

**Appendices**  
**Geoduck aquaculture panel**  
**Protect Henderson Inlet**  
**9 January, 2024**

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## **Appendix 1A**

### **Reasons Why the Project 2022103702 Geoduck Aquaculture Project Should Not Be Approved**

**Prepared by  
Protect Henderson Inlet  
an environmental nonprofit organization**

**Presented January 9, 2024**

**Introduction:**

We appreciate the opportunity to present this information to Sharon Rice, Hearing Examiner for Thurston County, as we believe that we have unique perspectives about the science pertaining to geoduck aquaculture, science that has been systematically overlooked and misinterpreted.

Protect Henderson Inlet (PHI) is a registered 501(c)(3) organization in the State of Washington with primary goals of education, restoration, and prevention of harm to the environment, particularly Puget Sound and with focus on Henderson Inlet in Thurston County.

PHI does not oppose aquaculture, recognizing that oyster and clam cultivation has occurred within the Salish Sea for thousands of years. We recognize and respect the rights of native peoples of the region. We recognize that commercial shellfish growers produce food for us, that their industry provides other benefits to the region. We recognize that sometimes natural resources must be used for the good of the people and can negatively impact the environment. We believe that geoduck aquaculture does not represent a reasonable tradeoff for the environmental damage it does.

Based on a thorough review of relevant science, PHI opposes the current methodology of geoduck aquaculture, a lucrative, but invasive practice with little local benefit. We also are highly concerned about the largely unknown cumulative impacts from rapid expansion of commercial aquaculture in the South Puget Sound and the potential impact of an industrialized waterfront.

Today, topics for presentation include:

- A Review of SMA/SMP Principles – Mr. David Bricklin, Environmental Attorney
- Misunderstood Science – why the GARP report and other scientific studies do not actually support geoduck aquaculture.  
Presenter: Dr Ron Smith, President of PHI, Bachelor of Science in Biology University of Southern Mississippi including Marine Invertebrate Studies at the Gulf Coast Research Laboratory, Doctorate of Medicine University of Mississippi Medical School, Board Certified in Diagnostic Radiology

- A new look at impacts on forage fish from geoduck aquaculture  
Presenter: Dr. Deborah Hall, Secretary of PHI, Bachelor of Biology, Millsaps College, Doctorate of Medicine University of Mississippi Medical School, Board Certified in Pediatrics and subspecialty certified in Child-Abuse Medicine
- False claims by the shellfish industry about the safety of plastic products used in geoduck aquaculture  
Presenter: Betsy Norton, member PHI, Bachelors of Arts in Chemistry, Gonzaga University, Master of Arts Political Science University of Washington, Certified Scrum Master and Project Management Professional
- How the issuance of this permit will negatively impact education of children in Southwest Washington  
Presenter: David Hall, Board Member PHI, Past Chairman Thurston Conservation District, 15 years on TCCD board, waterfront property owner Johnson Point Loop

Before beginning these presentations, I'd like to suggest some principles that frame these arguments:

1. From the Thurston County SMP "The applicant bears the **responsibility** to prove that their actions will be in compliance with the criterion set forth in regulations."
2. There can be no net loss of ecologic function from the applicant's actions
3. Fran Lebowitz said, "Think before you speak, **read** before you think". To see the truth, simply read the material. Verify that what we say today is true.
4. In the words of Jack Reacher (or Tom Cruise, if you will), "**details matter.**"

## **Misunderstood Science – Why the GARP Report and other scientific studies do not support the practice of geoduck aquaculture**

I am a scientist, and I want to bring you a viewpoint based on review of the science which you have not heard before. I encourage you to not only listen to my arguments, but to challenge them by going to the sources that I will cite. This is the scientific method; Make a hypothesis, test the hypothesis to prove or disprove it, then verify by repetition that those results are indeed true. The science gives the answers that we seek, and for too long, the truth of the science has been misstated by Taylor Shellfish to further its own financial interests.

I am not the first to notice this. Please read the scathing rebuke by Federal Judge Lasnik in his 2019 ruling against The US Corp of Engineers and Taylor Shellfish, in which he calls them out over their abuse of science. Referring to environmental impacts of aquaculture

“Although the minimal impacts finding is repeated throughout the Corps’ Decision Document (see NWP003038, NWP003045-46, NWP003049, NWP003051, NWP003091, NWP003107), it is based on little more than selectively chosen statements from the scientific literature”. And ...

