extension
ALABAMA A&M & AUBURN UNIVERSITIES

Seabird Interactions with Floating Oyster Aquaculture Gear

► Learn the concerns and potential risks of seabirds interacting with floating oyster aquaculture gear and mitigation options currently available to oyster growers.

Industry Background

Commercial oyster farming in Alabama is a relatively new industry that has continued to grow in the last few years. In 2023, at least ten commercial oyster aquaculture operations reported harvests to the Alabama Department of Public Health (ADPH) with a value estimated to be at least $3,200,000. These oysters are produced for raw consumption for the half shell market.

In Alabama, more than 200,000 acres of water are conditionally approved by the ADPH for oyster farming and harvesting (figure 1). However, only 61 acres had permits for commercial oyster aquaculture, and only 45 acres were used in production as of 2023. Therefore, the oyster aquaculture industry has a significant growth opportunity.

Figure 1. Oyster farming park in Grand Bay, Alabama.

Oyster Farming Gear and Infrastructure

Oyster farmers in Alabama primarily use two types of gear: the adjustable long-line system and floating cages (figure 2). These gear systems suspend the oysters in the water column for filter feeding while protecting them from predators such as crabs and oyster drills. Suspension at the surface also provides accessibility for the farmers to remove the oysters from the water for occasional sorting, tumbling, and air drying to prevent biofouling. Biofouling is the accumulation of marine organisms, such as barnacles and algae, that clog the mesh of the bags, prevent water flow, and limit oyster access to food, resulting in slower growth.

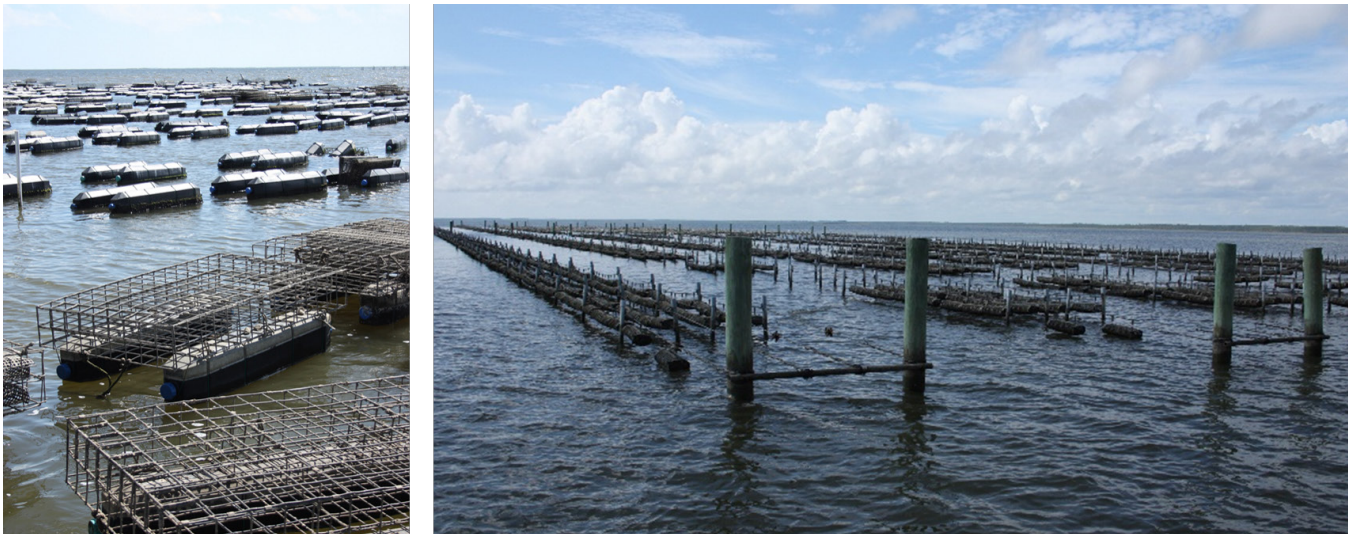

Figure 2. Oyster floating gear: left, floating cages; right, adjustable long-line system.

Shellfish Regulations for Raw Consumption

Oysters are filter feeders that use their gills to separate food particles, such as algae, from the water. This means that algae and bacteria are concentrated in the gut of the animal in numbers much higher than found in the surrounding water. As oysters are often eaten raw, these concentrated bacterial levels may lead to foodborne illness when water quality is poor and the environment has higher numbers of human pathogens. Poor water quality may be the result of wastewater discharge or excessive rain that causes bacterial runoff from land sources. To prevent illnesses, water quality monitoring for each region determines whether the area is open for shellfish harvesting.

