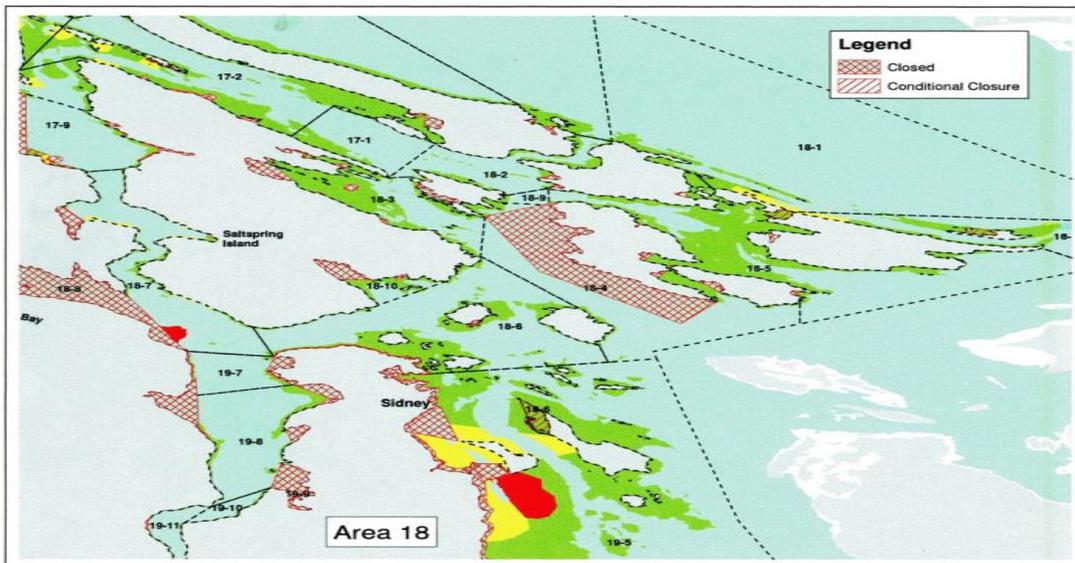


INDUSTRIAL AQUACULTURE, PLASTIC DEBRIS AND THE THREAT TO THE MARINE ECOSYSTEM IN TRUST WATERS

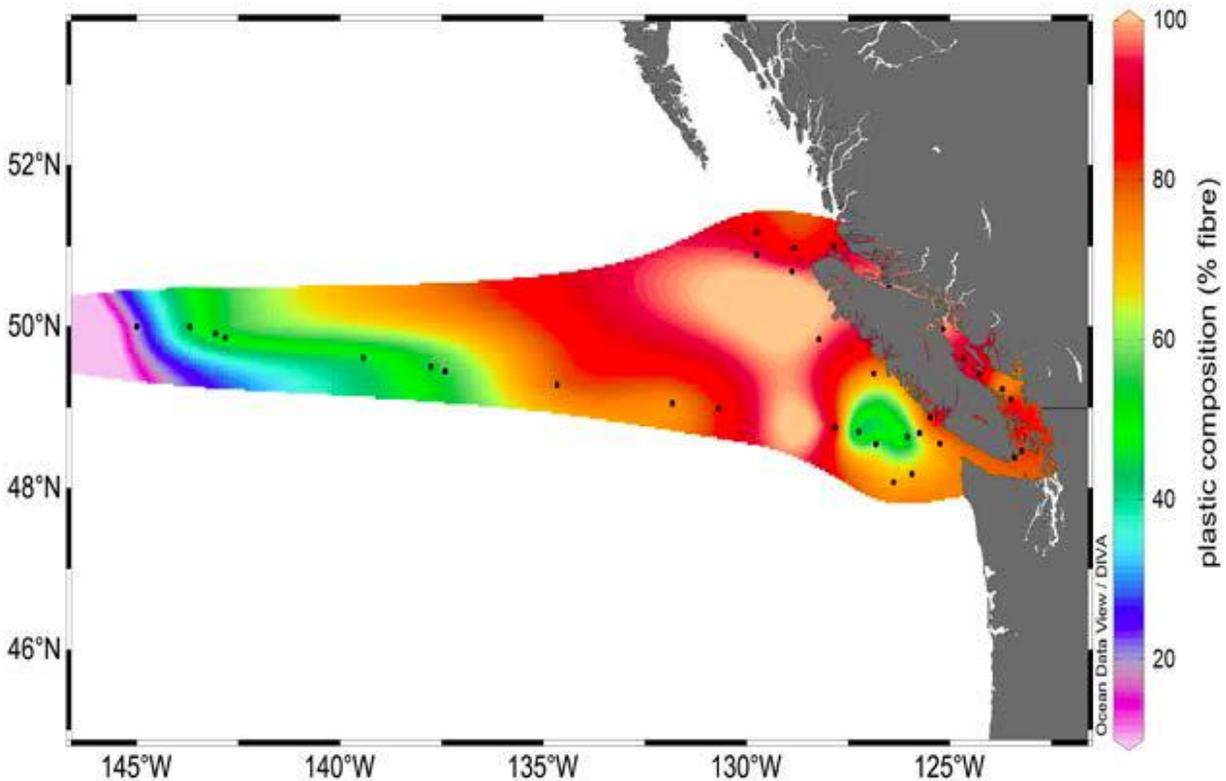
Presentation to Trust Council June, 2014

