

1 PUBLIC HEARING BY THE PIERCE COUNTY HEARING EXAMINER

2
3 In Re:)
4 Administrative Appeal: AE1-10)
5 Appellants: Coalition to Protect)
6 Puget Sound Habitat and Case Inlet)
7 Shoreline Association)
8 Shoreline Substantial Development)
9 Permit: SD22-06)
10 Applicant: Longbranch Shellfish,)
11 LLC)
12)
13)

14 Excerpt of Transcript of Proceeding

15 Before STEPHEN J. CAUSSEUX, JR.

16 Tuesday, March 15, 2011

17 APPEARANCES

18 For the Appellant Coalition to Protect Puget Sound Habitat:

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14 Also present: Ty Booth, Senior Planner, PALS
15 Adonais Clark, Environmental Designee, PALS
16 Dave Risvold, Environmental Biologist, PALS
17 Jenny Pelesky, Clerk

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23
24 Reported by: Linda M. Grotefendt, CCR
25 License No. 3013

1 (Herein begins the first excerpted portion
2 of the transcript.)

3
4 DAN PENTTILA, having been first duly sworn
5 upon oath by the Hearing Examiner, testified as follows:
6

7 THE WITNESS: My name is Dan Penttila. That's
8 spelled P-e-n-t-t-i-l-a. I reside at 5108 Kings Way,
9 Anacortes, Washington 98221.
10

11 DIRECT EXAMINATION

12 BY MS. HENDRICKS:

13 Q Mr. Penttila, can you please tell us how you became the
14 most recognized forage-fish expert for the Washington State
15 Department of Fish and Wildlife for the last several
16 decades?

17 A My background is University of Washington, 1970, bachelor's
18 in zoology; University of Oregon in 1971, master's in
19 biology. And within months after graduating from the
20 University of Oregon, I was employed with the Department of
21 Fish -- then-Washington Department of Fisheries in the
22 incipient Puget Sound Bait Fish Project.

23 I was involved in bait-fish research and
24 investigations from March 1972 through July 2010, at which
25 time I retired from the agency. I'm continuing in forage-

1 fish matters as a private consultant, under the name Salish
2 Sea Biological.

3 During the course of my career, I was involved in all
4 phases of all life-history stages of most of the forage
5 fishes in Puget Sound: herring, surf smelt, sand lance;
6 the sampling of adults, sampling of larvae in plankton
7 surveys; mapping of spawning habitats for habitat-
8 protection purposes; biological sampling of fish
9 themselves. And details of my work activities are included
10 in my CV submitted for this matter.

11 Q Have you concluded Washington Department of Fish and
12 Wildlife forage-fish spawning-habitat mapping surveys
13 around the Longbranch site?

14 A Yes. Yes. During the course of my work activities, a main
15 feature of my work activities in Puget Sound was the
16 mapping of spawning habitats for surf smelt and sand lance.

17 When we came upon the scene in the early 1970s,
18 virtually very little was actually known about the
19 distribution of surf smelt spawning beaches in Puget Sound,
20 and nothing was known of sand lance spawning beaches in
21 Puget Sound.

22 Over the course of the years, we formulated several
23 projects where we did, basically, synoptic surveys of all
24 the shorelines in the Puget Sound basin, pursuing evidence
25 of spawning activities--that is, detecting eggs in situ--

1 in beach gravel samples in various places around and about
2 Puget Sound, including the Longbranch site.

3 And during the course of our survey activity, we
4 surveyed past and on the Longbranch site three times. They
5 were on November 23rd, 1992 -- that's -- the field report
6 for that survey is our Appellant Exhibit 253 -- January
7 5th, 1996, Exhibit 254; and January 19th, 2007. That is
8 our Exhibit 255.

9 During the January 5th, 1996 visit, sand lance eggs
10 were found on the farm site. And subsequently, as is our
11 convention, a thousand-foot polygon of what we call
12 documented spawning habitat was erected based on the
13 observance of the sand lance eggs at that site, and it
14 almost exactly coincides with the boundaries of the
15 Longbranch farm proposal.

16 Q Now, during your work, did you also spend years reviewing
17 that application of the GMA and the SMA to these type of
18 habitat protections?

19 A Yes. During the course of our habitat mapping and the
20 routine of observance and acceptance, by other resource
21 agencies in the area, that forage-fish spawning habitats
22 are vulnerable of all of the myriad of human shoreline
23 development practices, language specific to forage-fish
24 spawning habitats was eventually included in the language
25 of the Growth Management Act of the state, the Shoreline

1 Management Act of the state, the Washington Administrative
2 Code Hydraulic Code rules; and, also, the federal
3 government has come to decide that documented forage-fish
4 spawning habitat sites are critical habitat -- "essential
5 habitat," I believe, is their term. The GSA listed
6 salmonids.

7 Q Could you give us just a quick overview of different
8 reports that you have written for the State of Washington
9 that are used as reference?

