MOLLUSKS ON THE MEND

Efforts are under way to bring scallops and oysters back to local waterways

by Karen Nelson

They have been providing tasty sustenance to local residents for well over 2,500 years. But now, oysters and scallops find themselves in a new role: as indicators of ecosystem decline and restoration.

Bay scallops in Pine Island Sound—which supported one of the best commercial fisheries in Florida in the 1950s—are now virtually nonexistent. Red tide and degraded water quality in 2005 and 2006 blew out a successful, small-scale 2003 restoration near Pineland. But oysters, which have never supported a sustained modern commercial fishery in Pine Island Sound, are now on the rise thanks to restoration efforts that also began in 2003.

SCALLOP STRUGGLES

The highest-ever commercial landing of bay scallops in Florida was in Pine Island Sound in 1952: 186,572 pounds of meat. Many residents believe that the collapse of the local commercial scallop fishery in 1963 was due to the building of the Sanibel Causeway and its spoil islands. However, the cause of the breakdown is still an open question for scientists. Other scallop fisheries throughout the southern half of the state have also seen troubles; Tampa Bay's successful scallop fishery collapsed in the 1960s.

Recreational scallop harvesting in Pine Island Sound gave out in the late 1980s, and statewide harvest regulations were first established in 1985. The Sanibel Causeway has not been discounted as a factor in the local collapse, but declining water quality, increasing freshwater inflow, overfishing, and the dredging of canals and waterways in the 1950s and 1960s were probably also causative factors. In addition, the scallop's own biology limits natural recovery of a threatened population. Unlike oysters, scallops only live for about a year, so that a bad year with limited spawning success means that the aging population will not be replaced unless there are other populations nearby.

When the Florida Fish & Wildlife Conservation Commission's Fish & Wildlife Research Institute (FWRI) began surveying scallops in northern Pine Island Sound in 1994, scallop densities (per six hundred square meters) went from a high of 110 in 2001 to just twenty-one in 2003. The Sanibel-Captiva Conservation Foundation (SCCF) began surveying the southern portion of the sound in 2004, and only one scallop was found in a total of twelve thousand square meters. The state defines a collapsed population as five scallops per six hundred square meters.

Earlier efforts to restore bay scallops met with mixed success. Young scallops were placed in protective cages in several Florida locations in the hope that they would spawn and

PHOTOS COURTESY OF JAMES J. GRECO

A long chain of volunteers in Estero Bay assists with Florida Gulf Coast University's community-based project to restore oyster reefs in several Southwest Florida locations.

repopulate depleted areas. The cages worked but the scallops were overgrown by organisms like barnacles, which added weight to the shell and impeded the scallops' ability to open their valves to feed or swim.

In the fall of 2003, William S. Arnold and Steve P. Geiger from FWRI's Molluskan Division, Jay R. Leverone from Mote Marine Laboratory, and Jaime Greenawalt Boswell from SCCF launched an experimental restoration effort in northern Pine Island Sound (near Pineland on Pine Island). Twelve scallops found during the FWRI's annual summer survey had been transferred to a hatchery to spawn, so that the larvae could be reared until they were ready for release.

Scallop larvae float in the water for about two weeks before they are "sticky" and ready to attach themselves to sea grass blades with a byssal thread. (Once scallop and oyster larvae are ready to attach and begin to develop shells, they are called spat, and the process of the new spat setting at a site is called recruitment.) In October 2003, about 1.5 million larvae had reached the "sticky" stage, and they were released within three floating construction booms (normally used to contain sediment during shoreline construction). A fourth boom served as a control, with no larvae added.

Spat collectors (something for the spat to adhere to) were deployed within the contained areas and outside the booms. Spat settled on 79 percent of the collectors within the treatment booms, while no spat was found within the control or outside the booms. After three days, the larvae had attached to sea grass blades and the booms and spat collectors were removed.

When adult density was checked in July 2004, it was greater than 120 per six hundred square meters. In 2005, surveys of adult scallops showed about two scallops per six hundred square meters in southern Pine Island Sound and ninety-three per six hundred square meters in northern Pine Island Sound, which was the highest-density population in the state. Unfortunately, red tide plus the water quality problems caused by the large-volume Lake Okeechobee releases that year wiped out these gains. However, once water quality is stabilized, the 2003 experiment showed that scallops can be successfully reintroduced.

