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These fact sheets for the off-bottom oyster aquaculture industry in the Gulf of Mexico provide guidelines and suggested safety procedures in preparing for tropical storms and hurricanes:

- Introductory Planning Guide
- Adjustable Long-Line Farms
- Floating Bag Farms
- Floating Cage Farms
- Land-based Operations
- Workboats

To access all of the fact sheets in this series, visit the National Sea Grant Library at *nsgl.gso.uri.edu*. Using the "search the catalog" function, search "Oyster Aquaculture Hurricane Preparedness Series."

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Tropical Storm and Hurricane Preparedness for Off-bottom Oyster Aquaculture in the Gulf of Mexico Floating Bag Farms Guide

Many oyster growers in the Gulf of Mexico region use the floating bag system, an off-bottom culture gear. This fact sheet provides guidance related to storm preparation and planning for this gear type. It is part of a series providing an overview of storm preparation and planning for other oyster aquaculture operations, including adjustable long-line farms, floating cage farms, land-based operations, and workboats.

The floating bag system uses a series of bags, typically buoyed by twin floats. The bags are attached to a main line that is anchored at either end, but anchoring configuration can vary by site. The floats may have removable caps, allowing a farmer to fill the floats and sink the bag to the sea bottom, but many float designs do not have this capability. Bags are flipped to allow for partial air drying, which provides some control of biofouling.



INSTALLATION

During installation of the floating bag system, there are several important considerations.

- □ Assess the site's exposure to storms as a primary factor in site selection.
- Orient main lines parallel to prevailing winds and waves.

Photo courtesy of Orlando Sentinel

- □ Choose an anchoring system suitable to the bottom type.
- Install substantial, durable anchors (buried to at least 5 feet depth) that will hold in the farm's bottom substrate in the strongest storms (see Figure 1 for some options).



FIGURE 1. Two types of anchors used to secure floating cage main lines: helical screw anchor (left) and arrowhead anchor (right). Photos courtesy of Auburn University Shellfish Lab

- □ Bury anchors (typically helical metal screw anchors) fully in the sediment to reduce projection above the sea floor, corrosion, and tangling hazard.
- □ Invest in durable main line that meets the supplier's recommendation with some protection from chafing at friction points (e.g., anchor attachment).
- □ Allow sufficient spacing between lines to ensure bags do not collide in bad weather.
- □ Use a system that will reinforce the bag to reduce chafing at friction points (see Figure 2 for one example).
- If floats have removable caps, invest in and practice with a system, such as a mechanical davit or a compressor to fill floats with air (with a back-up system in place), that allows for safe and efficient sinking and re-floating of bags.
- □ Place identifying tags on each bag.

PRIOR TO HURRICANE SEASON

Prior to the onset of hurricane season, oyster farmers should take these steps to reduce the risk of losses.

- Check stocking densities and reduce as necessary (though some farmers have had success by overstocking bags to achieve neutral buoyancy just prior to a storm).
- □ Check biofouling and control on a routine basis.
- □ Check all lines for chafing (especially near the clips) and repair as needed.
- □ Check all bag clips are secured and in good condition at attachment points.

- □ Have crew conduct timed practices to gauge time needed per line to prepare for a storm.
- □ For shoreside operations, pick up loose pieces of equipment and secure bags to reduce loss from flooding and wind.
- Review storm plan with crew and family so they can account for personal preparations alongside farm preparations.

DURING HURRICANE SEASON

A tiered approach to preparation, which has been adopted in each fact sheet, allows growers to stage tasks based on the storm or hurricane's track forecast. The authors developed the following color codes to address increasing levels of concern and actions.

CODE YELLOW

Once a hurricane or tropical storm has formed in the Gulf of Mexico or has a chance of entering the Gulf, it is time to begin preparations according to the farm's plan. Note that the timeline is fluid and will depend on the storm's speed and track.

- Re-check stocking densities and reduce as necessary.
 If opting to overstock bags to achieve slightly positive buoyancy, ensure stocking is appropriate.
- □ Farmers opting to sink their bags below the surface but still float off the bottom by overstocking bags should consider taking this step now.
- □ Re-check all lines for chafing (especially near the clips) and repair as needed.
- □ Ensure all bag clips are secured and in good condition.
- □ Secure any empty bags on shore or on lines.

- Document the condition of the farm with dated photographs and notes.
- □ Document the numbers of various sizes of oysters.
- □ Review workboat(s) plan.

CODE ORANGE

Once a hurricane or tropical storm watch has been issued, final preparations should begin. In the case of a fast-moving storm, proceed with tasks associated with final stages of preparation.

- □ Sell product as market allows.
- □ Track the storm's progress frequently and carefully. When assessing whether to sink bags, keep in mind the amount of time necessary to carry out the sinking operation. Farmers should also weigh the risks of bags and oysters being buried in the substrate.
- □ Remember that the day before the storm is to make landfall, farmers should not plan to be on the water. They will need that day for other preparations and the weather will likely not allow for it.
- □ If weather conditions do not warrant sinking bags, consider adding slack to anchor lines to allow for storm surge. Alternatively, some farmers opt to tighten their mainlines to pull bags under the water surface.
- □ If weather conditions warrant sinking bags, remove both floats from bags and allow them to rest on the



bottom or remove one float or alternate floats to partially or completely submerge the bags to keep them just above the bottom. Store floats safely onshore.

- □ For systems that have floats with caps, remove caps from floats or alternate floats and ensure all air from floats is removed when sinking.
- □ Some growers suggest replacing caps on floats (once all air is removed) to prevent sediment from filling the floats (though this may depend on sediment type). This adds considerable time to preparations.
- □ If allowed by state regulations, some farmers opt to tow floating bags to more protected areas.
- □ Prepare to implement workboat(s) plan.

CODE RED

When a hurricane or tropical storm warning has been issued and there is a high probability of being in the path of the storm, farmers must conclude final preparations if and only if they can be accomplished safely. Farmers will make a series of personal risk assessments.

- □ Conduct last check of farm.
- □ Implement workboat(s) plan.
- \Box Get to safety.

POST-STORM RECOVERY

Oyster growers and their employees must be ready to take care of the needs of the farm as soon as it is safe and reasonable to do so. After a storm has passed, the following tasks should be considered.

- □ Assess risk of returning to farm, and proceed only when safe.
- □ Patrol the area upstream and downstream of the farm for significant debris that could entangle or dislodge gear once it is raised, and remove or secure debris.
- Document the condition of the farm with dated photographs and notes.
- □ Refloat bags as soon as practically possible by adding flotation and/or reducing stocking densities.
- □ If caps were removed from floats, use systems designed for this task, with bags lifted from reinforced points, allowing water to drain out the end caps and being careful to work any bags out of the sea floor if necessary.
- □ If necessary, use an on-board washdown hose to rinse sediment off the bags or out of floats and recap once washed down.

- □ Assess and document oyster survival, gear condition, and losses.
- □ Once mortality risk has passed, resume normal biofouling regimen.
- □ Communicate with public agencies about closures and effects of the storm.
- □ Communicate with buyers and suppliers to provide situation and outlook reports.

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Photo courtesy of Pelican Oyster Company

This fact sheet is the result of a collaborative effort among shellfish aquaculture extension specialists in the Sea Grant programs of Florida, Mississippi-Alabama, and Louisiana. For further information, contact:

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The views expressed herein do not necessarily reflect the views of any of these organizations.

The information and checklists provided in this series of fact sheets are meant as guides only. Following these guidelines and suggested safety procedures does not assure that damages will not occur to oyster crops, gear, or facilities.