10 A Starting in 1978, I wrote my first Sound-wide report on
11 surf smelt spawning-habitat studies--or surf smelt studies,
12 not just spawning habitat--in Puget Sound. And we have a
13 number of exhibits submitted of my reports. I'm blanking
14 on the exact titles right now.

15 There's been a number of conference papers dealing
16 with our survey. We had to invent the survey protocols and
17 also the results for -- initially, the results for sand
18 lance investigations, because the sand lance spawning-
19 habitat context in the upper intertidal zone, that we're
20 involved with in this hearing, was not known before 1989.

21 They simply escaped the notice of generations of fish
22 biologists in the Puget Sound basin up until the point
23 where we, sort of serendipitously, discovered sand lance
24 eggs in surf smelt spawning context. And then once we knew
25 what we were looking for--we had a second egg up high on

1 the intertidal beaches--we had to invent a way of detecting
2 those eggs, because they are visually very cryptic and
3 can't be readily seen, or else they would have been
4 discovered before 1989.

5 Anyway, we -- in terms of the reports, my final report
6 with -- for the Washington Department of Fish and Wildlife
7 was the report on -- summary report on marine forage fishes
8 in Puget Sound, prepared for the Puget Sound Nearshore
9 Partnership. And it's on the pugetsoundnearshore.org
10 website, along with Jim Johannessen's report on bluffs and
11 beaches and a number of other reports that might be
12 relevant to this proceeding.

13 Q And did you also contribute your efforts on the interim
14 guide that was produced as well?

15 A Oh, yes. And you will have to prompt me on what exhibit
16 number this was, but yes, October 2007, generated a report
17 called "Protecting Nearshore Habitat and Functions in Puget
18 Sound, An Interim Guide," by EnviroVision, Herrera
19 Environmental, and Aquatic Habitat Guidelines Working Group
20 of the State Agencies.

21 Q That's A179.

22 A 179, okay. And I submitted as an exhibit just the forage-
23 fish excerpt, and, basically, it is a review of the WACs
24 and the GMA references and the SMA references with regards
25 to forage-fish habitats. That is supposedly to be used.

1 Now, I understand -- you just commented that perhaps
2 the aquaculture industry is not -- these guidelines don't
3 apply to them. And I would ask the rhetorical question:
4 If not, why not?

5 Q That was during our breakfast. In fact -- well, I'll just
6 ask you the question. Do the hydraulic codes apply? Let
7 me ask -- redirect. Are there hydraulic codes in the Fish
8 and Wildlife protocols that are used for protection of
9 nearshore?

10 A Yes. There's a whole -- I forget the chapter and verse of
11 the Washington Administrative Code. But, yeah, there's
12 Hydraulic Code rules, and within the Hydraulic Code rules,
13 there's saltwater provisions.

14 Q In your opinion, are those important for the protection of
15 forage fish?

16 A Yes. Yeah. They are instrumental. Prior to our
17 appearance on the scene in 1972, nobody gave a hoot about
18 forage-fish spawning-habitat protection. Where the fish
19 spawned were virtually unknown, even for herring. And so
20 the existing WACs of today referring to forage fish has
21 evolved from in-house policies in the 1970s to written
22 insertions into the WAC code in the early 1980s. And as
23 sand lances were found to be as vulnerable as surf smelt
24 and herring and ecologically valuable, language pertaining
25 to sand lances was inserted into the hydraulic codes, later

1 on in the 1980s, when we found and started mapping the sand
2 lance habitats.

3 So yeah, they're instrumental. They are one of our
4 main tools to try to curtail the habitat degradation that
5 otherwise would occur more widely in Puget Sound, with
6 regard to these fishes' critical habitats.

7 Q Were you surprised to find out that the aquaculture
8 industry was exempt from getting a hydraulic permit?

9 A I'm not party to all of the ins and outs of who's -- who's
10 -- what's going on in Olympia with regards to that, so
11 perhaps "surprised" is too strong a word.

12 Q Is it a concern?

13 A Yes, it would be a concern. And I think the -- the rules
14 that we have fomented for the protection of forage-fish
15 habitats -- they are -- they are applicable, I think, to
16 any in-water activities, especially one that is covering so
17 much ground as aquaculture. Truth be known, I have
18 informed the aquaculture industry over the years, at
19 various presentations, as to the importance of these
20 habitats and to persuade them to pay them some mind.

21 Q Could you review the Washington Department of Fish and
22 Wildlife smelt, salmon, and spawning-habitat protocols used
23 on such surveys to map spawning habitat?

24 A Okay. And these were the protocols used on and near the
25 Longbranch site. Basically, when we realized we had a

1 second visually cryptic egg type in the beach gravels that
2 needed to be mapped if we were to effectively protect their
3 habitat, we sort of invented a method by which bulk samples
4 of upper intertidal beach material are collected, screened,
5 and processed in a manner to highgrade the lightweight
6 material out of these bulk samples, and subsamples of these
7 bulk samples' light fraction are inspected under a
8 microscope to detect -- to detect surf smelt and sand lance
9 eggs.