Good afternoon and thank you for allowing me to present to the Islands Trust Council. My name is Barbara Mills and I am a board member with the Association for Denman Island Marine Stewards. I come today to speak to you about the most current internationally recognized research that documents the threat that plastics and microplastics pose to all levels of the Marine Ecosystem in general, and Trust waters in particular. Marine debris, especially plastics and microplastics are widely recognized as a global environmental threat. Microplastics are plastic particles that are less than 5 micrometres in size and result from the fragmentation of larger plastic pieces as they weather or degrade. Now that it is evident that DFO has no mandate to limit, fine, or provide consequences to aquaculture tenures that damage the environment, it is time to explore the need to prevent environmental degradation before it happens.

The last four months have made the issue of plastics in aquaculture an even more urgent concern for us in Trust waters. As we all know, in February, the Department of Fisheries and Oceans unveiled their horrifying maps, opening up much of Island Trust waters to geoduck aquaculture.



In April, an International Conference sponsored by Simon Fraser University, called “Stewarding the Sound” focused on Baynes Sound as an Ecologically and Biologically Significant (and threatened) Marine Ecosystem. In his presentation, Professor Juan Jose Alava demonstrated that the Strait of Georgia had been found to have the highest level of microplastics on the BC Coast, and revealed that Baynes Sound, on Denman Island’s west coast, is one of the “hot spot of contamination”. Because 90% of the west shore of Denman Island and Baynes Sound are blanketed with aquaculture tenures, this is highly concerning and not surprising. Denman’s experience with extensive aquaculture, and the resultant pollution, could be considered the early warning test case for other Trust islands.



(Plastic Contamination emanating from Baynes Sound and the Strait of Georgia)

Last week, one of our long standing aquaculture leases was seen being converted to an intertidal geoduck lease. This was conducted with no warning or consultation to upland owners. This picture shows the installation of PVC pipes, using a power auger to drill into the intertidal substrate to install pipes. Typically the average number of PVC pipes installed in this kind of lease is up to 40,000 pipes per acre. In addition to the pipes, plastic is widely used in predator netting that covers the entire industrial geoduck site.



So what is the Issue with Plastic and Microplastic Marine Debris?

We all know that there are a variety of other sources of debris in our oceans, but few raise the concerns that plastics do. Most others are either “inorganic” and are consequently not bioavailable to marine organisms, or are substantially similar to naturally occurring substances, and therefore degrade as naturally occurring biomass, without harming the marine environment. In Contrast, Plastics stand out because of a few factors including: their persistence, their ability to float and therefore travel long distances, and their ability to absorb, accumulate, and subsequently desorb or leach persistent organic toxins directly into the water column, sediment, and the tissues of marine organisms.

Presenters at previous Trust Council meetings have spoken eloquently about the issues of marine birds and mammals becoming trapped in plastic debris and of plastic littering our beaches.

They have also explained that PVC pipes, used in geoduck aquaculture leach highly toxic substances such as PCBs, lead, cadmium, and vinyl chloride into the marine environment. As you probably know all of these substances are toxic to marine organisms and humans alike, and are of great concern. ADIMS has also spoken to to you about the 2-4 tons of debris collected annually from our beaches, 90% of which is plastic aquaculture debris.

But less well known is the threat that microplastics play in marine contamination. As plastic use continues to rise the abundance of microplastics in the ocean have steadily risen. One researcher coined a catchy and accurate phrase. "Old plastic never dies, it just fades away....into tiny pieces". Microplastics are a unique problem because of their size, invisibility and their ease of floating in the by marine marine environment. These microplastic pieces are durable, and steadily accumulate organic toxins, and when unknowingly ingested by organisms, they deposit their freeloading toxins into the fat tissues of marine organisms. They consequently begin their journey through the marine food web. (Takada, H. 2013)

Consequently microplastics have become an urgent focus of intense research by scientists around the globe. Here is a summary of facts intrinsic to this issue:

