

In this episode, we talk about the impact of invasive species and diseases on shellfish aquaculture. During our discussion we talk to Sam Chan, a professor at Oregon State University and statewide aquatic invasive species specialist with Oregon Sea Grant.

Invasive species can be plants, animals, and other organisms (such as microbes). Species can travel to new geographic areas through a variety of routes known as “pathways.” Pathways can be natural or manmade. Natural pathways include wind and currents that might sweep animals and plants into new territory. Most of the time, however, species are moved by humans.

Invasive species can be introduced by humans intentionally - like when someone releases a pet snake into the woods - or by accident. For instance, lionfish are one of the biggest invaders in the Gulf of Mexico. While lionfish are native to the South Pacific and Indian Oceans, the leading theory is that they escaped from a Florida aquarium that was destroyed during a hurricane.

### *Invasive Plants and Animals*

Aquaculture farms, just like the natural environment, can be significantly affected by invasive species. An example of this are oyster drills, a small, predatory sea snails that live on rock and shell beds in low tidal areas up to a depth of 25 feet. In the Gulf of Mexico, the Atlantic oyster drill attaches to oysters with their huge foot and then bore into the shell with a sandpaper like tongue called a “radula” until it can reach the tissue and eat the oysters alive.

While Atlantic oyster drills are native to the Atlantic coast of North America, they have been accidentally introduced with baby oysters to Northern Europe and the West Coast of North America from California to Washington. Their feeding habits can cause millions of dollars worth of damage every year, and controlling oyster drills can be tough.

Similarly, in Oregon shellfish farmers are facing challenges from the presence of invasive tunicate species, also known as sea squirts. Tunicates are rather weird creatures - they are invertebrates that spend most of their lives attached to rocks, docks, or other hard surfaces. In this episode, Sam talks to us about their impact on shellfish farms.

### *Contamination*

Plants and animals aren't the only invaders shellfish farmers have to be worried about. Diseases, such as *Vibrio*, can also have far reaching negative impacts. A handful of species of *Vibrio* bacteria are commonly associated with shellfish and can cause human illness, called vibriosis. According to the Center for Disease Control (or CDC), vibriosis causes an estimated 80,000 illnesses and 100 deaths in the U.S. every year.

Luckily for shellfish farmers, there are ways to reduce the risk of vibrio. Because vibrio bacteria are temperature dependent, limiting harvest during the warmer summer months, properly cooling the shellfish after harvest, or moving them to waters where the bacteria aren't present

for a period of time to enable the shellfish to remove the bacteria from their systems can reduce the risk. However, due to the contamination risks, the CDC recommends that individuals with compromised immune systems should avoid eating raw or uncooked shellfish.

In addition to vibrio, shellfish farms can also suffer from E. coli contamination. But, those pathogens typically invade marine environments through a different sort of pathway - upland runoff. After heavy rains, the water running off land can carry E. coli bacteria from farm fields, overflows from wastewater treatment plants, or failing septic tanks.

### *Water Quality Protection*

In addition to harming human health, contamination from Vibrio and E. coli bacteria can have other negative impacts on the shellfish industry. Heavy rainfall can result in water closures, meaning that both wild harvesters and shellfish farmers have no way to bring in their catch and sell it for a profit. The federal Clean Water Act (or CWA) and other laws are responsible for these closures. While these closures are important for human health, they can hurt the people who rely on shellfish resources. For example, shellfish farmers who lease submerged state lands may miss out on potential profits when closures happen during peak demand times.

In bodies of water where contaminant levels are unsafe, fish and shellfish advisories are issued to help people make informed decisions about where to fish or harvest shellfish. All 50 states and some U.S. territories and tribes issue advisories. However, these fish and shellfish advisories are just recommendations, not laws.

Sometimes poor water conditions can also force fishery closures, which are mandatory. States generally maintain online databases of closed areas so that harvesters and aquaculturists can know ahead of time that they won't be able to enter and take shellfish. Fisheries can only be reopened once the state tests and verifies that the contaminants have decreased to safe levels in the closed area.

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

Keywords: oyster drills, tunicate, vibrio, vibriosis, water quality, shellfish advisories

### Resources:

- Center for Disease Control, Vibrio Species Causing Vibriosis:  
<https://www.cdc.gov/vibrio/index.html>
- National Sea Grant Law Center, Regulating Invasive Species in Aquaculture:  
<http://nsglc.olemiss.edu/projects/ag-food-law/files/regulating-invasive-species-in-aquaculture.pdf>
- Oregon Sea Grant, Invasive Species:  
<https://seagrant.oregonstate.edu/outreach-and-engagement/Invasive-Species>