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Oyster Gardening Along the Northern Gulf Coast

► The eastern oyster, *Crassostrea virginica*, is an important species both commercially and ecologically. Alabama's relatively small coastline limits its annual wild oyster landings; however, the coastal communities are home to significant oyster processing capacity, which is not immune to market volatility.

High variability in Alabama's annual landings was common during the last decade with National Oceanic and Atmospheric Administration (NOAA) Fisheries reporting a high of 344,914 pounds in 2021 to a low of 24,781 pounds in 2018. This variability in oyster harvest was common throughout the Gulf of America with NOAA reporting 2023 harvests of 7.815 million pounds down from 19.027 million pounds in 2008. Notably for Alabama in 2008, Alabama's oyster harvesters faced even greater uncertainty. High salinities in Mobile Bay, resulting from drought conditions, likely produced ideal conditions for the oyster drill, *Stramonita haemastoma*, a predacious snail that devastated the commercially harvested oyster reefs (figure 1). That year, Alabama's wild oyster harvests fell 90.5 percent from 2007.

Beyond commercial value, oysters play an important role in estuarine ecology. Oysters grow naturally on the bottom in groups or formations called *reefs*. They are also found on pilings, sea walls, jetties, or other hard surfaces. Oysters need to be in groups for successful reproduction and protection from predators, including drills and crabs. When reproducing, male and female oysters release sperm and eggs into the water column, where fertilization occurs.

The cues for reproduction along the Gulf Coast typically include rising temperatures, starting in late spring to early summer and continuing through fall. Other cues include changes in salinity and the presence of oyster sperm and eggs in the water. This reproduction strategy, called group *synchronous spawning*, must be coordinated among the individuals, and these cues help improve fertilization success. Once the oyster egg is fertilized, the resulting larvae will develop in the water column for the next 10 to 20 days (temperature dependent). As they grow larger and complete their larval stages, oyster larvae begin to settle to the bottom. At this point, the settled larvae can move short distances to find hard substrate (existing oysters, pilings, rocks, etc.) to permanently attach to, becoming spat (figure 2).

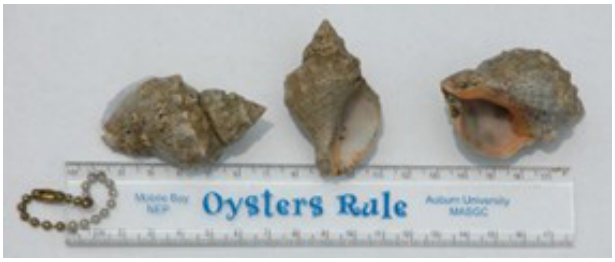

Figure 1. Oyster drills are a primary predator of oysters.

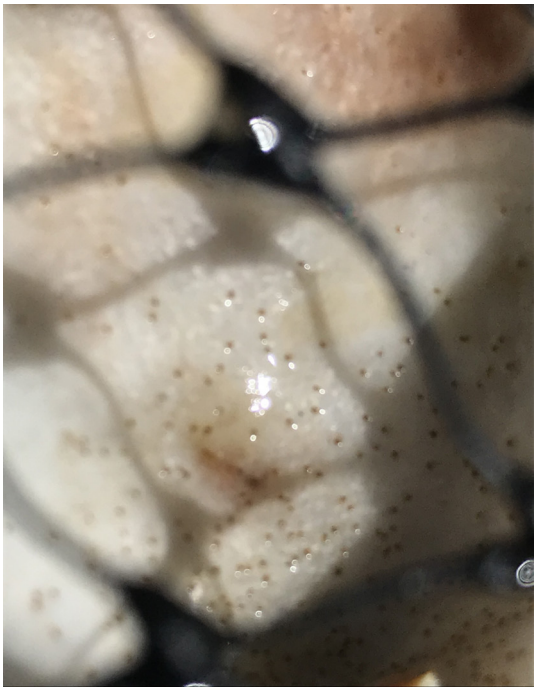

Figure 2. Settled larvae seek hard substrate on which to permanently attach.

Settled larvae that do not find hard substrate generally will not survive. Oyster reefs serve as habitat for more than 300 species of vertebrates and invertebrates that help form the food web of the estuarine ecosystem. Moreover, oyster reefs help reduce erosion by breaking wave energy before it can reach the shoreline.

In addition to habitat and shoreline protection, oysters provide significant filtration services through their filter-feeding strategy. Oysters filter as much as 2 gallons of water per hour, helping remove phytoplankton from the estuarine waters they inhabit. This improves the water quality (clarity) in critical nursery areas where numerous fish and shellfish species undergo crucial developmental changes. The health of oyster reefs varies widely and is subject to natural and human-made impacts. Oyster reefs can be buried over time by sedimentation from upstream sources or in a single day from strong storms.

