

- Introduction: "The time has come," the Walrus said, "to talk of other things."
- Stephanie Otts: This is a podcast, not about shoes and ships and sealing wax, but about the who, what, where, why, and how of shellfish aquaculture, including the many different legal challenges that can arise. We're the National Sea Grant Law Center and we invite you to sit down and get ready for a wave of knowledge.
- Stephanie Otts: Hi, I'm Stephanie. I'm the director of the National Sea Grant Law Center.
- Cathy Janasie: Hi, I'm Cathy. I'm a Senior Research Counsel at the National Sea Grant Law Center.
- Amanda Nichols: And I'm Amanda. I'm the Ocean and Coastal Law Fellow with the National Sea Grant Law Center.
- Stephanie Otts: You are listening to Law on the Half Shell.
- Amanda Nichols: Up until now we've mainly been focused on legal issues involving shellfish grown in bays or open marine environments. However, freshwater sources can have an impact on shellfish aquaculture as well. In this episode, we'll be talking about some of the legal issues involving fresh water that have affected shellfish aquaculture in recent years.
- Cathy Janasie: So freshwater sources can impact shellfish aquaculture in a myriad of ways. First, some shellfish such as freshwater mussels must be cultivated in freshwater due to their biology. Freshwater mussels are different from their saltwater cousins in several ways. Unlike saltwater mussels, fertilization for the freshwater species takes place internally. Now mussels release sperm into the water where it is then taken into the bodies of the female mussels who actually utilize fish as hosts for their larvae.
- Cathy Janasie: A female mussel can produce hundreds of thousands of larvae, which clamp on just certain fish species gills and enjoy those host nutrients from two to three weeks. Eventually they metamorphosis, fall off their host and spend the rest of their lives as free living creatures.
- Cathy Janasie: The larvae that attach to inappropriate fish species are sloughed off before metamorphosis can occur and unfortunately die. 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 bioaccumulate any toxins that exists in the water where they live, making them potentially dangerous to consume, if not carefully monitor.
- Cathy Janasie: Salt water muscles in contrast, reach edible size in about a year and a half, leading to a lower chance that they have bioaccumulated any potentially harmful substances from their marine environment. They also reproduce externally with fertilization taking place in the water outside and resulting in

tiny larval mussels that float around for a while until the lucky ones find a nice solid place to settle down and stretch out their anchoring byssal threads. The mussels are then anchored there for the rest of their lives. Sadly, mussels are the most imperiled group of animals in the United States. In fact, 35 species have gone extinct in the last 100 years.

Cathy Jansie: That's really sad actually.

Amanda Nichols: That's very sad.

Cathy Janasie: The quality and quantity of freshwater that drains into the United States saltwater sources can also have a great impact on shellfish aquaculture.

Cathy Janasie: In particular, the quality and quantity of freshwater in estuaries can impact the shellfish that either naturally live or are grown there. So an estuary is a partially enclosed body of brackish water with one or more rivers or streams flowing into it. And with a free connection out to the open sea. So fun fact, most of the fish and shellfish eaten in the United States, including salmon, herring, and oysters complete at least part of their life cycle in the estuary. Estuaries need freshwater to keep their ecosystems healthy. The water level and salinity of an estuary naturally varies over time and seasons. However, too much variation can upset the delicate balance the ecosystem requires. Estuary and ecosystems can also become unbalanced due to pollution that enters rivers upstream and is eventually discharged, such as land runoff and industrial, agricultural, and domestic waste.

Amanda Nichols: Let's look at Apalachicola Bay as an example. So Apalachicola Bay is an estuary and lagoon located on the northwest coast of Florida. Fun fact, at one time, Apalachicola Bay actually supplied 90% of the oysters sold in Florida and 10% of the oyster sold nationwide to buyers who loved the sweet and unusually large shellfish that the area produced. And during those times it wasn't uncommon to see 600 oyster boats crowded together on the water, all harvesting oysters. A Bay resident even came up with a pasteurization method that allowed the mollusks to be packed and shipped, growing the local industry even more.

