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TIMELY INFORMATION
Agriculture & Natural Resources

OFF-BOTTOM OYSTER FARMING

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Off-bottom oyster farming is the culture of oysters in some type of mesh container (basket, bag, cage, etc.) that is held above the seafloor. Oysters grown this way are typically hatchery-reared single set oysters instead of clumps of oysters normally found in the wild. The container provides protection from predators and eliminates burial in sediment. Suspending oysters in the water column improves growth rates due to improved water flow. Off-bottom production systems take advantage of the availability of food (single cell algae called phytoplankton) throughout the water column and have the following potential advantages over other production methods like bottom culture:

Figure 1. Off-bottom oyster farm in Mississippi Sound with three types of production gear.

- Promote faster growth;
- Increase survival;
- Allow control of fouling (e.g., barnacles, overset oysters, mud worms);
- Improve shell shape and appearance; and
- Increase product consistency.

Figure 2. Premium Gulf Coast off-bottom cultured oysters.

Oysters produced using off-bottom culture techniques are typically sold to the premium half-shell market. Traditional on-bottom production (from either public oyster reefs or private oyster grounds) yields very large quantities of oysters that tend to obtain lower prices than farm-raised oysters. For example, the 5-year average price of Gulf Coast oysters (from 2006-2010) was $3.17/pound (in shell) versus the same 5-year average price of New England oysters of $33.67/pound (National Marine Fisheries Service). Gulf Coast oysters harvested from the bottom are primarily intended for the shucked meat market and can vary widely in quality and condition. Only the best of these oysters are selected for the premium half-shell market, where oysters are sold live in their shells to be eaten raw. These oysters are still variable enough that they are consistently valued for much less than farm-raised oysters from the other regions of the United States.

Opportunity for the Gulf Coast

There are well-developed markets for premium farm-raised oysters elsewhere in the nation, with strong oyster farming industries established in other regions. There are several possible reasons why oyster farming has not become established along the Gulf Coast.

1. The very productive waters of the Gulf of Mexico pose a technical challenge. While allowing for very rapid oyster growth, these waters also lead to very rapid fouling of the production gear by algae, barnacles, and other fouling animals. The fouling can significantly reduce water flow and food supply to the oysters if not regularly cleaned. Previous attempts to farm oysters off-bottom in the Gulf of Mexico region required substantial labor costs associated with fouling control.
2. The condition of oysters decreases during the spawning season. When oysters spawn, the meats become thin and watery. As a result, the marketability of oysters is reduced during spawning season.
3. Lack of branding oysters from the Gulf Coast makes it difficult to enter the highly competitive premium half-shell market. Beyond the famous Apalachicola oyster, almost all other oysters harvested from the Gulf of Mexico are labeled and sold as ‘Gulf oysters’.

Auburn University, Alabama Cooperative Extension System, Louisiana State University, Mississippi-Alabama Sea Grant Consortium, Louisiana Sea Grant and National Sea Grant, and private farmers have partnered since 2009 to address the barriers to oyster farming. Removing the barriers will lead to the development of a new oyster industry that will create jobs and provide a more reliable supply of oysters in Alabama, Mississippi, Louisiana and other Gulf of Mexico States. The results of this research, Extension and industry partnership include the following.

1. Several production methods have been developed that allow for relatively easy control of fouling by allowing controlled exposure to air (forcing a simulated extended 'low tide') for various durations and frequencies. Efforts by pilot commercial operations have demonstrated substantial market demand for branded, farm-raised Gulf Coast oysters at a price competitive with oysters farmed in other regions of the US. Though a niche market, there has been demand created throughout the southeastern US and other regions in this specialty crop.

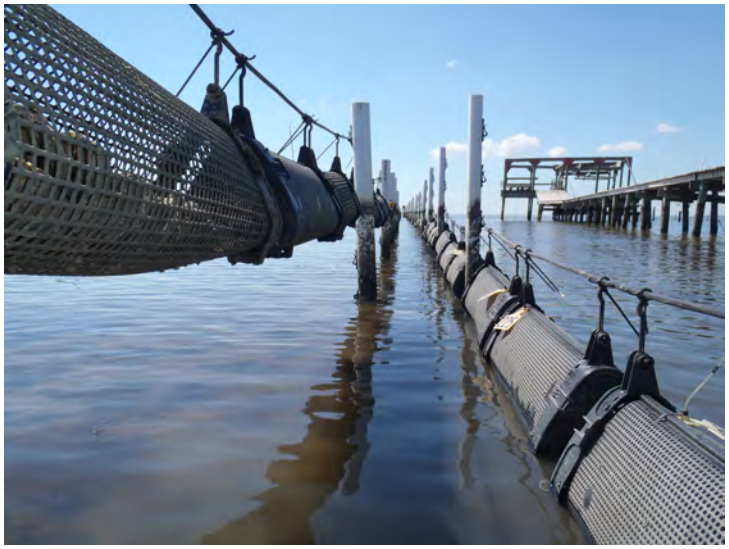

Figure 3. Adjustable longline production culture system, with baskets on the right set at standard depth and baskets on the left raised to increase the duration of exposure in order to control fouling.

