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I submit this testimony based upon 77 years hands-on interaction with the tide and bedlands of Willapa Bay. I met my first Ghost Shrimp at age 5 digging cohogs at Stackpole Harbor in 1940.

I've spent most of my life working the bedlands of Willapa for local oyster companies and our own Northern Oyster Company holdings. I doubled our company through observation of key tidal flows, current patterns, soil structure, stability and many other subtle indicators that those overlooked wastelands could be made productive. Every one of these bedlands were at the time quicksand, Ghost Shrimp monocultures, unused by shorebirds, devoid of eel grass, zero habitat for prey species, and benthic invertebrates with no possibility of spawning grounds for herring, sandlance, or other fishes, no depressions or vegetated tidal pools, nothing but quick sand and strings of filimus algae destined to form large mats that settle onto oyster beds poisoning every benthic creature trapped beneath it.

One year later, after a chemical treatment of Carbaryl, every treated bed was fully functional as an oyster bed. Eel grass and tidal pools were prevalent. Shorebirds, by the flock, fed on the massive populations of worms, bugs, and invertebrates. Juvenile crabs were everywhere among the oysters and tide pools. Examination of eel grass showed herring spawn on the new grass blades with Dungeness crab eating small oysters, on the beds, all indications of high usage of the beds when they were tidally submerged. This list, including juvenile flat fishes, salmon smolts, blennies, ling cod, even an occasional octopus, has rated the natural ground raised oyster beds of Willapa Bay as the bay's highest rated habitat overall including the eel grass beds. Incidentally, the digging action of high density shrimp will totally remove eel grass and its' root systems.

The foregoing description was of the result of shrimp eradication on several Northern Oyster Company beds surrounding, or near, our primary bed E82 in the Stackpole area on the Northern Peninsula. Like conditions are found fairly universally baywide on similar reclaimed beds. It must be stated that with the Carbaryl treatment a bed so treated with one application, at low tide on a drained bed, would not have to be repeated for five to seven years. The bed remains the top-rated habitat for marine animals all that time. Retreatment, again a one-time event, starts the entire process over for at least another 5-year uninterrupted contribution to Willapa's ecosystem. That works out to a negative 1 to a positive 1825 positive ratio. The example stated, though based upon Carbaryl, is used to identify and compare the condition and function of the same bed with and without shrimp over a given time frame. Since the use of a control has been denied us by the Department of Ecology to date we have had to abandon use of one 42-acre bed of our Stackpole holdings to shrimp and acres of other beds are becoming critical.

I've spent the last 40 or more years in defense of Willapa Bay's irreplaceable marine ecosystem. 32 years as the Willapa Bay Oyster Grower's front man on shoreline development and water quality issues; both on the county

and state level. I dealt directly with our federal and state representatives and agencies on the Spartina eradication in Willapa which was kept active only by the constant pressures of the Willapa Growers and Senator Sid Snyder.

It is very painful for me to witness the track this permit has taken. No one can deny that politics has replaced science in this process. The Seattle news article that evolved into the grower's permit retraction, the D.O.E. refusal, to reconsider refusal to accept work already completed to be applied to this permit, statements made by D.O.E. upper management about this permit's status. The craziness and dishonesty seems to be evermore like Washington D.C. than Washington State lately.

D.O.E. is intentionally ignoring the impacts of surrendering Willapa Bay to burrowing shrimp. Nowhere in D.O.E. consideration is there a true assessment of what losing the bottom grown oyster industry will do to the overall ecology of our bay. Ignored is that Willapa Bay has an entirely sand base as opposed to Puget Sound's primary gravel base. That Willapa soils are all fines that shrimp will fully exploit making on bottom oystering impossible.

D.O.E. and individuals from Puget Sound are praising the major companies use of piling elevated plastic structures to overbuild the quick sands of Willapa's shrimp infestation. These same people have, for years, been hammering the same companies in Puget Sound for filling their sound beds with plastic installations. Until recently Willapa Bay had only low long lines on beds, too unsuitable for ground culture, now the bay has hundreds of acres of plastic plantations rising as much as 6-feet into the tide; some isolated but more often displacing what we are previously producing traditional ground grown beds.

