Residents Say NO to Pesticide-Poisoned Bays ...and Shellfish

Public outrage forces officials to reverse decision to spray

By Nichelle Harriott

The power of consumer outrage should never be underestimated. This spring, when word got around that Washington's Department of Ecology ("Ecology") approved a permit that would allow the neonicotinoid imidacloprid to be sprayed in Willapa Bay and Grays Harbor to control burrowing shrimp, and would essentially contaminate the oyster beds and the oysters the state was trying to protect, consumers, environmental organizations, and prominent local chefs spoke out against the application. Neonicotinoids are the family of pesticides linked to declining health of bees, butterflies, birds, and aquatic organisms. Phone calls, emails, and social media involving shellfish customers voicing their displeasure at being served potentially contaminated oysters caused the local oyster growers association and Ecology to pull the permit.

In this part of the Pacific Northwest, the shellfish industry is important, injecting an estimated $270 million or more into the region's economy, and providing jobs for many. Washington's tidelands, especially those in Willapa Bay, have been particularly productive for more than 100 years. But over the last few decades, oyster harvests have been reduced, and shellfish growers blame the burrowing shrimp (ghost shrimp, *Neotrypaea californiensis*, and mud shrimp, *Upogebia pugettensis*) for threatening the industry. The creatures burrow into shellfish beds, making the beds too soft for shellfish cultivation. Their burrowing churns the tidelands into a sticky muck, smothering the oysters.

For several years, Ecology allowed the use of carbaryl, a carbamate insecticide, to help control the shrimp, but the pesticide is a highly toxic, older generation chemical that many would like to see phased out, and attempts have been made to do so. After several years of deliberations and studies, Ecology identified imidacloprid as its preferred choice for eradicating the shrimp. According to the agency, imidacloprid disrupts the burrowing shrimps' ability to maintain their burrows. A risk assessment conducted by Ecology concludes that, "The proposed use of imidacloprid to treat burrowing shrimp in shellfish beds located in Willapa Bay and Grays Harbor is expected to have little or no impact on the local estuarine and marine species. . . and will not significantly impact human health."[1] Ecology and members of the shellfish industry believe that imidacloprid is a "safer" choice compared with carbaryl.

Imidacloprid Safer? The Science Does Not Say So

But recent studies on this chemical and its chemical class, neonicotinoids, find that it is anything but a 'safer' option. Neonicotinoids have gotten a lot of attention due to their association with pollinator decline. They are known to be highly toxic to bees, impairing their navigational, learning/behavioral and foraging abilities, and impacting their immune system, making them more susceptible to diseases and parasites. A mounting body of science shows that, even at low levels, these chemicals can impact bees. And like bees, neonicotinoids are also toxic to aquatic invertebrates. Since imidacloprid is water soluble, it poses even greater danger to aquatic organisms. Its persistence and largely irreversible mode of action in invertebrates make it particularly dangerous in these ecosystems. A 2015 scientific review by Christy Morrissey, PhD, Pierre Mineau, PhD, and others, on the impacts of neonicotinoids in surface waters from 29 studies in nine countries finds that these chemicals adversely affect survival, growth, emergence, mobility, and behavior of many sensitive aquatic invertebrate taxa, even at low concentrations.[2] Neonicotinoids were also recently evaluated by a large panel of international experts chartered under the International Union for the Conservation of Nature (IUCN), which found that these chemicals have "wide ranging negative biological and ecological impacts on a wide range of non-target invertebrates in terrestrial, aquatic, marine and benthic habitats."[3]

Ecology received extensive public comments during the comment period for the proposed imidacloprid permit. Comments submitted by the Xerces Society, supported by Beyond Pesticides and other environmental organizations, finds that Ecology failed to consider existing published research that demonstrates the potential for wide-range ecological damage from imidacloprid; that the risks, coupled with the lack of data on how imidacloprid will impact sensitive marine environments warrant greater caution. The groups warned that existing data shows imidacloprid's potential to damage the rich marine ecosystems of Willapa Bay and Grays Harbor. Further, the comments note, imidacloprid's impact on these key species can also cause a cascading trophic effect, harming the fish, birds, and other organisms that rely on them for sustenance.

Picking oysters by hand at low tide, Willapa Bay, Washington, October 1969. Photo from NOAA Fisheries collection.

Federal Agencies Also Raise Concern

But environmental organizations were not the only ones to raise concerns about the use of imidacloprid. The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) voiced many concerns over the application of imidacloprid to the bays. Among them include concerns surrounding the large size of the area to be treated. NMFS believes that the proposed acreage should be reduced because of many unknowns regarding impact to other aquatic and terrestrial biota. Further, NMFS states that the burrowing shrimp are native to the region and play an important role in the natural ecosystem. The agency also voiced concern for the green sturgeon –a "species of concern" under the *Endangered Species Act* (ESA), and the potential direct and indirect impacts to its food sources in the designated critical habitat. The agency believes that effects and damages will not be limited to the treatment sites.

Similarly, the U.S. Fish and Wildlife Service (FWS) also expressed reservations over imidacloprid use. FWS wrote Ecology expressing its opposition to the imidacloprid permit, citing a lack of scientific information regarding fate and transport, efficacy, persistence, and effects to non-target organisms. It went on to dispute claims that shrimp control improves biodiversity, citing the possibility of significant alterations occurring to the bay's ecosystem without burrowing shrimp control, and disagreeing with Ecology's conclusion that "no significant adverse impacts" would be expected.

So Just How Did the Imidacloprid Permit Come to Be?