The "National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish" provides national regulatory criteria for opening and closing shellfish growing waters. Furthermore, each state has regulatory authority to monitor water quality conditions and determine when areas should be closed for harvest. In Alabama, one of the conditions for a harvest closure is elevated levels of fecal coliform bacteria that may occur from sewage spills or excessive rainfall. Fecal coliform bacteria are found in the feces of humans and animals. Although most bacteria in this group are not harmful, an increase in their abundance indicates a greater risk that human pathogens, such as *Escherichia coli* (*E.coli*) and *Salmonella*, are present in the water. These bacteria are abundant in wastewater. They are also elevated on farmland where animals are present and areas with faulty septic systems. When it rains, the bacteria can be washed from these sources into coastal waters. ADPH regularly tests water in conditionally approved growing areas and if these levels exceed regulatory thresholds, the area is closed until levels decrease to below this threshold. In some cases, oysters are sent to other laboratories for tests that may expedite the reopening of closed areas.

Potential Health Risks of Birds on Oyster Farms

Birds are regularly seen perching on floating oyster aquaculture gear and nearby pilings. The primary species encountered in Alabama include brown pelican (*Pelecanus occidentalis*), double-crested cormorants (*Nannopterum auritum*, formerly *Phalacrocorax auritus*), and various species of gulls and terns (figure 3). During these interactions, the birds excrete waste that may land on the floats or in the surrounding water near the farmed oysters. Although water quality testing indicates that the risk of gastrointestinal illness from recreational activities contaminated with seagull feces is two orders of magnitude lower than activities in human-waste-contaminated areas, there is little data assessing the seafood safety risk of seabirds roosting on floating oyster gear.

One potential risk from having birds perch on oyster farming gear is the spread of foodborne illnesses such as *E. coli* and *Salmonella*. Recently, there has been concern over the transmission of *Campylobacter* bacteria, which is typically contracted by handling raw foods, such as chickens, in processing operations. Pathogenic *Campylobacter* cause severe gastroenteritis.

Figure 3. Birds roosting on floating aquaculture gear.

A 2021 *Campylobacter* outbreak in Rhode Island caused eight documented illnesses and was traced back to an oyster farm. The result was a harvest closure for the farm until testing by the local health agency was completed, which took 52 days. Testing and management of shellfish for raw consumption is highly regulated for consumer safety. In some areas, these human-wildlife conflicts have led to restrictions on floating gear and requirements for bird mitigation plans. However, some birds are protected under the Migratory Bird Treaty Act of 1918, so lethal control methods are illegal and impractical. Thus, there is growing interest in using nonlethal bird deterrents to prevent birds from roosting on floating gear.

In the 2019 revision of the NSSP Guide, a new section was added to Chapter VI, Shellfish Aquaculture, stating that if the local shellfish control authority (Alabama Department of Public Health) determines that there is a human health risk from birds roosting on or near oyster gear, the grower should have, within their required operational plan, a description of mitigation or deterrent strategies to minimize the potential health impacts. Mitigation strategies include resubmergence or relocation to an area with high flow. Deterrent strategies include measures to prevent the interaction of birds with the gear. The NSSP Guide does not define what number or bird species constitute a human health risk. The risk will be impacted by the pathogens found within the birds, the survivability of those pathogens at the site, and the hydrodynamics of the site, including water depth, current, and wave action. Therefore, defining what constitutes the human health risk of these bird interactions is complex.

Mitigation Strategies

Mitigation strategies are meant to reduce the potential human health risk without necessarily preventing initial bird interactions. The primary strategy in this case would be to submerge the floating gear and oysters to allow the potential bacterial contamination to be purged from the animals. In Alabama, resubmergence time is based on regulations for *Vibrio* bacteria and is set at 7 or 14 days, depending on how long the oysters have been out of the water. However, to remove additional contamination from roosting birds, the gear would need to be submerged to a point where there was no surface out of the water, requiring partial filling of pontoons for floating cages.

A more drastic mitigation strategy would be to stop harvesting during times of bird interactions, which is not feasible for most farms as birds may be present much of the year or even year-round.

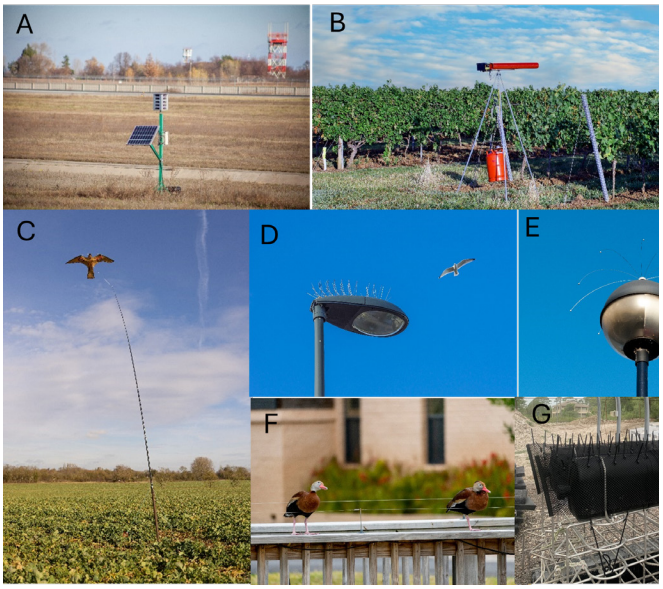

Figure 4. Examples of bird deterrents: A. Auditory deterrent that mimics bird distress calls. B. Propane cannon. C. Predator kite. D. Metal spikes. E. Bird spider. F. Wires. G. Zip-tie "ticklers."