“conclusory findings of minimal individual and cumulative impacts are not supported by substantial evidence in the record”.

<https://protecthendersoninlet.org/us-district-court-seattle-judge-lasnik/>

*Details matter*, so let’s get into those details

### **The GARP Report**

The most glaring deficiency in Taylor Shellfish’s argument that their permit should be approved is their assertion that the report from the Geoduck Aquaculture Research Project (GARP) proves geoduck aquaculture safe for the environment. It

does not. Most of the findings are either negative or inconclusive towards establishing geoduck aquaculture as environmentally safe.

You may read my full review of the 2013 GARP report in my submission to the county dated 24 July, 2023 pages 8-12 and addressed to Abbie Adams and Brett Bures and in Appendix B. I will summarize the important findings here:

In fact, GARP's exhaustive literature review sums it up well:

"There is a dearth of peer-reviewed information on *P. generosa* and its congenitors. This is particularly true for intertidal *P. generosa* in Puget Sound as no Washington State regulatory authority currently surveys intertidal geoduck."

The research added by GARP adds little to this understanding, and only offers a glimpse into the effect of geoduck aquaculture on the environment.

The GARP report is cited repeatedly by Taylor and others, including the Shellfish Hearing Board in multiple appeals, but, on detailed review, it seems doubtful that anyone has actually read it. When I met with Scott McCormick on September 25<sup>th</sup>, 2023 at the Thurston County Planning Office, it was plain that he had no detailed understanding of its content. Please *read* the GARP report, especially the recommendations section 4. Please also *read* the actual scientific articles (not just the abstracts) for the VanBlaricom and McDonald scientific papers as actually published after finally being peer-reviewed in 2015, as, after peer-review: they differ somewhat from what was printed in the GARP report and are the real scientific reports. *Details matter*. Links to the articles and my full critiques are found at [www.protecthendersoninlet.org](http://www.protecthendersoninlet.org) under the heading of Science or here in Appendix C.

### **The good news:**

The GARP report does *suggest* that in a general sense, Puget Sound beaches are pretty resilient, that the constant need to adapt to the harsh marine environment allows the inhabitants of the beach to bounce back after insults like the harvest phase of geoduck where the entire planting zone is liquefied to depths between 2-3 feet or when eelgrass is wiped out in the planting phase.

**The bad news:**

Unfortunately, there is no provision in this permit for such recovery. The permit applied for is perpetual, and geoduck operators prefer to immediately replant their sites with no fallow period. See notes from Seattle Shellfish/James II permit approved by you in July 2023. Eelgrass recovery is estimated at 5 years by the US Army COE. Recovery of the other many species found in the beach is simply unknown.

**Details that matter:**

The literature review attached to GARP report cites scientific work that found 165 species on a typical sand/gravel beach. When this is used as a standard, both of these studies are extremely limited in that they scientifically assessed only a few species.

The Vanblaricom study identified 50 species, but only was able to generate statistics for 10 (20%). Of these 10, 3 were markedly reduced but “not to the point of extinction.” This is highly significant. 30% of the species evaluated were significantly reduced. Compared to the reference beach, that’s only 6%.

The McDonald study identified 68 species, but only 12 (18%) or 7% of reference beach were statistically evaluated, and the invasive harvest phase was not even included. Even the abstract calls this paper a “first look.”

As an example of the limitations of these studies, sand dollars, present by the thousands on our Henderson Inlet beaches including the proposed site, were not a studied species and will be purposefully removed during the planting phase of geoduck cultivation, eventually wiped out at this site.

**More bad news:**

The section of the report based on research from Drs Reusink and Horwith clearly shows that the harvest phase of geoduck kills eelgrass, and there are now major restrictions in place throughout Puget Sound because of this finding. Taylor could argue that there is no native eelgrass in Henderson Inlet, but in the GARP report these same authors also reported suspicion of more widespread negative impacts and recommended further investigation. This has not been done.

No sentinel species (an organism that can be used like a “canary in the coal mine”) was identified in the report. However, there were certainly species that could

have been considered as I will detail. If eelgrass was not naturally sparse in the South Sound, it would serve well. What about the many other species that live in the beach? Here is where *details matter*.