Oyster aquaculture attempts to reduce the variability in the supply for the consumer market. Culture techniques range from low-tech planting shells to catch naturally settling oyster larvae to hanging ropes in deep water to collect larvae for grow-out to using intensive culture to produce single oysters for the half-shell market. In each method, oyster larvae are collected from the wild or spawned in a hatchery setting. The resulting larvae then settle and affix to a substrate such as microclutch (figure 3), and the resulting spat are grown to a marketable size.

Figure 3. Larvae may affix to a substrate such as microclutch.

Oyster gardening is a nonconsumption, education, and restoration-focused program that began in the Chesapeake Bay. Using the abovementioned aquaculture process, the Alabama and Mississippi Oyster Gardening Programs set hatchery-spawned oyster larvae on whole oyster shells (versus microcultch) purchased through the oyster shell recycling program. Gardeners then protect the resulting oyster spat-set-shell in small gardens for the duration of the season. When the season concludes after 4 to 6 months, the now larger oyster florets (oysters attached to a common shell producing a complex structure similar to the wild, natural reef) are planted within restoration efforts in their respective state.

Like the Chesapeake Bay program, the northern Gulf Coast programs rely on volunteer oyster gardeners from coastal counties who have water access. Each oyster gardener grows oysters in up to four gardens from late May to November in Alabama or August to February or March in Mississippi. During this time, the juvenile oysters grow from a few millimeters to more than 50 millimeters. The gardens are suspended from the oyster gardener's pier to ensure they remain off the bottom and away from pilings. Each garden generally consists of four PVC-coated wire mesh (1-inch square) cages measuring 14 inches wide x 8 inches tall x 17 inches deep. This setup (figure 4) increases the water flow through the cages, bringing in more food and oxygen and allowing waste to fall away from the suspended reef. By keeping the gardens off the bottom and away from pilings, the juvenile oysters are protected from predators, including oyster drills. On average, each volunteer grows 1,100 oysters per site. Since oyster gardening efforts began in 2001, nearly 2 million oysters (about 2.5 inches) have been grown by volunteer gardeners for restoration plantings.

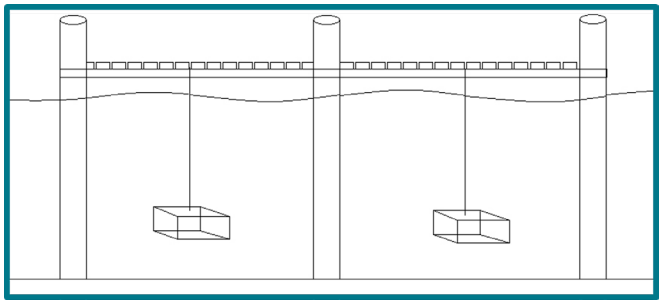

Figure 4. Oyster gardens are suspended to remain off the bottom and away from pilings.

Once every 7 to 10 days, oyster gardeners pull each of their cages out of the water to rinse mud, algae, and other fouling material from them. A water hose is helpful but not a requirement. Oyster gardeners who do not have running water on their pier can rinse their oysters by rapidly raising and lowering the gardens at the water's surface three or four times (figure 5). For a video demonstration of this process, see "Gentle Rinse for Oyster Gardens" on the Alabama Extension YouTube channel at www.aces.edu/go/GentleRinse or scan the QR code.

Figure 5. An option for gardeners without running water on their pier is to raise and lower the gardens at the water's surface three or four times. For a video demonstration of this process, see "Gentle Rinse for Oyster Gardens" on the Alabama Extension YouTube channel at www.aces.edu/go/GentleRinse.

After the fouling material has been rinsed from the oysters, oyster gardeners visually inspect the gardens for predators, including blue crabs, stone crabs, and oyster drills. Any predators are removed, and the gardens are returned to the water. This regular maintenance not only enhances the oysters' growth but also prevents them from growing through the mesh of the garden, which will make it impossible to plant on the restoration reefs. The entire maintenance process for four cages takes less than an hour. In some seasons, rapid growth requires thinning a portion of the oysters for early planting on reefs, giving the remaining oysters more room to grow and making the weekly maintenance more effective.

At the conclusion of the season, program personnel visit each oyster gardening site, collect the remaining oysters, and plant them on restoration reefs. The restoration sites are selected in conjunction with state marine and public health regulatory agencies and are outside normally harvested areas or in designated sanctuary areas. The care the oyster gardeners provide allows the oysters to attain a larger size more rapidly than they would in the wild. This larger size can improve survival rate and increase the probability of restoration success.

The Oyster Gardening Programs of Alabama and Mississippi are always looking for new participants. Questions to think about when considering participating in this program include the following:

- Do you have a pier or access to a pier?
- Can you conduct the necessary maintenance during the gardening season?
- Will you allow Extension personnel associated with the Oyster Gardening Program to access your pier periodically to check the growth and condition of the oysters during the season?

If interested, please contact the Auburn University Marine Extension and Research Center at (251) 471-2124 or email oystergardening@auburn.edu.

Work Cited

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