10 Prior to the advent of this technique in 1991, we used
11 only visual inspection of handfuls of beach material in the
12 field to detect what we were then only looking for: surf
13 smelt eggs. So this bulk sampling technique is much more
14 efficient in detecting eggs, especially in small -- in low
15 densities on the beach surface, where they might escape
16 visual notice.

17 Q Now, you mentioned that they're extremely hard to see. Can
18 the normal person see these eggs of the sand lance or the
19 surf smelt easily when they're walking on the beach?

20 A Untrained, no.

21 Q Okay.

22 A But the whole matter is trainable. The protocols are
23 trainable. A number of NGOs have assisted us in the Puget
24 Sound basin. Over the years of our surveys, they've gotten
25 -- went out and gotten grants to do certain counties. And

1 I trained them up and did some -- afforded them some lab
2 QA/QC for their tentative results and that sort of thing.

3 But the average person in -- even a shoreline
4 landowner who thinks they might be fairly intimately
5 familiar with the comings and goings of creatures on their
6 beach, are usually fairly ignorant of the presence of surf
7 smelt and sand lance spawning habitat, and especially sand
8 lance.

9 We've come to find sand lance eggs on 10 percent of
10 the shoreline of Puget Sound's basin, roughly 200, 250
11 miles, I think it's up to now. And prior to our discovery
12 of the eggs through an application of our visual
13 techniques, not one single report from a private citizen,
14 of sand lance spawning activity, had ever been forwarded to
15 us. Their spawning-habitat context is unknown.

16 And also, as far as that goes, the spawning behavior
17 of the fish is just now being documented for the first
18 time. In 2009, 2010, a video -- underwater video team
19 connected with the Puget Sound -- or the Island County
20 Beach Watchers organization has succeeded in videotaping
21 sand lance spawning activity for the first time ever in the
22 world.

23 So -- so our knowledge is evolving of -- particularly
24 of sand lance is the least known of the three
25 shore-spawners.

1 Q What is the Washington Department of Fish and Wildlife
2 Salmonscape Database?

3 A Oh, that's a publicly accessible database on the WDFW
4 habitat program website. It was determined, after 30
5 years, that: Gee, it would be a good idea to put this all
6 down digitally, GIS-wise. And so that was done. So there
7 is a database that you can get into on the habitat program.

8 Type in "Salmonscape," click on "Salmonscape." You'll
9 get a map of the state. With the cursor, draw a little
10 square around anywhere in the Puget Sound basin, hit
11 "change map," and then, when that map comes up, there will
12 be a menu on the left side of the new map. It indicates
13 intertidal forage-fish spawning habitat, and there will be
14 "surf smelt," "sand lance," "combined," and "potential"
15 choices there, where anybody can look and see the
16 present-day, current distribution of our documented
17 spawning habitat polygons.

18 And I think it has been evolving since I left so that
19 some of the survey-by-survey, station-by-station data might
20 also be available to those with the proper computer
21 machinery. So that's Salmonscape, with a capital "S."

22 Q Would you think it would be important that Pierce County
23 should know the inventory of their spawning sites in their
24 county, as to what they have here as sand lance?

25 A Yes.

1 Q Because it's such a small percentage?

2 A Every political jurisdiction in the Puget Sound should know
3 that, I believe, if they are a jurisdiction that is
4 required to periodically update their Critical Area
5 ordinance or their Shoreline Master Program. I believe the
6 language states that they are to pay attention to where
7 these places are.

8 Now, they are not the -- maps are -- we've covered
9 everywhere in Puget Sound, just about, several times, but
10 that's not sufficient to have the maps perfect. There is a
11 potential that not all of the documented spawning sites
12 are, in fact, known yet. So there is a need, down the
13 line, for the next generation of field biologists to
14 continue this mapping.

15 Q Are a great majority of these spawning sites in South Puget
16 Sound, or are they widely dispersed?

17 A I'm afraid I don't know what proportion. I couldn't give
18 you a proportion of the total that's in Pierce County or
19 south of the Narrows. South of the Narrows, if you look at
20 our spawning-habitat distribution, there's an awful lot of
21 shoreline that's occupied with smelt sites or sand lance
22 sites. Occasionally, both species using the beach. Down
23 here, the surf smelt tend to spawn in the fall/winter, and
24 that's when the sand lances spawn. So both of the species'
25 eggs will be in the same gravel at the same time.

1 This almost happened at the Longbranch site. If I
2 might refer to this picture here -- well, I won't leave you
3 out. Okay, the sand lance polygon is right about down here
4 (indicating), almost centering on this stream delta.
5 Immediately north of this plot here is a surf smelt polygon
6 that reaches for nearly a mile up the shoreline, up towards
7 Longbranch proper.

8 There is a sand lance polygon at the tip of the spit
9 going into Felucy Bay. Spit tips are favorite places for
10 sand lance spawning. There's also a sand lance polygon on
11 this spit immediately south of the Longbranch farm site
12 too.

13 And that's fairly typical, that when you take them in
14 total -- a considerable amount of the total shoreline down
15 in southern Puget Sound here is documented by one species
16 or another of those two.

