**, and for dispersal of their population. For more information on the life history see Freshwater Mussels of the Upper Mississippi River System at http://www.fws.gov/midwest/mussel/

GLOSSARY
Knowledge of the following terms is important for understanding freshwater mussels.

Anterior end -- the shorter end of the shell as measured from the umbo; also considered the front end

Beak -- the raised part of the dorsal margin of the shell; also called the umbo

Beak cavity -- the depression or pocket on the inside of each valve leading into the beak

Beak sculpture -- the raised loops, ridges, or bumps on the umbo

Bivalve - mollusk with a shell made of two hinged valves

Brail or crow foot drag bar - An approximately 8' foot long piece of wood or metal with chains hanging down. At the end of each chain are several 4 pronged hooks with knobs on each prong (like small grappling hooks). As the bar is dragged along the bottom of the river, mussels close on the hooks, thus allowing collection of large numbers of mussels without diving.

Brood pouch or marsupium- portion of female mussel's gill where larvae develop into glochidia

Channelization - the straightening and/or deepening of a river channel

Chevron -- a V-shaped marking

Clammer or sheller - a person who harvests mussels

Compressed -- flattened or pressed together laterally

Concentric -- having a common center

Conglutinate – a number of glochidia bound together with mucus

Distal -- away from the center or origin

Dorsal -- referring to the top part of the shell where the hinge is located

Elliptical -- having the form of an ellipse, or oval

Elongate -- long or extended

Endangered - a species faced with the danger of extinction

Extinct - a species that no longer exists

Extirpated - a species that has been eliminated from a particular area, but still exists somewhere else

Exotic - from another part of the world; foreign

Glochidium - the larva of a freshwater mussel (Superfamily Unionoidea) that generally lives as a temporary parasite on a host fish; a mussel larva that is microscopic, many species require a fish as a host for development to a juvenile

Growth lines -- darkened lines on the surface of the shell indicating periods of rest during growth

Hinge -- the elastic part of the shell that unites the valves along the top of the shell

Inflated -- swollen or expanded

Interdentum -- a flattened area between the pseudocardinal and lateral teeth

Introduced - brought in and established in a new place or surroundings

Iridescent -- exhibiting rainbow colors

Lateral teeth -- the elongated teeth along the hinge line of the shell

Left valve -- the left half of the shell when the dorsal edge or hinge is facing up and the anterior end is directed forward (away from the collector)
Marsupium – See brood pouch

Midden – a refuse heap marking the location of a previous habitation

Mollusk or Mussel -- soft-bodied animal with a muscular head and foot and a mantle, which usually secretes a protective shell

Mussel Bed – Area of mussel concentrations

Nacre -- the interior layer of the shell, usually white, pink, salmon, or purple and iridescent

Nucleus -- The center around which things are formed. Beads made from the shell of freshwater mussels are used as the center around which oysters lay nacre to form a cultured pearl.

Oblong -- having the shape of or resembling a rectangle or ellipse

Ovate -- egg-shaped

Parasite - an organism that grows, feeds, and is sheltered on or in a different organism (host) while contributing nothing to the survival of the host

Periostracum -- the outside layer or covering of the shell

Plications -- folds

Pollywogging – wading in the water to find mussels

Posterior end -- the longer end of the shell as measured from the umbo; also considered the back end; also the end with the siphons, usually sticking above the stream bottom

Posterior ridge -- the ridge on the back half of the valve running from the umbo to the posterior ventral edge

Posterior slope -- the area along the dorsal part of the shell between the posterior ridges of the valves

Pseudocardinal teeth -- the triangular, often serrated, teeth located on the anterior-dorsal part of the shell

Pustule -- a bump or raised knob on the outside surface of the shell

Quadrate -- square

Right valve -- the right half of the shell when the dorsal edge or hinge is facing up and the anterior end is directed forward (away from the collector)

Serrated -- notched or grooved

Shell margin -- the circumference of a valve outline when laid flat; also known as the edge

Siltation - deposition of fine mineral particles (silt) on the beds of streams or lakes

Spawn - to deposit sperm or eggs into the water

Striated -- marked with lines or grooves

Substrate – soil on the river's bottom

Sulcus -- a shallow depression or furrow on the outside surface of the shell

Threatened - a species likely to become endangered

Truncate -- having the end shortened or squared off

Tubercle -- a pointed, rounded, or knoblike projection on the shell

Umbo -- the inflated dorsal part of the shell; also called the beak

Valve -- one of the two halves of the shell

Ventral -- referring to the bottom edge of the shell