2. Experiments with triploid oysters have allowed the production of non-reproductive oysters with good summer condition. Alternatively, oyster farmers can simply choose to conduct seasonal harvests when condition is optimal.
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While challenges to off-bottom oyster farming in the Gulf of Mexico remain, research suggests that oyster farming may be a viable near-shore domestic aquaculture industry that can provide an economic benefit to coastal communities. Both producers and related supporting industries will benefit from development of this industry. Considerable interest exists for off-bottom oyster farming within the Gulf region. This fact sheet summarizes some challenges and considerations for prospective off-bottom oyster farmers: location, choice of production gear, permitting, security, coastal storm preparedness, business planning and marketing.

Challenges and Considerations

Location

In Alabama, prospective farmers are required to obtain the use of private oyster riparian rights, either through purchase of waterfront property where oyster riparian rights can be successfully exerted or through a lease of already obtained oyster riparian rights from another waterfront property owner. Oyster riparian rights allow a waterfront landowner to determine who may harvest in a designated area up to 1,800 feet offshore from the mean low tide line (subject to restrictions). The use of oyster riparian rights has been encouraged as a mechanism for off-bottom oyster farms by state regulatory agencies. The State Lands Division of the Alabama Department of Conservation and Natural Resources requires a minimum 10' upland buffer be leased (along with any oyster riparian rights) to provide an 'upland interest' to the lessee.

Figure 4. Bill Walton, Extension Specialist, has assisted prospective farmers with site selection by assessing oyster growth and survival at potential sites. Photograph by Katie Jackson.

Of course, there are many other factors that should be considered in selecting a location for an off-bottom oyster farm. Most importantly, any oyster farm where oysters are harvested for market must be within waters that are, at a minimum, classified as "conditionally approved" for harvest by the Alabama Department of Public Health. Furthermore, it is unlikely that permits will be obtained in areas where submerged aquatic vegetation (sea grasses) is present. An ideal location should also provide conditions for rapid oyster growth (e.g., salinities typically above 15 parts per thousand, or ppt) and high survival. These two requirements can be assessed before final site selection, but sporadic events also need to be considered (e.g., prolonged freshwater, low dissolved oxygen).

Beyond these critical elements in site selection, logistical considerations should be taken into account, including protection from prevailing weather, travel distance, conflicts with other users, etc. In addition, the bottom type (e.g., sand, mud) and the water depth should be considered because these will affect the choice of production gear.

Choice of Production Gear

The choice of production gear should be based on a combination of factors including investment and operating costs, profitability, desired farm layout, availability of equipment and replacement parts, ease of handling, durability and likelihood of surviving severe weather. Importantly, in waters along the Gulf Coast, gear that readily allows for the control of fouling by periodic air drying (also called emersion) is highly recommended. Fouling has the potential to overwhelm an oyster farmer who would incur very high labor costs to control the fouling organisms. Pro-active control of fouling is essential, with routine control measures taken before fouling becomes problematic. Regular monitoring of the oysters and gear is recommended to identify when additional fouling control should be carried out. Additionally, gear choice should be based on realistic expectations of available labor. For example, some gear is best handled by at least two individuals.

Figure 5. It is highly recommended that any culture gear selected readily allow control of fouling by periodic air drying. These floating cages, for example, can be flipped up on the floats periodically to expose the gear and oysters to the air.

Permitting

Obtaining the proper permits is essential to establishing an oyster farm. Permitting is specific to each state and subject to change. Local permitting agencies should be approached about current permitting requirements and guidelines. In Alabama, permitting agencies involved with off-bottom oyster farming include the Marine Resources Division (MRD) of the Alabama Department of Conservation and Natural Resources (ADCNR), the Alabama Department of Public Health (ADPH), the Alabama Department of Environmental Management (ADEM), State Lands Division of ADCNR, and the US Army Corps of Engineers (USACE). Additional agencies likely will be involved in the application process (e.g., Alabama Marine Police, US Fish & Wildlife Service, etc.). These permits are for varying durations which should be considered when planning the scope of each permit.