17 Q In your opinion, have a lot of the sites that you -- are
18 the prerequisites for geoduck aquaculture coincident with
19 sand lance habitat?

20 A It may be mere happenstance, but yeah, it would appear to.
21 The fact that -- speaking of cumulative-impact analyses,
22 which I will not do, the statements that were made of 91
23 percent of the shoreline of Totten Inlet being occupied
24 with farming activities, aquaculture farming activities --
25 I believe that's the number; 90 percent, something like

1 that.

2 There, if that's true, it may be that 90 percent of
3 the shoreline of Totten Inlet has been documented to be
4 smelt and/or sand lance spawning habitat as well. So
5 there's an example of a place where there's quite a bit of
6 overlap between aquaculture activities and forage-fish
7 spawning activities too.

8 Q Is it a concern for you that the sand lance are spawning in
9 the fall/winter and that the harvesting around
10 Christmas/Thanksgiving is a prime time when they harvest
11 the geoducks?

12 A Yes, it would be, I think. Because I concur with Jim
13 Johannessen's testimony yesterday, that there's a
14 likelihood of fine material from harvest activities being
15 able to move up-beach into the sand lance spawning-habitat
16 zone from the digging zone or the harvest zone. There's
17 only a couple vertical foot separating those two zones.
18 And -- and the -- I thought perhaps that, during the course
19 of consideration of this matter, that there had been a
20 proposal to curtail or prohibit geoduck harvest during the
21 sand lance spawning period.

22 I think that might have been just someone's proposal.
23 I don't know if it made it in. I read the County report --
24 thumbed through the County report here this morning, the 36
25 points. I don't believe any of those 36 points involved

1 the curtailment of geoduck harvest during the sand lance
2 spawning season.

3 Q Would you explain the value of forage fishes to the marine
4 ecosystem?

5 A Forage fishes are called forage fishes. They used to be
6 called bait fish because, back in the '70s, we were just
7 worried about providing salmon support bait, herring, to
8 the fisheries.

9 But present-day, they're called forage fishes because
10 they are foraged upon by a whole suite of higher consumers
11 in the food web, what I call the charismatic mega fauna:
12 the birds, the whales, the ling cod, the salmon, the
13 humans. And they are -- just a few species, four or five
14 species, then connect the vast bottom part of the food web.
15 All the planktonic forms that these fishes feed upon, both
16 phyto- and zooplankton.

17 So they are -- they are the key link in the middle of
18 the food web. And I would state that -- if you want to see
19 a food-web diagram, look at Page 12 in my forage fishes --
20 "Marine Forage Fishes of Puget Sound" Pisner paper, it has
21 a food web there that illustrates that -- that importance
22 of the middle band of positions in the food web being
23 occupied by what we consider to be the forage fishes, in
24 large part.

25 Q Have much of the critical forage-fish habitat been damaged

1 at this point, or been lost?

2 A The exact percent is unknown. When we showed up in 1972, a
3 considerable proportion -- an unknown proportion, but what
4 I considered to be a considerable proportion of the
5 potential spawning habitat for forage fishes--surf smelt,
6 sand lance, particularly--in Puget Sound had been damaged
7 in some manner by inadvertent human activity.

8 Inadvertently damaged by human activities. Everything
9 from the massive railroad causeway from the Nisqually to
10 Bellingham down to individual 100-foot single-family
11 residence building lots, built on bulkheads that were too
12 far out from the shoreline.

13 But I think -- I'm not sure if the number is changed,
14 but I think already, by that time, 30 percent of the
15 shoreline of Puget Sound had been armored in some manner or
16 other. I believe that's a number that Puget Sound
17 Partnership bandies about.

18 And although we do have hydraulic rules in place to
19 try to ameliorate the continued degradation of such
20 activities, the WAC Hydraulic Code does not preclude those
21 activities. Single-family-residence bulkheads get a bye.
22 We cannot deny them even if we don't think they're a good
23 idea. All we can do is design them so that their impact is
24 minimal.

25 Meanwhile, the other thing that armoring does that

1 cuts off the normal erosional inputs of sediment down onto
2 the beaches, which is how the beaches are made -- the
3 gravel doesn't come down the streams, it comes off the
4 bluffs.

5 Q Is it important that those beaches, once they are suitable
6 substrate, in your opinion, are protected?

7 A Yes.

8 Q Okay.

9 A Yeah. That's keystone to our -- it's the one thing we
10 thought we could do, with a minimal staff that got
11 deprioritized about every five years. That's the one thing
12 we thought we could do to protect the species, is to
13 protect their critical habitats, and in the absence of any
14 other more-expensive way to try to assess their numbers or
15 otherwise protect them.

16 Q Now, is the forage-fish species sand lance your most
17 closely occurring farm site -- would you review the sand
18 lance spawning ecology pertinent to this case?

19 A Okay. Very briefly, like I say, just a year and a half
20 ago, we found out what sand lances do when they spawn. And
21 still, there's not -- there's not all the answers. The
22 videos need to be analyzed to glean more information out of
23 them and, also, for the videos to be done in more places
24 than just the north shore of Penn Cove.