Amanda Nichols: However, the local oyster industry in the Bay has taken a steep nose dive since more profitable times. In 2013 the National Oceanic and Atmospheric Administration declared the Bay a fishery disaster due to the sudden and unexpected losses of oysters that caused a serious economic impact for local fishermen in their communities. NOAA Fisheries administers disaster assistance to mitigate such impacts under two statutes, the Magnuson-Stevens Act and the Interjurisdictional Fisheries Act. And under both of these statutes, a state governor or an elected representative of an effected fishing community can request a fishery disaster determination from the Secretary of Commerce who can also initiate an independent review. If the Secretary determines that a fishery disaster has occurred, the fishery's eligible for disaster assistance funds from Congress.

Cathy Janasie: Despite Congress's assistance, however, Apalachicola Bay's oyster fishery was left decimated with no real cause as to why. And there can be several reasons for this. Many attribute the collapse to a convergence of negative factors including the 2010 BP Deepwater Horizon oil spill. After this spill, local oystermen successfully petitioned the state to allow them to harvest the entire bay early and work seven days a week to get the job done.

Cathy Janasie: Previously, only certain segments of the bay were open at a time, and oystering was only allowed five days a week. But in their race to escape the creeping oil, the oyster men did too good of a job. By harvesting so many adult oysters, baby oysters, or spat, didn't have enough adults to adhere to preventing them from to maturity themselves. Using BP settlement money, the state tried to restore the Bay by scattering fossilized oysters and limestone into the water, but the spat didn't take. Another contributing factor would be the oyster drill, which is a small marine snail that literally drill a hole into oyster shells in order to suck out the meat. In the past, the drills never have been able to survive in Apalachicola Bay's mix of salt and freshwater long enough to show up in large numbers. So the question was then, what changed?

Amanda Nichols: According to many, the answer to this question lies in the decades old water dispute between Florida, Georgia and Alabama, which has been raging since 1990. The entirety of this conflict is often referred to as the Tri-state Water Wars. Generally the Tri-state Water Wars are a water use conflict among Georgia, Alabama, and Florida over flows in the Apalachicola, Chattahoochee, Flint River Basin, and the Alabama-Coosa-Tallapoosa River Basin. Each of these states use those freshwater sources to meet multiple needs for their citizens, including those related to drinking water, power generation, agriculture, aquaculture, navigation, and recreation. So Georgia wants to continue growing its metro areas and supplying heavily agricultural areas with adequate water. And one of the biggest consumers of the disputed waters in the state is Atlanta. Which because of the granite underlying much of the metro area has very little groundwater resources, and as a result depends on the multiple river systems that originate near it for surface water.

Amanda Nichols: Alabama is concerned that Atlanta's eve- increasing thirst for water, will severely limit its own use of water for power generation, municipal supply, fisheries, and other current and future needs. And then finally, Florida wants enough freshwater to reach the Apalachicola Bay to sustain its shellfish industry. As Atlanta and other upstream areas take more and more freshwater out of the sources that eventually flow into the Bay, less freshwater actually reaches the Bay, disrupting the balance of freshwater and saltwater that allowed native oyster populations to thrive for eons. And this is a huge issue actually because Apalachicola Bay provides 35% of the freshwater flow to the Eastern Gulf of Mexico. So now we can see why oyster drill populations are likely growing in the Bay. The ecosystem isn't getting the freshwater it needs to thrive. And again, the oysters are not receiving the correct mix of fresh and saltwater that they need to flourish.

Cathy Janasie: With these issues in Apalachicola Bay, what is being done about the situation? Long-term ongoing litigation is preventing any real progress from reaching Apalachicola Bay. While the original water wars litigation that began in 1990 came to a close in 2012, a new series of legal actions began in 2013 over the waters, and the U.S. Supreme Court, which has been pointed a special master to oversee the proceedings. Special masters supervise litigation in order to ensure that the court orders are being followed and to report on the activities of the entity being supervised to the court.

