

Climate Change & Seafood Safety

It was not a welcome headline that graced the *Chinook Observer* the morning of October 2, 2002: “Clam opener canceled due to high toxin count.” That day the Washington coast’s largest newspaper relayed disappointing news to the thousands of would-be razor clam diggers who are drawn each fall to Washington’s coastal beaches for the limited harvest season. Harvest closures have been a recurring problem on the Washington coast. They result from marine biotoxins, including domoic acid and paralytic shellfish poisoning toxin, and bacteria that cause intestinal disease in humans.

Because marine biotoxin production seems to hinge on a complex set of factors, including water temperature, researchers are beginning to wonder what role climate change might play in future seafood harvest seasons and the availability of safe seafood resources throughout the Pacific Northwest.

Pacific Northwest seafood resources, both recreational and commercial, represent a means of sport and employment. They also represent a way of life among tribal communities that depend on these resources for sustenance and cultural identity.

The University of Washington’s Pacific Northwest Center for Human Health and Ocean Studies, directed by Elaine M. Faustman and Ginger Armbrust, researches how environmental factors trigger blooms of the marine algae that produce domoic acid, which caused the 2002–2003 harvest closure. When people eat seafood contaminated by domoic acid, they may experience nausea, memory loss, confusion, seizures, and even death. Faustman, Professor of Environmental and Occupational Health Sciences, leads the center’s human exposure research project.

While controlled laboratory studies are beginning to illuminate environmental and genetic factors that contribute to domoic acid production, Armbrust, Professor of Oceanography, says researchers are not certain of causes of domoic acid production in the environment. Domoic acid has prompted beach closures dating back to 1991 and has become an emerging concern in Puget Sound, where three closures have occurred since 2003. The 2002–2003 harvest closure on the Washington coast cost the local economy an estimated \$10 million.

Some studies suggest that harmful algal blooms, including blooms of domoic acid, are on the rise.

According to an article by Moore *et al.* in the journal *Environmental Health*, little progress has been made in teasing out the role of climate impacts from the many other variables thought to contribute to harmful algal blooms. The article suggests that studying documented and predicted impacts of ocean warming from large scale climate variability (such as *El Niño*) can help predict future anthropogenic climate change. While researchers suspect that a type of algae known as diatoms might struggle because of its physiology, a type called dinoflagellates might fare better. If warmer waters occur for greater lengths of time each year and favor growth of some kinds of dinoflagellates, such as the kind that produce paralytic shellfish poisoning (PSP) toxins, harvest closures could increase. In Washington State, harvest closures result when PSP toxin levels in seafood are too high.

In addition to testing for domoic acid and PSP toxins, the Washington State Department of Health tests for bacteria that cause the intestinal disease vibriosis. Levels of these bacteria in shellfish increase as summer temperatures rise. A large outbreak of vibriosis in 2006 in Washington State sickened dozens of people. Nationwide, about 300 people were infected by contaminated Pacific Northwest oysters that year, threatening the entire industry. Another outbreak in 2004 in Alaska made dozens ill. The Alaska outbreak is of particular note because, at the time, scientists did not think Alaskan waters were warm enough to permit the growth of the *Vibrio parahaemolyticus* bacteria sufficient to make people ill. Researchers who studied the outbreak concluded that increased ocean temperatures played a role.

The effect of future climate change on susceptibility of Northwest seafood resources to biotoxins and bacterial contamination is not yet fully known. However, as we put more effort into understanding these mechanisms now, the story may help those who count on these resources for income, food—and even cultural identity—to weather the changes. ■

Authors

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Resources

Moore SK, Trainer VL, Mantua NJ *et al.* (2008). Impacts of climate variability and future climate change on harmful algal blooms and human health. *Environmental Health*, 7(Suppl 2): S4.