The hypocrisy of these people, some no doubt will be submitting testimony against this permit, is unbelievable. I can only hope that their testimony is judged by the science before acceptance which most opposition has not been to date. Meanwhile other D.O.E. jurisdictions have left unchallenged the unlimited use of plastics in Pacific County's shore and bed lands. Our shore line now abounds with the residues of their dereliction.

Again D.O.E.'s avoidance of assessing plastics marine impact, presently the only D.O.E. blessed method of shrimp avoidance for industry within the Willapa ecosystem, endorses the impression that there is a responsible alternative with less impact than allowing ground cultivation through chemical control.

Please read the "Plastics on the Half Shell" micro plastics in shellfish a B.C. Canada 2016 study – 9/22/17 Daily Astorian attached.

Shellfish growers do not own Willapa Bay. We only share it with all the creatures that use it for part, or all, of their existence. Man has however had the power of making drastic changes that impact everything in it. One major change was the damming of the Columbia River and the resulting reduction of spring flood waters that once turned Willapa Bay into a near freshwater lake for weeks at a time. A death sentence for the new shrimp recruits found in the upper few inches of sand. This natural control ceased with Columbia flood control and shrimp populations began exploding shortly after World War II. The much touted, but unproven theory among agencies, is that shrimp are cyclic in populations. And this present explosion is natural. I agree that shrimp are naturally cyclic, but not in the sense of being applied to present conditions. The natural control factor prior to Columbia River flood control has never been acknowledged or factored into the present shrimp explosion. Prior

to damming the fresh water control likely overroad the spikes by killing the vulnerable young and due to shrimp's longevity, the population was controlled and remained fairly stable; far below the levels we have today. Historically available evidence of this still exists today. The massive native oyster reefs and stocks that supported an entire industry from 1850 to 1900 could not have existed had burrowing shrimp population not been naturally controlled. Native oyster cannot tolerate siltations. Creating siltation is the shrimp's means of survival. Shrimp must constantly dig filter and expel the fine particles of sand that they clean for food and throw out of their tunnels or the tunnels would fill and suffocate them. Which imidacloprid applies as a killing tool. A massive shell midden carbon dated to 1400 years old is located on the North Peninsula near Oysterville establishing that native stocks were always in abundance which could not have occurred with high shrimp populations. Furthermore, historically, the stable sands of the peninsula's intertidal lands north of Nahcotta to the tip of Leadbetter point were firm enough to safely drive a two-wheel drive vehicle on down to the +1" tidal elevation. I know this because I regularly did so. Before me, my grandfather did the same with his Model T Ford in the early 1920's equipped with 4" wide tires. It's been impossible to do this since the 1960s due to the shrimp. These same bedlands were sold by Washington State starting in 1890s to farm tiny native oysters. They were firm and not shrimp infested as now or they could not have possible used them. There is absolutely no evidence the shrimp population we have now existed before in Willapa Bay. The exact opposite is shown by historical evidence from the 1400-year old midden, to the facts stated above; all invalidate your agency's claim that the recent population explosion within Willapa's ecosystem is cyclic and natural. It is not. It is an unnatural situation that is causing baywide ecological destruction and your agency must stop playing the fake natural card to avoid this unpleasant situation and address the true issue of shrimp up-ending the Willapa ecosystem and how they can be controlled honestly.

Your and other Washington landholding agencies constantly refuse to admit that Burrowing Shrimp are an environmental problem for Willapa Bay's entire ecosystem. Our issue, oyster-vs-shrimp is only a documented portion of the shrimp-vs-ecosystem catastrophe that is now impacting all segments of Washington's southern coastal marine populations. Willapa Bay's ecosystem supports the base for a major portion of the near shore coastal fishery along with its' infrastructure. Recent studies find that the baywide food production processes depend upon stable conditions that are completely canceled on shrimp grounds.

All the while, yours and other agencies, shun your responsibility for the whole by ignoring the obvious while beating up the only group that has consistently over the past many years, put science time and much treasure into finding solutions not only for shrimp but for most every disaster facing Willapa's vulnerable ecosystem from water quality. Eradicating Spartina, fighting harmful development, restoring wetlands, to this fiasco. Local growers have always put the bay's welfare first. Enlightened regulators have realized that unintended negative consequences occur sometimes as a by-product of the best of projects and sometimes extreme measures must be taken to rectify the unintended consequences. Some local examples also of Columbia River origin are (1) the islands created by Army Corps dredging and rerouting attracting salmon smolt eating birds. Answer: kill birds, and (2) federal protection of sealions, now tamed by human interaction wiping out both sturgeon and endangered salmon runs. Answer: kill seals and sealions again.