FGCU's Aswani Volety (above) and Erin Dyke (opposite), a former graduate student at FGCU now with the Department of Environmental Protection, check the growth of oysters on fossil shells.

PHOTOS COURTESY OF JAMES J. GRECO

Scallops, like oysters, help to clean estuarine waters, opening their valves to filter small particles of algae and organic matter from the water. The outer rim of the shell is lined with tiny blue eyes, which can detect motion. Scallops can escape predators by clapping their valves shut and expelling water through the mantle, which lines the inside of the shell and is what actually creates new shell as the scallop grows.

Historically, local bay scallop populations were abundant and were distributed from Southeast Florida through the Panhandle. The populations naturally experience dramatic local fluctuations. FWRI's Arnold believes that what keeps populations stable overall is the movement that occurs between local populations during the two-week larval stage, when the larvae are traveling in the water column. He thinks restoration efforts statewide must be directed toward the reestablishment of a metapopulation, or a population of populations. Collapsed local populations can be replenished by nearby populations, but the growth of human

populations and resultant loss of water quality and habitat limits the movement between local scallop populations.

THE OYSTERS OVERCOME

In the mid-1900s and earlier, local fisherfolk occasionally sold several bushels of oysters to supplement their income, but oysters were mostly collected for food or traded. In the 1930s, a limited attempt was made to commercially harvest oysters in Charlotte Harbor, and a few beds were maintained in Bull and Turtle bays, areas known for their relatively large oysters. Some archaeologists speculate that the Calusa Indians may have practiced aquaculture in these same areas. However, successful commercial oyster production requires more temperate waters than are found in Lee and Charlotte counties.

These "valued ecosystem components"—to use the lingo of the South Florida Water Management District—are nature's miniature water treatment plants, coastal engineers, and aquaculturalists. Oysters will be used as one of the benchmarks for the Comprehensive Everglades Restoration Plan (CERP), as well as a post-CERP indicator for scientists making recommendations on the timing and duration of freshwater releases from Lake Okeechobee into the Caloosahatchee and St. Lucie estuaries.

The complex, three-dimensional structure of an oyster reef provides safety and nesting habitat for numerous species of invertebrates and fishes. Oyster reefs serve as the foundation for mangrove islands, snagging red mangrove propagules as they float by. Mangrove prop roots shelter small sea dwellers, and mangrove-canopied islands serve as bird rookeries. Oyster reefs also act as natural breakwaters, which help protect the shoreline.

Oysters can filter 1,500 times their body volume (from four to thirty-four liters of water) in an hour. As oysters filter water (removing phytoplankton, sediments, and pollutants), what they don't consume is food for bottom dwellers. These in turn attract numerous species of invertebrates and fish. Many of these serve as forage for important fisheries species, birds, and mammals. The filtered water also results in greater light penetration downstream, which helps promote the growth of sea grasses.

Aswani Volety, professor of marine science at Florida Gulf Coast University (FGCU), headed up a community-based project to restore oyster reefs in several Southwest Florida locations between 2003 and 2006. Volety's "Community-Based Restoration of Oyster Reefs in Southwest Florida-Western Everglades Watersheds" was awarded one of four national 2006 Partnership Awards by Coastal America, which recognizes exceptional teamwork in restoring and protecting our nation's coasts.

To determine the best new reef locations, Volety placed wire mesh bags of oysters in areas being considered. Primary concerns were salinity, water depth, and, since Volety was relying on the larvae already in the system, high spat recruitment. After deciding on the reef locations, he brought in more than six hundred volunteers to transform tons of fossil shells delivered from quarries into twenty-three living oyster reefs in Lee and Collier counties.

Volunteers shoveled the shells into wire mesh bags; hundreds of these ten- to fifteen-pound bags were needed for each reef. Placement of the bagged shells required the coordination of more volunteers plus the added element of boat transportation to get to the reef areas. Once on the site, the bags of shells were unloaded "bucket brigade style" to the reef site, where staff from FGCU's Coastal Watershed Institute arranged the bags in pre-designed reef configurations.