When you get past the abstracts, both papers are full of disclaimers and both strongly urge further research. They never state that geoduck aquaculture is safe for the environment. They in no way suggest that shellfish aquaculture is beneficial to the environment.

These papers, which make up the main argument cited by industry that geoduck aquaculture is harmless, even in the most optimistic light, are weak. They do not have the strength to justify this invasive practice and do not establish *no net loss to the ecosystem*. *No effective mitigation can be structured for impacts that are not fully understood*. The applicant bears the burden of proof that their actions will not be harmful.

#### **The unfinished work:**

The recommendations of GARP in section 4 are incredibly important. First and foremost, the 21 authors and contributing scientists in their Section 4 conclusion, “Research Priorities & Monitoring Recommendations,” called for cumulative long-term studies to understand what happens when the same site is replanted or when a second site is placed near the first. None have been done. Instead, we have witnessed massive approval of permits for permanent geoduck aquaculture sites. You have approved 19 out of the past 19 such project that have come before you.

#### **More work to be done, not yet started, scary:**

Assessment of the potential impact of geoduck aquaculture on native geoduck stocks was one of 6 priorities for the GARP study, but *they did not study it*. This is highly relevant information, as the State of Washington sells contracts for harvest of wild geoduck in subtidal, state owned waters for substantial profit, with revenues going to the general fund. This legislative order to study the possible impact of hatchery geoduck stock raised in the intertidal zone was unfulfilled, as was the related mandate to assess sterile triploids for hatchery use. Importantly, the GARP report did cite studies that prove cultivated geoduck are reproductively active within 2-3 years.



In Effect of Geoduck Aquaculture on the Environment: A Synthesis of Current Knowledge by WA Sea Grant <https://marine-aquaculture.extension.org/wp-content/uploads/2019/05/Effects-of-Geoduck-Aquaculture-on-the-Environment.pdf>

- “Hatchery-reared shellfish may differ genetically from their wild counterparts for multiple reasons”
- “wild geoduck populations have high levels of genetic variability that could be perturbed by an influx of cultured genotypes.”
- “Even if broodstock are collected locally, hatchery populations may differ from wild populations owing to random genetic drift or different selective pressures in the hatchery. These differences may reduce the fitness of cultured geoducks and cultured–wild hybrids in the natural environment (Lynch and O'Hely 2001, Ford 2002). As the differentiation between wild and cultured populations increases, the potential for negative genetic interactions between wild and cultured populations increases.”

So, the Johnson Point Loop site would grow about a quarter of a million geoduck, planted from limited genetic stock of a few select individuals which would then spawn and interbreed with native geoduck in nearby and far-off waters for another 4-6 years before harvest. Will those limited strains alter the genetics of native geoduck? The authors of GARP stated a high level of concern about potential impact on native geoduck clams, admonishing further research. None has been done.

I spoke with Dr Hank Carson of the WDFW, the biologist in charge of monitoring the State's wild geoduck harvest program, and he shares my concern that the effect of intertidal geoduck aquaculture on wild stocks is unstudied and unknown. The raising of millions of hatchery geoduck of limited genetic diversity could have the same negative effect that has been seen from hatchery salmon on wild stocks. Since we don't know the answer, the principles of First do no harm, no net loss of ecologic function, and the applicant bears the burden of proof must apply.

**The bottom line:**

You will see when you look closely at this work, that the job was only partially done, and that the majority of findings were actually negative or inconclusive towards geoduck aquaculture.

- Planting on or near native eelgrass is prohibited because of GARP
- The mandated evaluation of impact on genetics of wild geoduck was not done and remains an unknown
- The cumulative impacts of repeated cultivation of geoduck at the same site or addition of nearby sites remains completely unstudied despite the strong recommendation for such in GARP
- The two scientific studies funded in GARP represent early research, and although honestly performed, are weak; they do not have the strength in scientific terms to justify this practice on an industrial scale

