

Freshwater Issues

In previous episodes, we focused on legal issues involving shellfish grown in bays or open marine environments. However, freshwater sources can impact shellfish aquaculture as well. In this episode, we talk about some of the legal issues involving freshwater that have affected shellfish aquaculture in recent years.

Freshwater sources can impact shellfish aquaculture in a myriad of ways. Freshwater mussels are different from their saltwater cousins in several ways. Unlike saltwater mussels, fertilization for freshwater places takes place internally. Male mussels release sperm into the water, where it is then taken into the bodies of female mussels, who will actually utilize fish as hosts for their larvae. Another important difference is that many freshwater mussels live a very long time before reaching edible size. As a result, they have a much longer time to bio-accumulate any toxins that exist in the waters where they live, making them potentially dangerous to consume.

The quality and quantity of freshwater that drains into the United States' saltwater sources can also have a great impact on shellfish aquaculture. In particular, the quality and quantity of freshwater in estuaries can impact the shellfish that either naturally live or are grown there. Most of the fish and shellfish eaten in the United States complete at least part of their life cycles in estuaries. Estuaries need freshwater to keep their ecosystems healthy, and while the water level and salinity of an estuary naturally varies over time and seasons, too much variation can upset the delicate balance the ecosystem requires.

Apalachicola Bay, an estuary and lagoon located on the northwest coast of Florida, is a good example of this. At one time it supplied 90% of the oysters sold in Florida and 10% of the oysters sold nationwide. However, the oyster industry in the bay has taken a steep nosedive since those more profitable times. Many attribute the collapse to a convergence of negative factors, including the 2010 BP Deepwater Horizon oil spill, the oyster drill, and the decades-old water dispute between Florida, Georgia, and Alabama, which has been raging since 1990.

In the meantime, former wild harvesters of oysters in Apalachicola Bay are increasingly looking towards aquaculture. Though the oysters are smaller on average and pricier to produce, many are hoping that consumers will pay a premium to eat oysters from Apalachicola Bay again. They also hope that aquaculture gear such as mesh baskets will protect the shellfish from predators, further helping new farmers turn a profit. But is Apalachicola Bay's situation a function of states prioritizing urban areas, such as Atlanta, over rural ones, like Apalachicola Bay?

Urban v. rural disputes like the one in Apalachicola Bay can result in additional freshwater-related scenarios that harm shellfish, such as the opening of the Bonnet Carre Spillway, a flood control operation in the Lower Mississippi Valley about 12 miles west of New Orleans. It allows floodwaters from the Mississippi River to flow into Lake Pontchartrain, and, eventually, into the Gulf of Mexico. Today, the spillway primarily helps to divert river floodwaters from the city of New Orleans.

Unfortunately, opening the spillway in 2019 yielded negative ecological results. Though the Army Corps' actions may have saved New Orleans from a lot of flooding-related damage, the negative impacts of the two openings can still be felt elsewhere in and around the Gulf. In July, Mississippi announced that the increase in freshwater into the Mississippi Sound was responsible for the death of the state's oyster beds, which could take years to recover. Furthermore, the influx of freshwater killed approximately 132 dolphins and 175 sea turtles.

The state was also forced to begin closing its beaches in June due to a harmful algal bloom (HAB) of blue-green algae—a dangerous event that happens when too many nutrients, like fertilizers, enter a body of water. Such blooms can be intensified by higher temperature waters, and algal toxins can also be bio-accumulated by the fish and shellfish that live in the area. By the 4th of July, Mississippi was forced to close all of its mainland beaches due to the toxic bacteria.

The HABs off the coast of Mississippi followed a HAB in 2018 in Florida that was the worst HAB in decades in the state, as beach closures and fish kills plagued the state's coasts. The red tide lasted for months, prompting the state to declare a state of emergency.

However, HABs are not purely a marine problem – they can occur in freshwater sources as well. Freshwater HABs are increasing due to nutrients from sources such as fertilizers and other agricultural runoff entering freshwater sources. While not every algal bloom is toxic—some algal species can produce both toxic and nontoxic blooms—toxic blooms can cause problems for swimmers and other recreational users in the form of rashes or allergic reactions. HABs are also poisonous if consumed, and thus, are a risk for drinking water supplies. They can cause diarrhea, vomiting, nausea, numbness, and dizziness. Some health effects can be more severe, as some toxins can cause liver and kidney toxicity.

HABs also have the potential to harm aquatic organisms, including freshwater shellfish being cultured for food, by contributing to deteriorating water quality and ecosystem health. However, the toxins present in algal blooms do not likely harm shellfish directly. Though shellfish bioaccumulate toxins present in HABs that can harm humans when eaten, they are not apparently affected by the biotoxins themselves.

Congress, federal agencies, and the states have taken steps to address HABs and the nutrients that contribute to their occurrence. These actions include developing guidelines for algal toxins, primarily for use in guiding swimming advisories, funding research to close gaps identified by scientists and decisionmakers, and coordinating the efforts of federal agencies and their partners to study and address HAB's.

Listen to the full episode for more details on the who, what, where, why, and how of shellfish aquaculture!

Key Words: estuary, HAB, harmful algal bloom, freshwater, tri-state water wars

Resources:

NOAA- What is a Harmful Algal Bloom?: <https://www.noaa.gov/what-is-harmful-algal-bloom>

NOAA- What is an Estuary?: <https://oceanservice.noaa.gov/facts/estuary.html>