25 But it appears that the sand lances -- first of all,

1 for those of you that are unfamiliar, sand lances have a
2 peculiar diurnal habit of burrowing into sandy substrates
3 during those times of the day when they are not up in the
4 plankton, feeding on things. We think that's a predator-
5 avoidance mechanism.

6 It generally happens at night, but not always. They
7 can be found burrowed into the substrate during the day.
8 And the details of what they do in the vicinity of their
9 spawning areas, out in 10 or 20 feet of water, are still
10 unknown. Those haven't been videotaped.

11 But the pre-spawning fishes rove to and fro along --
12 it happens at high tide. They rove to and fro along the
13 shoreline and ripen in schools. And at some triggering
14 moment--and we don't know what triggers them at this point
15 yet--schools of a few dozen to several hundred will
16 suddenly split off of these roving schools, and they will
17 press themselves onto the bottom; the whole school will
18 writhe violently on the bottom of the substrate. This is
19 in waters of 1 or 2 feet deep. There will be a burst of
20 milt, and we presume that, at that milt burst, eggs are
21 also being extruded; fertilization is occurring in the few
22 moments that the eggs take to settle down out of the vents
23 of the females, down onto the sandy bottom.

24 And the fertilized eggs are adhesive for a moment when
25 they touch the sandy bottom, and they acquire a coat of --

1 sometimes complete coats, sometimes just a few sand grains.
2 Anyway, their egg shells are adhesive for a moment, and
3 they acquire sand grains that adhere to them. They rest on
4 the sandy bottom, once again, up in the upper third of the
5 intertidal zone, as near as we can tell, and they incubate
6 there.

7 There will be several spawnings on a beach during the
8 course of the two- to three-month spawning season. And
9 they take -- each brood takes one month to hatch.

10 Q So you're saying that that part of the beach is a very
11 important part of the beach?

12 A Yes.

13 Q I hate to bring up -- we're going to have to start to get
14 down to the specifics of the Longbranch, because I'm on a
15 time frame here of our six hours.

16 I would like to introduce Exhibits 248 -- A248, A249,
17 and A252, which is on the spawning behavior and life
18 history that Mr. Penttila furnished; as well as Exhibit
19 256.

20 Would you review your concerns about the potential
21 impacts of the geoduck-farm operations on spawning -- on
22 the sand lance spawning?

23 A Okay. It is acknowledged that the design of the farm and
24 the apparent policy of aquaculture, in terms of where they
25 want to plant geoducks -- that there will be a physical

1 lateral separation between the innermost geoduck tube
2 arrays and the spawning substrate itself.

3 I would, once again, just refer to Jim Johannessen's
4 testimony, that he suggested there's a likelihood of fine
5 material being able to move up-beach on flood tides into
6 the spawning zone. That's one thing.

7 And let's see. I have the grain-size analysis. What
8 exhibit number is that amongst the 250s, my group?

9 Q It's in the exhibits.

10 A Yeah. It would be 258 or so, amongst those that I
11 submitted.

12 Q Oh, I see. Is it "Known Spawning Beaches"? No, let's see.
13 Grain-size, A256.

14 A 256, okay.

15 Q That's the one I introduced.

16 A This is a summary of data collected from throughout the
17 Puget Sound basin of surf smelt and sand lance spawn-
18 bearing-substrate grain-size analyses, where we collected
19 bulk samples. We screened the samples down through a set
20 of Tyler screens to get an idea of just what the substrate
21 is comprised of. And for sand lances, this is the graph
22 (indicating). Down here is the tiny little representation
23 of silt-sized particles in the spawning substrate. Most of
24 the spawning substrate is made up of medium sand. And so
25 that's -- this is from 70 samples collected throughout the

1 Puget Sound basin.

2 So that's an example of the fact that sand lance
3 spawning substrates are silt-free, for the most part, in a
4 natural condition.

5 Q Now, would you please review your concerns about the
6 impacts of ingestion of forage-fish larva by the cultured
7 animals in a geoduck farm. Basically, the planted
8 geoducks.

9 A Yeah. It came -- actually, our knowledge and our concerns
10 are evolving. When I first was called upon to contribute
11 forage-fish information to this matter, I was not really
12 aware of the fact that geoducks can ingest -- apparently
13 can ingest zooplankton as well as phytoplankton. And I
14 would posit that there is a likelihood that hatched sand
15 lance larvae off this site or surf smelt's larvae from the
16 area to the north or sand lance larvae from the areas to
17 the south of the farm site would be exposed to ingestion by
18 culturing geoducks during the course of the farm operation.

19 There's -- much about this is unknown. There's much
20 about this that I would propose that should be included in
21 an EIS. I would propose that -- and we have a set of
22 exhibits, that perhaps weren't originally submitted, on the
23 ingestion of zooplankton by -- by bivalves. We have it
24 here somewhere.