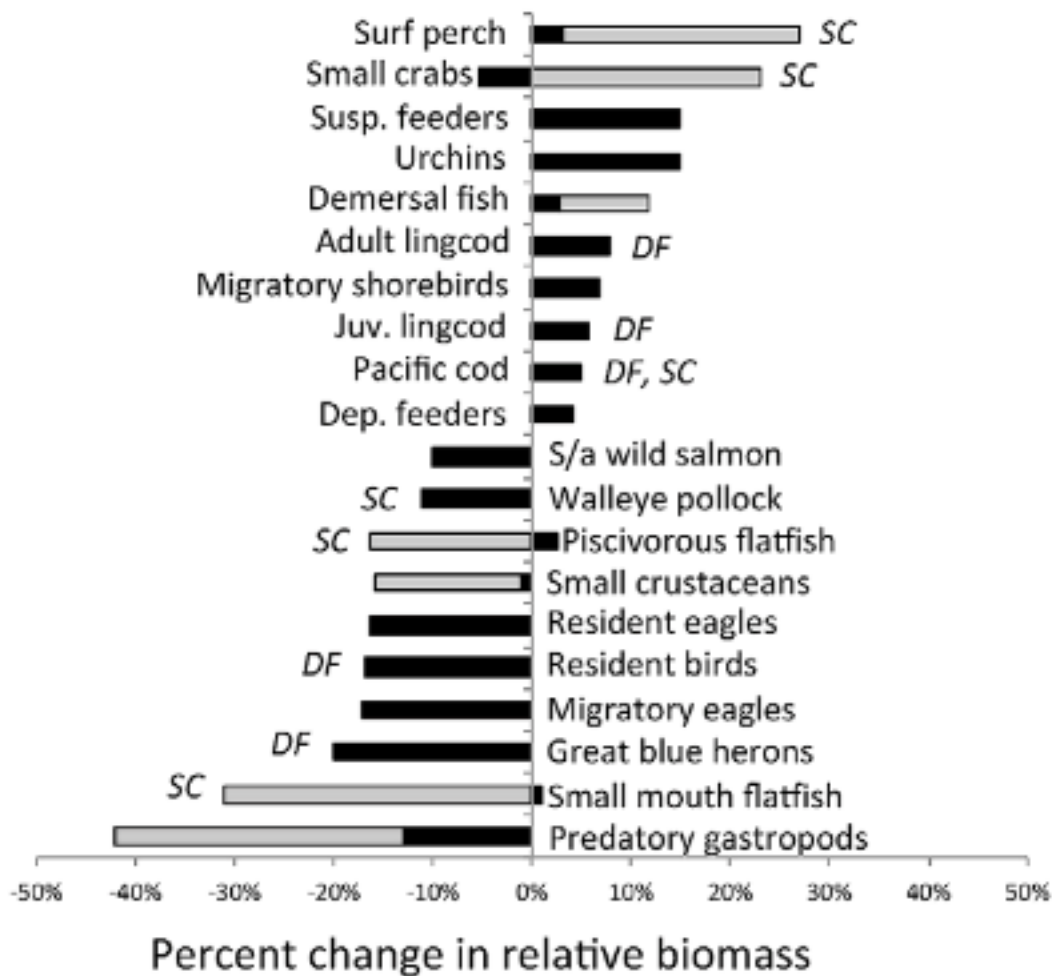
## Other Science

I'd like to briefly touch on three other scientific works which may superficially seem to support geoduck aquaculture, but on review do not.

1. In December 2015, Washington Sea Grant issued the 84-page Final Report to the Washington State Legislature titled *Shellfish Aquaculture in Washington State*. Within that report are several scientific papers including *Evaluating Trophic and Non-Trophic Effects of Shellfish Aquaculture in the Central Puget Sound Food Web*, lead author Bridget Ferriss.

From computer models, the authors concluded, based on data previously obtained by Sean McDonald and cited in the GARP report that "The biomass of food web members that were linked to geoduck culture through mediation functions changed considerably, with the biomass densities of some members increasing and decreasing by more than 20%".

Please see the attached graphic showing major decreases in small crabs, wild salmon, Walleye pollock, resident eagles, resident birds, migratory eagles, great blue herons, and predatory gastropods, some of the decreases resulting from a decrease in small crustacean and demersal fish.



Although they did not predict negative effects on phytoplankton availability in the ecosystem due to overconsumption by geoduck, and geoduck predators did not show a significant change (good news for growers), they did conclude “the impact of antipredator structure (PVC tubes and nets) placed on geoduck plots had a larger influence on the surrounding food web by providing predation refuge or by changing foraging opportunities.