Volety's team established two reefs in Naples Bay, five in

PHOTOS COURTESY OF JAMES J. GRECO

Lee County donated use of a barge for FGCU's oyster restoration project; volunteers formed a chain to create an oyster reef in Estero Bay using bagged fossil shells (left); all of the groups working in Estero Bay departed from the boat ramp at Lovers Key State Park (bottom).

Hendersen Creek (in the Rookery Bay National Estuarine Research Reserve), five in Estero Bay, and eight in the Caloosahatchee Estuary. "Every reef is doing well," says Volety. The reefs are up to one hundred square meters large, and there are about three thousand oysters per square meter (including the three-dimensionality of the reef).

"Oysters need gently flowing water," explains Volety. "They are stuck in one place, and food needs to be brought to them and waste taken from them." If the organic matter in their waste decomposes in place, oxygen is removed from the water. "Places with incoming and outgoing tides are good," he says. However, he says that if there are a lot of boat wakes, the oysters "won't open their valves."

Once the reefs are established, it's hard to count and measure how many creatures are harbored there, but one can say that they are there. "There is a lot of biomass on the reef, and critters come to eat," explains Volety. He says that while it's difficult to quantify it, clearly "there is trophic transfer from the oyster reef that helps to recruit important fish."

The Iona Cove/Shell Point at the mouth of the Caloosahatchee River provides ideal conditions for oysters. "It's a great environment: warm, with plenty of food," notes Volety. Oysters begin spawning three months earlier there than in San Carlos Bay. Scientists believe that a change in salinity or temperature probably triggers spawning, but "we don't really know," says Volety.

Larvae coming downstream in the Caloosahatchee at the end of the spawning season—October and November—settle there and by the following May, the oysters have grown to about four inches. Unfortunately, the high-volume freshwater releases from Lake Okeechobee that start coming down the river in the summer kill off most of the adult oysters. However, their shells contribute to the reef structure. By the tail end of the spawning season, when lake releases have slowed and salinity has reached more normal levels, the reef structure captures the larvae coming downstream and, according to Volety, "keeps the system alive."

Karen Nelson is a freelance writer living on Sanibel Island.

PHOTOS COURTESY OF JAMES J. GRECO

OYSTERS, SCALLOPS, AND THE CALUSA

In the early 1990s, zooarchaeologist Karen Walker analyzed five prehistoric sites in Lee and Charlotte counties that were inhabited in the 500 B.C. to 1400 A.D. range by Calusa Indians or their predecessors. Her analysis included shells and bones that were tallied by a count of MNI, or minimum number of individuals. For bivalves, this might mean counting only the left valve and discounting all right valves to insure that each individual animal is only being counted once.

A count by MNI is not a true picture of the percentage of the diet based on shell, but the MNI is a useful indicator of the food sources available. At Useppa Island, 49 percent of the MNI was from an oyster reef environment; Cash Mound (in Turtle Bay) came in at 36 percent, Big Mound Key at 34 percent, Josslyn Island at 19 percent, and Buck Key at 13 percent.

"Oysters were more important in Archaic times [pre-500 B.C.] and even early Caloosahatchee I times [roughly 500 B.C. to 500 A.D.]," says Walker. "Then later, they became relatively scarce in Pine Island Sound. They were more common around Cape Haze peninsula, the mouth of the Caloosahatchee, and Matlacha Pass.

"Scallops occur here and there through time," continues Walker, "always in bunches but never in great quantities." However, the season of collection of a scallop can be determined by scallop size (since they only live about a year), enabling archaeologists to use scallops in conjunction with clam shells, oyster drills, and catfish otoliths to draw a more complete picture of the season that a site was occupied.

FOR MORE INFORMATION

Florida Fish & Wildlife Conservation Commission's Fish & Wildlife Research Institute, http://research.myfwc.com

Florida Gulf Coast University's Coastal Watershed Institute, www.fgcu.edu/cwi

Sanibel-Captiva Conservation Foundation Marine Laboratory, www.sccf.org/mlab_index.htm