Cathy Janasie: The U.S. Supreme Court normally assigns a special master to lawsuits brought between states that are first heard at the Supreme Court level. This is because the Supreme Court is an appellate court, meaning that it reviews cases that have already had a trial by a lower court. In most cases, the court already has a record and evidence to review when it is deciding a case. When states sue each other, however, the case goes right to the Supreme Court. This means that there has been no trial before the court gets the case. There is no record, evidence or prior ruling for it to review. In cases between the states, the special master conducts what amounts to a trial. The taking of evidence in a ruling. The Supreme Court then assesses the special master's ruling as an appeals court would rather than conduct the trial itself.

Amanda Nichols: And the Florida versus Georgia case has now been going on for over five years. Lawsuits between states do not go away quickly, meaning that for the time being more freshwater is not reaching Apalachicola Bay. In 2016 the special master who is a lawyer based in Maine, released his report in the case. He found that while Florida was indeed harmed, the state didn't prove by clear and convincing evidence that putting a cap on how much water Georgia could consume would actually improve the river flows at a time that would provide a material benefit to Florida.

Amanda Nichols: Further, he found that because the U.S. Army Corps of Engineers was not a party to the case, Florida could not actually receive the relief it sought. So in 2018 the Supreme Court ruled that the special master applied too high of a standard to Florida's claims. So the court then replaced the original special master and sent the case back to be heard by the new special master. The court gave the new special master a set of questions to answer and over the last year, the two states have been submitting additional briefs based on the Supreme Court's ruling. The hearing is now set for December 16th, 2019 in New Mexico.

Cathy Janasie: 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.

- Cathy Janasie: But is Apalachicola Bay situation's a function of states prioritizing urban areas such as Atlanta over rural ones like Apalachicola Bay?
- Amanda Nichols: This urban versus rural dispute can be seen in other freshwater-related scenarios such as the opening of the Bonnet Carre Spillway and the Mississippi River. The Bonnet Carre Spillway is a flood control operation in the lower Mississippi Valley located in St. Charles Parish, Louisiana, 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 a way primarily helps to divert river floodwaters from the city of New Orleans. A little bit of a fun fact, the Spillway was actually built in response to the Great Mississippi Flood of 1927, that inundated much of the Mississippi river basin with floodwaters.
- Amanda Nichols: It was first opened during the Ohio River flood of 1937 which left around 1 million people homeless and resulted in property damage amounting to approximately \$500 million, which is approximately \$8.7 billion when adjusted for inflation in 2019. So the spillway has been open 11 other times since it was built, but most recently in February 2019, when river levels were predicted to rise to minor flood stage in New Orleans due to excessive upriver rainfall. According to the national weather service, this year's flooding was caused by pounding spring rains and is the longest lasting flooding since the Great Flood of 1927. The Army Corps of Engineers closed the Spillway on April 11th, 2019 only to reopen it again on May 10th, 2019, marking the first time in the Spillway's history that has opened twice in one year. As well as the first time the Spillway has been open two years in a row.
- Cathy Janasie: Unfortunately opening this Spillway in 2019 also 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.
- Amanda Nichols: That's a little weird, Cathy. How could opening the Spillway have impacts to other parts of the Gulf? Wouldn't it have just backed up floodwaters into the more rural parts of Louisiana?
- Cathy Janasie: You might think so, Amanda, but that's unfortunately not the case. Let's look at Mississippi for example. As a result of the opening of the Bonnet Carre Spillway, much of the floodwaters from the Mississippi River would have verged into the Mississippi Sound, significantly unbalancing the fresh and saltwater there, and inundating the area with excessive nutrients originating from upstream sources.
- Cathy Janasie: In July, Mississippi announced that the increase in freshwater into the 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.

Amanda Nichols: Oh God, that's so sad.

Cathy Janasie: I agree Amanda, how awful. The state was also forced to begin closing its beaches in June due to a harmful algal bloom or a 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 bioaccumulated 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.

Amanda Nichols: Well, that doesn't sound like a very fun holiday weekend.

Cathy Janasie: No, it sure doesn't.