As of this writing, establishment of an off-bottom oyster farm requires the following from an applicant:

- Establish legal control of oyster riparian rights (established per MRD regulations that require a certified survey of the bounds);
- Submit a joint application to the USACE and ADEM (with an associated fee). This is then subject to public comment and review by ADEM for consistency with the Coastal Management Plan. The application likely will be reviewed by other state and federal agencies;
- Provide a survey of submerged aquatic vegetation (SAV) during the growing season (June through September) as required by ADEM; and
- Submit Riparian Easement application to the State Lands Division of ADCNR for commercial activity that exempts other public uses of the state-owned sea bottom. This easement will incur an annual charge of approximately $0.15 per square foot of exempted area.

After these permits are obtained, construction may proceed with periodic renewal of the permits.

To begin operation of an off-bottom oyster farm the following is required:

- Submit an operations plan to ADPH describing the farm's facilities and operations. This is required to obtain an aquaculture permit which is renewed annually;
- Obtain an annual oyster harvester's permit and harvest tags from MRD; and
- Submit a list of people involved in working the oyster farm to MRD. Update this list frequently as workers are added or removed. Workers will need to carry dated written permission (issued at least monthly) to be working on the oyster farm.

Those interested in beginning an oyster farm are encouraged to check with permitting agencies for current regulations and requirements.

Security

Oyster farming requires an investment of time and money. Theft and vandalism could lead to significant losses of oysters and gear. By exerting oyster riparian rights, the boundaries of oyster farms are enforced by MRD. Additional measures may be advisable, including security cameras or some sort of regular watch. Where oyster

farms are located near other oyster farms or coastal businesses, there may be opportunities for business owners to assist each other with security.

Coastal Storm Preparedness

Any oyster farmer along the Gulf Coast must have a severe storms preparedness plan. The implementation of the plan should be triggered by specific levels of storm warning. Given the limited time for preparation and the difficulty in keeping oysters alive for lengthy durations out of the water with likely power outages, removing oysters and gear from the water is not a practical solution. Therefore, it is recommended that oysters and gear be well secured at or near the sea bottom prior to a storm's arrival. For example, floating cages can be sunk and longline baskets moved to the lowest clip position on support poles. All lines and anchors should be inspected for chaffing or other damage and reinforced where needed prior to any storm event. As soon as practical after a storm event, the farm site should be inspected for damage and gear returned to normal operating condition. Significant effort should be made to locate and remove any debris originating from the oyster farm.

Figure 6. Advisor Glen Chaplin periodically inspects lines for chaffing at the Auburn University research site.

Business Planning

It is strongly advised that anyone considering oyster farming put together a thorough business plan before investing significant time or money. AgPlan is one on-line, free, business plan development site that can help (https://www.agplan.umn.edu/). Business planning allows:

- Establishing markets;
- Careful consideration and comparison of various options (e.g., location, gear);
- Understanding of upfront and ongoing costs and the range of potential profits;
- Identifying risks and opportunities; and
- Obtaining loans or securing investment.

It is recommended that oyster farmers carefully track their costs, production and sales over time. A number of specialized software packages exist for this purpose. These records will also be useful for potential expansion and accounting purposes.

Marketing

Figure 7. Branding of oysters cultured in off-bottom oyster farms has been a very successful marketing approach.

Oyster harvesters must sell their product to a properly licensed wholesaler; direct sales by harvesters are prohibited. Oyster harvesters, however, may choose to become wholesalers as well. Farmers should contact the ADPH for current options and requirements (with extra requirements for those wishing to ship interstate). Harvest is currently regulated the same way as wild harvest using the volume of oysters contained in a sack. Oyster farmers will likely want to sell by the piece (e.g., 200 oysters per sack). Note that each sack will require a harvest tag with appropriate records kept of harvest (temperature, salinity, etc.), transport and sales.

Additionally, those interested in off-bottom oyster farming should recognize that current business models indicate that the primary market is the premium, half-shell market where oysters are sold live in their shells. This is a specialized, niche market and oyster farmers need to be aware that many oyster dealers may not have buyer accounts for this product form. Though not able to sell directly (unless specifically licensed), oyster farmers may want to encourage sales by speaking directly with restaurants and fish markets about their product. In other parts of the country, branding of oysters by location or farm name has worked well. These brands, or appellations, are like wines or specialized beers (micro-brews), and seem to appeal to a niche audience that is often willing to pay more for the product. Still, any oyster farmer on the Gulf Coast should recognize that this is a developing market in the southeastern U.S.