The permit (a National Pollutant Discharge Elimination System (NPDES) permit under the *Clean Water Act*) to use imidacloprid to control burrowing shrimp came at the request of the Willapa-Grays Harbor Oyster Growers Association.[4] Imidacloprid, when it was first registered in 1994 by the U.S. Environmental Protection Agency (EPA), did not have a registered aquatic use. Therefore, in 2012 Willapa-Grays Harbor Oyster Growers Association petitioned EPA to allow imidacloprid's use for intertidal oyster beds to control burrowing shrimp. This represented a new use for imidacloprid. EPA approved the petition. The petition for new use was issued as a conditional registration on June 6, 2013 for the imidacloprid products Protector 0.5G and Protector 2F, which can only be used in Willapa Bay-Grays Harbor, according to the product labels.[5] The label for Protector notes, "This product is toxic to wildlife and highly toxic to aquatic invertebrates." The risk assessment conducted by EPA for this new use states, "The proposed use of imidacloprid on oyster beds in WA can result in residential exposure via potential contact with residues in oyster bed water or sediment during recreational swimming," including Native American tribes and subsistence farmers.[6] In accordance with the law, the agency also established tolerances for imidacloprid residues in or on fish at 0.05 parts per million (ppm), and in fish-shellfish, mollusk at 0.05 ppm.[7]

Public Backlash, Permit Withdrawal

Washington residents did not like the thought of a bee-toxic chemical being sprayed in their bays, and the backlash was swift. Calls went into the largest shellfish producer in the country, Taylor Shellfish, which soon thereafter withdrew its support for the permit. The loss of support from Taylor Shellfish, a major member of Willapa-Grays Harbor Oyster Growers Association, meant that the association no longer had the backing to move forward with the pesticide application. Ecology approved the imidacloprid permit April 16, 2015 and less than one month later it was withdrawn. In a press release issued May 3, 2015, Ecology states, "One of our agency's goals is to reduce toxics in our environment," said Ecology Director Maia Bellon. "We've heard loud and clear from people across Washington that this permit didn't meet their expectations, and we respect the growers' response."

Out of Balance!

Could habitat restoration reverse ecosystem damage that leads to pesticide use?

Willapa Bay is a shallow estuary in the southwest corner of Washington State that many believe to still be pristine. But human activity has affected the bay, throwing the delicate ecosystem off balance, leading to the loss of some native predators, an increase in invasive species, and slumping oyster productivity. In the mid-1800s, logging began altering stream morphology and increasing sediment load. Effluent from pulp mills was also dumped into waterways, impairing water quality and contributing to the decline of fish populations like salmon and sturgeon. Floodplains were cleared for agriculture and then later urbanized, leading to a loss of the natural riparian vegetation.[8] At the same time, the native Washington oyster, *Ostrea lurida*, also known as the Olympia oyster, began to decline due to over-harvesting and declining environmental quality. This lead oystermen to import the Pacific oyster from Japan that has thrived in the region. Artificial oyster beds were also created to help boost productivity.

Shrimp explosion

Although native to the region, by the early 1920s burrowing shrimp began growing in numbers. Some believe that changes in oystering practices led to the shrimp's success. The natural layer of shell deposits upon which oysters attach is typically removed during harvest, exposing bare sediment, and allowing the shrimp to burrow.[9] This, coupled with the declining predatory fish populations in the bay, led to an explosion in shrimp populations. Early efforts to prevent shrimp from burrowing (graveling, shelling) were not effective, and soon gave way to chemical control options.

Photo of the invasive ghost shrimp (Neotrypaea californiensis) by Flickr User Ken-ichi Ueda.

Invasive vegetation reducing mudflat habitats

According to Ecology, nearly a third of Willapa Bay's 45,000 acres of tide flats are infested with Spartina (*Spartina alterniflora*), an invasive salt marsh grass commonly known as giant cordgrass or smooth cordgrass. Spartina is native to east coast wetlands, but in the Pacific Northwest it has flourished, taking over other native plant species and reducing mudflat areas integral for oysters. Spartina is crowding out habitat for shellfish, birds, juvenile fish, and other wildlife. Thus far, it has displaced 16 to 20 percent of the key habitat for wintering and breeding birds.[10] Other non-native grass, like eel grass, has also taken over mudflats. Chemical treatment for these non-native species has been done for years, further endangering the long-term health of the bay's ecosystem.

Some chemical treatments employed in Willapa Bay:

Chemical	Action	Health Impacts
Carbaryl	to control burrowing shrimp	c, ed, r, n, aq, b
Imidacloprid	proposed to replace carbaryl, permit withdrawn	r, l,br,aq, b
Imazapyr	to control Spartina and eelgrass	gw, l, aq, b
Imazamox	to control eelgrass	br, aq, b
Glyphosate	to control Spartina and eelgrass	c, ed, r,aq

c – cancer, ed – endocrine disruption, r – reproductive, n – neutrotoxic, aq – aquatic toxicity, b – bees, br – birds, l – leacher, gw – groundwater

What can be done?

Several efforts are underway to restore salmon species in the Pacific Northwest, including Willapa Bay. Stream enhancement and restoration improves habitat for fish, amphibians, and invertebrates. These species can help control bountiful populations of burrowing shrimp and aquatic plants. Unfortunately, chemicals have been employed to reduce invasive plant pressures, and the borrowing shrimp. But the use of these chemicals only serves to further threaten the long-term health of the sensitive ecosystem by adversely affecting other non-target species, and potentially creating other out of balance communities. It is important that non-chemical options be explored, such as mechanical removal of invasive plants, and encouraging the revival of native fish and the development of natural oyster beds to suppress shrimp populations.

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Endnotes

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