25 Q Okay.

1 A That basically forms the basis of my concerns. Where it's
2 possible, when sand lance eggs hatch out, the larva is 4 or
3 5 millimeters long. It is encumbered by a yolk sac. It
4 has virtually no swimming ability, and it is basically
5 drifting in the plankton.

6 Tide's in, the eggs hatch. There's been some
7 suggestion that the larvae will go along the beach or
8 somewhere besides where the geoducks are. It's my
9 contention that, all other things being equal, the larvae
10 will follow the ebb tide down-beach in the surface waters
11 at first, and they will be in direct contact with the
12 geoduck farms. Not just here, but every place in Puget
13 Sound where spawning beaches are coincident with geoduck
14 farms.

15 There's the matter of -- okay, larva ingests, so it
16 can't buck the inbound current of a feeding geoduck, so it
17 winds up down in the filtration system. Is it eaten? Is
18 it digested by the clam, or is it somehow rejected alive?

19 The literature suggests that anything that's ingested
20 that's not eaten, digested, is ejected by the bivalve in
21 what they call pseudo feces, which is mucus-wrapped stuff
22 that the clam, for some reason, rejected from ingesting
23 into its alimentary canal.

24 I would submit that mucus-wrapped forage-fish larvae
25 are dead. And so that's the -- that's the gist of my

1 concern, however new it might be.

2 I also had conceived of a lab experiment where you
3 could get at this. There are geoduck hatcheries. There
4 are domesticated geoducks in tanks that could be presented
5 in some way with quasi-normal tank conditions. Larvae
6 could be pipetted at them with circumstances whereby you
7 could videograph the behavior of the larvae in the vicinity
8 of the feeding geoduck, whether the -- larvae at various
9 sizes even -- see whether it can get away, or if it's
10 helpless.

11 And so it's not an insurmountable problem to answer
12 these questions, but they are not -- they are not answered
13 now.

14 Q So would you say -- we have to get two short questions.

15 A Okay.

16 Q One, would you say this is a probable and significant
17 issue?

18 A Yes, I think it would be. Especially in the light of, once
19 again, cumulative-impactwise, of the consistent -- or
20 persistent rather, not consistent -- persistent report of
21 the disappearance of forage fish in Totten Inlet.

22 I used to not give it much credence. I don't have
23 data recently to know whether or not it's actually true.
24 The last time I was in Totten Inlet was in 2009, searching
25 for smelt eggs for a genetic study. The spawning

1 habitat -- the upper intertidal spawning habitat that the
2 fishes have been know to use since the 1970s appears to be
3 intact. So I don't know why else the surf smelt might be
4 gone for so many years.

5 They're short-lived. They're -- they will have
6 fluctuations in their relative abundance because they are
7 short-lived fish. But to have them gone now where people
8 have been saying they've been gone for 10 or 12 years,
9 that's unusual, and so that should be studied.

10 Q Thank you.

11 A Okay.

12 Q Oh, I have this exhibit, "Ingestion of mezzo-zoic plankton
13 by three species of bivalve," that you wanted to submit.

14 A There's actually three papers attached to it.

15 Q There's three papers to it?

16 A Yes.

17 Q Okay.

18 A I had them separate here, and I --

19 THE HEARING EXAMINER: Has the Applicant seen
20 these, or is this part of your --

21 MR. PLAUCHÉ: Are those part of your exhibits?

22 MS. STOCK: Those are not part of the exhibit.

23 MS. HENDRICKS: No. These are not.

24 THE WITNESS: No.

25 MR. PLAUCHÉ: Do you have a copy?

1 THE WITNESS: So how to best handle --

2 Q Do you have a set?

3 A I have a set. Why it's not here, I don't know.

4 MS. HENDRICKS: You can have this one.

5 MR. PLAUCHÉ: Oh, good. It has your highlighting.

6 MS. HENDRICKS: That's right.

7 THE HEARING EXAMINER: Would you like to take a
8 look at that and then make a determination later on whether
9 you want to object to it?

10 MR. PLAUCHÉ: Yeah. That would be great. Thank
11 you. I'm sorry. Yes, I'd like that opportunity.

12 THE HEARING EXAMINER: Okay. Do you have any
13 further questions?

14 MS. HENDRICKS: No, I don't.

15 THE HEARING EXAMINER: Okay.

16 MR. PLAUCHÉ: I do.

17 THE HEARING EXAMINER: Well, I'll ask Ms. Guernsey
18 first, though.

19 MS. GUERNSEY: No.

20

21 CROSS-EXAMINATION

22 BY MR. PLAUCHÉ:

23 Q Thank you for your time, Mr. Penttila. I certainly
24 recognize your expertise on forage fish.

25 A Thank you.

1 Q Do you have your report that was submitted end of January
2 up there with you?

3 A I do.

4 Q So if you can just pull that out. As I look through your
5 report, you've listed a number of references that you
6 looked at. And down on Page 4 -- I'll let you get there.

7 A Okay.

8 Q -- third from the bottom, you reference the U.S. Fish and
9 Wildlife Service biological opinion for Nationwide Permit
10 48?