Amanda Nichols: The HAB off the coast of Mississippi actually 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, HAB's are not purely a marine problem. They can actually 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.

Amanda Nichols: Toxic blooms can cause problems for swimmers and other recreational users in the form of rashes or allergic reactions, similar to the symptoms feared up with Mississippi's blue green algae bloom. HAB's have numerous negative health effects for humans. Just coming into contact with contaminated water can actually cause skin rashes or burns. HAB's are also poisonous if consumed. They can cause diarrhea, vomiting, nausea, numbness and dizziness. Some health effects can even be more severe. For instance, two toxins from blue green algae, Microcystins and Cylindrospermopsin can cause liver and kidney toxicity respectively. The children, the elderly, people with compromised liver function and pets are especially vulnerable to the toxins present in HAB's.

Cathy Janasie: In 2014 another blue green algal bloom in Lake Erie affected the drinking water for more than 500,000 people in Toledo, Ohio. And in 2016 a massive HAB in Florida's Lake Okeechobee negatively impacted tourism and aquatic life. In May 2018, the city of Salem, Oregon, which obtains its drinking water from the Detroit Lake, found dangerous levels of blue green algal toxins in its water supply. The result was a do not drink water advisory that lasted for weeks. And the Oregon health authority issued a temporary rule requiring that certain larger drinking water systems that use surface water regularly test for cyanotoxins.

Cathy Janasie: HAB's also have the potential to harm aquatic organisms, including freshwater shellfish being cultured for food by contributing to deteriorating water quality and ecosystem health. As masses of blue green or other algae die and

decompose, they consume oxygen, sometimes forming dead zones where life cannot survive. This condition is known as hypoxia. Such areas kill fish and other organisms such as crabs and clams potentially causing detrimental economic effects. However, the toxins present in algal blooms do not likely harm shellfish directly. Though shellfish bioaccumulate toxins present in HAB's, they can harm humans when eaten, they are not apparently affected by the biotoxin themselves.

Amanda Nichols: Congress, federal agencies and the states have taken steps to address HAB's and the nutrients that contribute to their occurrence. For example, the Harmful Algal Bloom and Hypoxia Research and Control Act of 1998 authorized a task force to prepare reports and plans addressing marine and freshwater HAB's and approved funding for research, education and monitoring activities among other things.

Cathy Janasie: Furthermore, in December of 2016 the EPA used its authority under the Clean Water Act to propose water quality criteria for two algal toxins in waters use for recreational purposes. States use such criteria when developing water quality standards, measures that describe the desired condition or level of protection of a water body and what is needed for protection. The values the EPA picked based on the noncancer health effects to children. While HAB's compose risk to pets, the levels are meant to be protective of human and not animal health. In May 2019, the EPA finalized the recommendations for recreational water quality criteria and swimming advisories for two cyanotoxins. The finalized recommendations aimed to prevent the human health risks associated with swimming and other recreational activities in waters continuing these blue green algal toxins. The water quality criteria apply to both marine and freshwater water bodies. Sources and the final values are about twice as high as the draft values proposed by the Obama administration in 2016. The EPA stated that its recommendations are protective of all age groups and are based on peer reviewed and published science.

Amanda Nichols: Some states have also developed guidelines for algal toxins, primarily for use in guiding swimming advisories. And Congress continues to show interest in addressing HAB's, interest that is largely focused on funding research to close gaps identified by scientists and decision makers and to coordinate the efforts of federal agencies and their partners to study and address HAB's.

Stephanie Otts: Join us next time as we explore the impact of storms and other disasters on shellfish aquaculture operations including resources available to assist in recovery. This podcast is a production of the National Sea Grant Law Center at the University of Mississippi School of Law. It is made possible in part by funding from the NOAA National Sea Grant College Program. The statements, findings, conclusions and recommendations are those of the speakers and do not necessarily reflect the views of NOAA or the U.S. Department of Commerce. Editing and production assistance was provided by Kerrigan Herret, a senior journalism student at the University of Mississippi. Thanks for listening.

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