Both radical solutions but created by unintended side effect of man's interference with a natural system. The imbalance caused by exploding shrimp population within the bay's ecosystem is a third example.

The solution is not radical or extreme although it only applies to a small segment of the bay's bedlands it will at least salvage natural bedlands through private investment while the majority, state lands, are left to degrade.

This effort by the shellfish grower is unique in pest control. Terrestrial farmers use chemicals to protect crops, to kill or control critters and diseases directly attacking their crops. The shellfish growers are not doing this. The growers have and will continue to share the space, accept predation loss while furnishing prime habitat, unrestricted, as we have for the past 160 years. The growers only goal is to be able to protect the land; not the crops, only the land. The billions of critters that will share this land have no voice here. Continuing to deny that this is a baywide problem may doom, even the limited grounds, that the growers may be allowed save. Hyped plastic plantations do nothing in supporting Willapa's benthic communities. Without control of burrowing shrimp, the effects will be felt throughout the southwest Washington economic and marine systems.

Not very respectfully submitted by,

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Plastics on the half shell

Researchers examine microplastics in shellfish

By KEN CHRISTENSEN
Oregon Public Broadcasting

Sarah Dudas doesn't mind shucking an oyster or a clam in the name of science.

But sit down with her and a plate of oysters on the half shell or a bucket of steamed Manila clams, and she'll probably point out a bivalve's gonads or remark on its fertility.

"These are comments I make at dinner parties," she said. "I've spent too much time doing dissections. I've done too many spawnings."

See PLASTICS, Page 7A

EO Media Group
Researchers are looking at plastics in shellfish.

Plastics: 'When you eat clams and oysters, you're eating plastics as well'

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And lately, the shellfish biologist is making other unappetizing comments to her dinner party guests — about plastics in those shellfish.

In 2016, she and her students at Vancouver Island University planted thousands of clams and oysters across coastal British Columbia and let them soak in the sand and saltwater of the Strait of Georgia. Three months later, they dissolved hundreds of them with chemicals, filtered out the biodegradable matter, and looked at the remaining material under a microscope. Inside this Pacific Northwest culinary staple, they found a rainbow of little plastic particles.

"So when you eat clams and oysters, you're eating plastics as well," she said.

Funded by the Canadian government and British Columbia's shellfish trade association, the project aimed to learn whether the shellfish aquaculture industry may be contaminating its own crop by using plastic infrastructure like nets, buoys and ropes. The experiment was a response to those claims by local environmental groups.

But tracking the origins of tiny plastic particles in a big ocean is new territory. So Dudas turned to Peter Ross, who has studied the effects of ocean pollution on sea life for 30 years.

"We've long known that plastic and debris can be a problem for ocean life," said Ross, director of the Vancouver Aquarium's Ocean Pollution Research Program.

In 2013, he began sampling the coast of British Columbia for microplastics. The researchers found up to 9,200 particles of microplastic per cubic meter of seawater — about the equivalent of emptying a salt shaker into a large moving box.

"So, large numbers," Ross said. "Rather shocking numbers."

Microfibers

They found plastics that were made small, like the polystyrene beads sold as bean bag filler and fake snow, and nurdles, the hard resin pellets used as a raw material for other plastic products. Microbeads, common in toothpaste and face wash, were also present.

But the majority of microplastics in Ross's samples resembled those showing up in Dudas's shellfish. They're showing up by the thousands along Puget Sound's shorelines too. They're microfibers.

"It's overwhelmingly fibers," Ross said. "And they're being readily consumed at the bottom of the food chain, in zooplankton."

The local research is adding to evidence of a problem that touches every corner of the planet: from the depths of the ocean abyss to the surface waters of the Arctic to an area in the middle of the Pacific Ocean now known as the Great Pacific Garbage Patch. Scientists think plastic pollution in the ocean could outweigh fish in the ocean by 2050.