11 A Yes.

12 Q Did you also consider the National Marine Fisheries Service
13 biological opinion for Nationwide 48?

14 A Yes. I was able to get ahold of both of those, and I read
15 quickly through the other one and didn't see where it had
16 many forage-fish references compared to this U.S. Fish and
17 Wildlife bio-pinion.

18 Q The National Marine Fisheries Service biological opinion
19 has two sections. One was an Endangered Species Act
20 consultation. One was an Essential Fish Habitat
21 consultation. Did you review both pieces of that?

22 A I'm afraid I can't recall.

23 Q Okay. Let me just go through just a couple of questions on
24 your report and testimony now, specific to forage fish
25 again. Given the distance of this site from documented

1 herring spawning areas, direct impact to herring spawning
2 habitat can't be an issue for this project; is that
3 correct?

4 A Correct.

5 Q Okay.

6 A Yeah. I believe there is a stipulation -- well, no. It's
7 part of the Growers Code of Practice perhaps, that herring
8 eggs will be left undisturbed until hatching on aquaculture
9 structures if they are observed. But that is also a
10 voluntary -- that is a voluntary Code of Practice.

11 Q Understood. And you've given some -- I'm sorry. I didn't
12 mean to interrupt.

13 A No. But in terms of herring here, it is some distance from
14 the -- from the nearest documented herring spawning ground,
15 which I think is -- well, there's a tiny one in Lake Bay,
16 up through Pitt Pass and north, on the west shore of Carr
17 Inlet. There's a relatively new spawning ground known now
18 in the Purdy Burley Lagoon area. And then there is a
19 spawning -- a relatively new herring spawning ground known
20 in Wollochet Bay. And I note those last two because it
21 does illustrate that, although we are fairly certain we
22 know where all the major herring spawning sites are in
23 Puget Sound, it is not absolutely and for sure that the
24 fish can't spawn here. But that would be hypothetical or
25 speculative, to say that they spawn here.

1 During the course of acoustical trawl surveys in South
2 Sound in the '70s and '80s, it was not unusual to find a
3 body of ripening herring positioning themselves in Drayton
4 Pass within a mile or two of this site. But we think that
5 those fish eventually wound their way up through Dana Pass
6 and Squaxin Pass and spawned in the Totten Inlet/Hammer's
7 Inlet area.

8 Q Understood. So it's unlikely that they would spawn here,
9 but, if they did, you reference this industry Code of
10 Practice that requires identification of spawn and sort of
11 avoidance of any disturbance of spawning herring?

12 A I guess that's the Code of Practice. I don't know of any
13 instances where it has been followed.

14 Q But as I recall, you've given presentations--I think you
15 testified to this--to shellfish growers--

16 A Yes.

17 Q --regarding identification of herring spawn and how to
18 implement that avoidance practice; is that correct?

19 A Right. And the last -- the most specific one would be to
20 Taylor Shellfish farm managers in about 2007 or so, where
21 all of this -- the general forage-fish information was
22 presented.

23 Q Okay. Thank you. And again, in light of the distance from
24 herring hatching areas, you would not anticipate the
25 young-of-year herring to be common at the farming site

1 either; is that correct?

2 A I stated that, I believe, in my report, but they are not
3 absent, because the Dorn beach seines detected them.

4 Q Okay.

5 A And we don't know where those came from, but they are
6 present in some small numbers, if I may.

7 Q But your report indicated that you would not anticipate
8 those?

9 A No. It's strictly due to the physical number of water
10 miles from the closest hatching ground.

11 Q Understood. And post young-of-year, the older herring --
12 they typically dwell primarily in deeper water?

13 A Yes. They are not the one-pluses. One-and-a-half-
14 year-olds and larger are not -- are not nearshore-dwelling
15 animals particularly. They do occur in the general area,
16 but they are out where -- in the daytime, they are most
17 likely to be found, say, in the 30 or 40 fathoms of water.

18 Q Much deeper than the --

19 A And then, at night, they rise up to 10 or 15 fathoms of
20 water. They do a diurnal migration too. But they are
21 probably not -- because of the shallow slope of the
22 shoreline, are probably not going to be encountered.

23 Q Okay. Now, you've also noted that the macro algae that may
24 form on the aquaculture gear here at the site could
25 possibly provide suitable herring habitat for them --

1 spawning habitat?

2 A Well, potential, in that, probably, the species of algae
3 that the herring do use in their local spawning grounds, in
4 the absence of eelgrass, would become established on the
5 aquaculture structures.

6 But the herring use certain areas of Puget Sound.
7 Once again, about 10 percent of the shoreline. I don't
8 know why they have selected to spawn where they spawn, but
9 they don't spawn everywhere that there's seaweed.

10 Q Understood. And if they spawned on macro algae at this
11 site and the condition that we talked about, of identifying
12 and avoiding any impact to herring spawn, would that
13 spawning ultimately be a positive for herring, a negative,
14 a wash, in your opinion?