Bird Deterrents

Bird deterrents are meant to prevent birds from landing on the surface of the gear. A few general categories of bird deterrents include auditory, visual, and physical deterrents (figure 4). Many of these were developed for land-based use and have not been tested for their effectiveness against the wide variety of bird species that may be present at Alabama oyster farms. Little information is available on how cage modifications affect cage flipping and desiccation protocols or their longevity in the potentially harsh conditions at oyster farms. These conditions include high winds, strong currents, storms, waves, and exposure to intense sunlight.

Auditory Deterrents

Auditory deterrents may mimic the sound of a distressed or frightened bird or produce enough sound to scare the birds away. Those that mimic bird calls may not be effective if multiple species are visiting a farm. Although the sounds are adjustable, they can only be set to one bird species at a time. Also, the birds may become accustomed to the sounds if they are constantly left on. Other deterrents use ultrasonic sound and may be set on a motion sensor. These may be solar powered or powered by batteries. Descriptions of these two types of auditory deterrents mention their effectiveness against gulls but do not specify other bird species, such as pelicans and cormorants.

Another auditory deterrent is based on emitting a loud sound or clapping at specified intervals. Propane-powered cannons are likely feasible only with a steady platform at the farm site. Reports indicate that birds can become accustomed to propane cannons and learn their firing schedule. Although the birds initially leave, they immediately return to the site.

Visual Deterrents

Using kites that mimic birds of prey has been effective at oyster farms. These deterrents change their flight patterns based on the wind. This is the primary strategy currently employed at Alabama farms and is reported to work well against terns. However, growers using this strategy indicate that habituation is an issue, and the kite must be moved regularly to remain effective. The efficacy depends on having the right wind conditions, and the kite must be taken down during periods of high winds to prevent it from becoming damaged. This strategy may not be effective against larger birds, such as pelicans and cormorants.

Commercially available laser systems that use green laser lights claim that the birds visualize this light as a physical barrier and move away from it. These systems can be automated, set on a timer, and programmed to change paths to ensure that birds do not adjust to the laser pattern. These deterrents may be less effective in daylight, and some regions have laws prohibiting the use of high-powered lasers. These laser systems are also relatively expensive.

Physical Deterrents

Physical deterrents are meant to modify the surface of the gear to prevent birds from landing on the surface. Modifications may include the use of "ticklers," such as plastic zip ties; sweeps; plastic or metal spikes; bird spiders; and wires. All these products aim to make the pontoon an undesirable place to land or perch.

The Wildlife Services—National Wildlife Research Center Mississippi Field Station and Mississippi State University found that physical deterrents, including bird spiders, sweeps, spikes, zip ties, and float-mounted triangles were effective in preventing cormorants from landing on cage floats. Research at the Auburn University Shellfish Lab (AUSL) indicates that plastic zip ties are effective ticklers and reduce bird interactions by approximately 85 percent. This is a very affordable strategy. However, it is unclear at this time if birds will adjust to these. Zip-tie ticklers also seem to be more effective with certain bird species. For example, AUSL observed a 99 percent decrease in terns versus a 74 percent decrease in pelicans. In addition, there is concern over the generation of plastic debris. Bird sweeps act using wind to spin and either prevent a bird from landing on the gear or push them off if they have landed. These would not be effective on calm days. Any deterrent, including "ticklers," sweeps, spikes, spiders, and wires, would likely have to be removed to flip the cage. It is not currently known how these deterrents hold up over time.

Anecdotal evidence suggests that the shape of a float can affect bird interactions. A wide, flat float surface may be more desirable for roosting versus a skinny, pointed surface, and growers have seen this behavior when they have both gear types on their farm. However, if all the floats are the skinnier type, birds may roost there despite slight discomfort versus not roosting at all.

Water harassment may also be a way to scare birds from cage surfaces. Sprinklers using a timer or motion sensor hit birds with water. These sprinklers could potentially be hooked up to use seawater at the farm site. Solar models are available. However, many would be needed for a large farm and would require mounting surfaces. While they could be attached to the cage pontoons, they would likely have to be removed during flipping.

Restrictions exist to some bird deterrents due to concerns over their being harmful to the birds. Check with your local authority for these restrictions.

Conclusions

As the industry grows, bird interaction with floating oyster cages is an important issue. Growers should anticipate bird mitigation strategy requirements and potential regulatory changes for food safety testing. Although current data suggests that the risk of pathogen transfer from birds to humans is likely overestimated, bird feces on oyster cages is undesirable for farms with public tours.

Additional Information

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