- Marine plastic debris inevitably breaks down into microplastics that are less than 5 micrometers in size. These particles float on the ocean at all levels of the water column, settle to the bottom of the seabed and intertidal zone, and litter our shorelines, often unnoticed because of their small size.
- *Although large plastic debris is known to have a deleterious effect on 260 marine organisms (Thompson, R.C, 2008), because of their size, microplastics, are available for ingestion by a much wider array of marine creatures, including relatively small invertebrates.*
- Ingestion of plastics is a problem by itself because it satiates an organism without providing nourishment, and blocks digestive passages.
- However an even greater problem arises from the ability of plastic debris to absorb highly toxic and deleterious organic marine pollutants and then desorb or deposit these organic toxins into the fatty tissues of marine life. The tissues of marine organisms therefore collect and accumulate these toxins in their tissues over time, and they bio-accumulate in ever greater amounts over the lifetime of the organism and the food web as they are ingested by ever higher levels of the food chain . (Engler, R.E. 2012)
- A distressing poignant example of this process is found in our own resident and itinerant killer whales found in the Strait of Georgia. Research has concluded that our Orcas are among the most contaminated cetaceans on the planet. PCB levels are particularly high. Sadly the level of contamination in males increases with age, while the females show higher levels of PCBs in their tissues only until they bare calves, at which time the mother unknowingly downloads a significant percentage of the contaminants from her tissues, through her breast milk to her calf. (Ross, P.S. et.al. 2000)

- But killer whales are not the only victims of toxins delivered by plastics. Because current and previously banned organic toxins enter the ocean from a variety of sources, and eventually sink to the bottom to settle into the sediment, they are available to all levels of marine organisms including bivalves and filter feeders. When organic toxins are stirred up by a variety of natural and human induced factors such as storms, wave action, or high pressure hoses or augers, they again become available in the water column for ingestion by small marine organisms.(Takada, H, 2013)
- Lab experiments show that microplastics are ingested by filter feeders, and although these organisms will expel sand particles they seem to bio-accumulate the plastic particles. It has been shown that the toxins accumulated in the plastic particles enter into the filter feeders tissue within three days.(Meams, A.J. 2008)
- Research has also documented that the longer microplastics are in the water, the higher the level of contaminants they carry.

Application of Research to Geoduck Aquaculture Methods in Trust Waters



Goeduck Aquaculture Methods: The New Pipeline!!!

We believe that we need to care about, and take a stand regarding the alarming research related to plastic contamination and the marine food web because:

1. Plastics are widely used in the aquaculture industry, especially in the methodology used intertidal geoduck cultivation, where thousands of PVC pipes, and plastic predator netting will be used.
2. We know, from our experience on Denman Island, of cleaning up tons of aquaculture debris every year, that aquaculture industry, as it is currently practiced, is a significant and unrepentant contributor to plastic debris.



3. It is not surprising therefore that in Baynes Sound, where 90% of the shoreline is blanketed with aquaculture leases, that this rich ecosystem is sadly considered a “hot spot” of microplastic contamination in the Strait of Georgia.
4. Because scientists have documented that highly toxic persistent bio-toxins such as PCBs, DDT, lead and cadmium settle into the marine sediment, and are reintroduced and redistributed into the water column when sediment is disturbed, it is particularly worrisome that geoduck aquaculture uses high pressure hoses to liquefy and stir up the substrate in order to prepare an aquaculture site, plant the geoduck seed, insert the hoses, and harvest the geoduck product. The DFO’s own research shows that resultant sediment persists for long periods after these operations occur. This sediment

will of course include the dangerous bio-toxins, and increase their availability to other marine organisms.

5. It is also alarming that the industry proudly states that geoducks “clean” the surrounding waters since they are filter feeders. This certainly would be the case, however, when they are filtering and cleaning bio-toxins that have been lying undisturbed on the sea beds and then absorb these toxins into the fatty tissue of their bodies we would presume they could then be uploaded to the consumer. We would also assume that the very act of geoduck aquaculture has the potential of also contaminating the other food that we as islanders harvest from our seas.

6. It is therefore puzzling and alarming to us, that so far, our governmental bodies are promoting and/or approving an aquaculture methodology that by all logic will contaminate the marine ecosystem within which the product is raised. At the same time, we would presume therefore that it could be contaminating its own product. It would be as if a health authority encouraged and rewarded neonatologists for housing premature infants in incubators filled with polluted air instead of oxygen.

7. Finally, DFO Aquaculture managers have admitted that once an operator has been awarded a lease, DFO has no mechanisms for sanctioning or punishing providers who break the rules or threaten the ecosystem. Their most serious consequence is a letter!! And even to this there is no follow-up!

Conclusions

The citizens of Denman Island are not giving up. We are doing our research, soliciting the help of scientists, advocating through articles, presentations, and even newspaper ads. We are not just worried about our quality of life. We are deeply concerned about our planet, safe food supply and the Marine Ecosystem which we have committed to preserving for future generations. We hope and would like to believe that the ubiquitous and extensive use of plastics by the geoduck industry is so far over the top in its potential for destruction of the marine food web, and so potentially harmful to the products that the aquaculture industry expects will feed the planet, that there must be some rational level of government that will hear our concerns.

We ask you, as our Trust Council to take this issue on, and to commit to advocating on behalf of **all of the Trust waters** that flow in and out with the tide, past all the islands in the Trust jurisdiction. We ask you to take a stand by requesting a ban on the use of plastics in aquaculture in the Trust waters until DFO can decisively prove that this extensive use of plastics will not irrevocably damage our marine ecosystem.

Thank you for your time and attention to this matter.

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