In turn, these effects propagated throughout the food web. They go on to note that the model predicts substantial decrease in most bird groups from “bottom-up” effects, meaning impact on food sources. This prediction includes “most seabirds”. This is a reminder that the Marbled Murrelet is listed as protected by the Endangered Species Act (ESA) and is listed as a resident of Thurston County in the US Army COE Programmatic Biological

Assessment. Additional listed species under the ESA in Thurston County include Bull Trout, Chinook Salmon, Steelhead, Boccaccio, Yelloweye Rockfish, Canary Rockfish, and Southern Resident Killer Whales.

This is important – the same data used in the GARP study makes dire predictions when modeled in the Ferriss study. Either way, this science does not prove geoduck aquaculture safe or suggest that there is no net loss of ecologic function – indeed, quite the opposite.

2. Next, let's look at the Programmatic Biologic Assessments, both from NOAA and US Army Corp of Engineers Seattle District prominently cited by County and Industry.

In the cover-letter from NOAA to the Corp of Engineers, NOAA states – “NMFS also concludes that the proposed action is likely to adversely affect Puget Sound (PS) Chinook salmon (*O. tshawytscha*), Hood canal summer-run chum salmon (*O. keta*), North American green sturgeon (*Acipenser medirostris*), and their designated critical habitat.

Regarding Puget Sound Chinook Salmon, it states in section 8.1, “the action would result in temporary in-water disturbance and noise associated with human activity and degradation of water quality such as increases in suspended sediments. These would occur broadly throughout the action area and occur on nearly daily basis for the 20-year period of the PBA including when juvenile Chinook Salmon are present. These activities would displace juveniles.”

Section 7.1.4 titled Benthic Community states “Each phase of the aquaculture activity, which is characterized by bed preparation (e.g. tilling), planting (e.g. net installation), maintenance (e.g. cleaning area nets), and harvest results in physical disturbance of the benthic community and often a temporary decrease in abundance of many infaunal and epifaunal species” and gives multiple scientific references. Given the principle of no net loss of ecological function, the issuance of a perpetual permit, with no fallow period to allow for recovery of the beach is unacceptable and ignores the GARP report's recommendation for cumulative impact analysis.

In section 7.1.5 Fish and Birds it states “In-water activity, noise, and increases in suspended sediment would displace many fish species and birds from localized work areas”. We will further discuss these factors in our presentation on forage fish. ”

The PBA *never* states that there will be no net loss of ecologic function from geoduck aquaculture as required by the Washington State SMA.

3. Last, and briefly, the paper submitted by Taylor Shellfish to the Thurston County Planning Department, Assessing Potential Benthic Impacts of Harvesting the Pacific Geoduck Clam ...in British Columbia is worthless in this argument. In short, when *details* are examined, this study provides little support for intertidal geoduck aquaculture.

One of the two test sites was subtidal and has no relevance to this discussion. At the other, an intertidal site, there were *no* geoduck harvested. There was a *simulated* harvest over only 500 square feet from which data was extrapolated. Basic mathematics show that this test site would represent only 1% of a typical 1-acre geoduck plot. The proposed site on Johnson Point Loop is 3.6 acres. This is like comparing a mouse to an elephant. Relevance to the proposed project is highly questionable.

In summation of this review of available science, there is insufficient evidence in the scientific literature as cited by Taylor Shellfish or government that the current practice of geoduck aquaculture will have minimal impact on the ecosystem of Henderson Inlet or the greater Salish Sea. There is ample evidence of harm and potential harm, and there are many unanswered questions.

**The burden of proof is on the applicant.** When the details of the 10-year-old GARP report, the primary support document of Taylor Shellfish’s argument, are reviewed, along with other science, **this research is insufficient to justify any permit for this invasive practice, much less one with no expiration date. The applicant cannot prove no net loss of ecologic function, nor can they prove that their actions can be mitigated.**

We, the members of Protect Henderson Inlet, recommend that you **not approve** this application for a 3.6-acre geoduck aquaculture project at Johnson Point Loop in Henderson Inlet.

## Appendix 2C. Johnson Point Forage Fish