15 A To find spawn deposition there, if it was regular, if it
16 was every year, if it just so happened that the farm site
17 was a previously undocumented herring spawning site that
18 was used every year, like we have found up in Purdy and
19 Wollochet, that would be important. Yes, it would be.

20 We endeavor -- we've talked mostly about surf smelt
21 and sand lance through all this, but we also endeavor to
22 protect every algae bed, every eelgrass bed in Puget Sound
23 where herring eggs have ever been found. And so this would
24 suddenly become a polygon on our habitat-protection charts.

25 And it's unlikely that just the farm would be used.

1 They would probably -- if there was -- hypothetically, if
2 there was spawning there at all, they would be using a mile
3 of shoreline in both directions. They would be using the
4 shorelines over on Anderson Island. They would -- there's
5 no herring spawning habitat that I know of, no herring
6 spawning ground that I know of that is only five acres big.

7 Q Got it.

8 A They're bigger than that.

9 Q Understood. So let's move on to surf smelt. Now, you
10 expressed concern about the potential ATV use impacting
11 surf smelt habitat. That's only a concern if ATVs are
12 actually used, right?

13 A Yeah. It turns out apparently, it's going to be a
14 nonissue.

15 Q Okay. Thank you. Now, you've also expressed a concern
16 about fish-gilling, I think you referred to, in
17 anti-predator nets?

18 A And, apparently, wide-cast nets are a nonissue.

19 Q Okay. So again, nonissue?

20 A Yeah.

21 Q Now, sand lance. Moving on to sand lance. You talked a
22 little bit about, I think it was 150 feet of vertical
23 separation between --

24 A Not vertical, lateral.

25 Q Lateral. Thank you. Lateral separation between the farm

1 location and the sand lance spawning area. You would not
2 argue that that buffering is not sufficient to protect the
3 sand lance spawning areas, would you?

4 A No, if all of the things were equal. Unfortunately, the
5 seaward edge of that particular buffer in this case is a
6 silt-generating operation.

7 Q So the concern there is what you talked about in your
8 direct testimony--

9 A Yeah.

10 Q --which was silt moving up the beach to spawning areas.

11 A Right. Right.

12 Q Generally, on forage fish or bait fish, is there a
13 commercial fishery for those fish?

14 A The last commercial herring fishery in Puget Sound is for
15 salmon support bait, a few hundred tons a year.

16 Q Okay.

17 A Surf smelt is targeted by a number of artisanal beach-seine
18 fisheries for commercial purposes and active sport-dipping
19 fisheries on spawning beaches scattered throughout Puget
20 Sound, not here, that I know of. And sand lance fisheries
21 were legislated out of existence in 1997.

22 Q Okay. So just surf smelt and herring still have a
23 commercial fishery?

24 A Right.

25 Q In your opinion, do those commercial fisheries impact the

1 continued viability of those forage-fish species?

2 A No, probably not.

3 Q Why is that?

4 A The sport fisheries and commercial fisheries for surf smelt
5 are taking place on the spawning beaches on a tiny, tiny
6 percent of the 250 miles of spawning beaches in Puget
7 Sound. So there's a vast de facto refuge of spawning
8 habitat when the fisheries are not undertaken.

9 And the herring -- it is the opinion of the herring
10 managers, which doesn't count me, that extraction of a few
11 tons of pre-spawning herring from the tens and tens of
12 thousands of tons of herring that occur in Puget Sound
13 every year is not -- is not a burden to maintenance of
14 herring stocks.

15 Q Thank you. Just a couple of questions about the site here
16 in particular. What type of beach substrate is present
17 here at the site?

18 A It varies. I know people refer to the beach as cobble
19 here, and I wish I had a good picture amongst the exhibits
20 that illustrates the zone of beach specifically used by
21 spawning forage fish.

22 Because you can have a beach that is -- looks, to the
23 layman, like a cobble beach; that is fist-sized rocks, you
24 know. But if you have a band up at the top, up by the
25 high-water mark, the uppermost few vertical feet of the

1 shoreline, like here, where the beach grades into coarse
2 sand/fine gravel, even if it's just in patches along the
3 shoreline, that is the sort of habitat that the forage fish
4 -- or the smelt, sand lance seek out for spawn deposition.

5 So you can have most of the beach unsuitably coarse,
6 but if you have, like this shoreline does -- and I looked
7 on this, and it's too hard to see and try to describe. But
8 there is a band of suitable substrate up at the high-water
9 mark that, areawise, is probably a small minority of the
10 total beach surface, up-beach of zero, say. But it is
11 enough to attract these spawning fish.

12 Q And on this site, what would be the elevation that you'd
13 see that spawning activity?

14 A It would be roughly from mean high water, whatever that is
15 here -- it's probably, like, +12 or +13 or something like
16 that, I suppose, down this far, compared to Seattle
17 district, +11 1/2. And that would reach down to +6, +5,
18 something like that.

19 It would depend on the conditions of the beach at the
20 time of observation, but the upper third of the intertidal
21 zone is -- for spawning habitat, is what we're interested
22 in conserving.

23 Q And is that generally for Puget Sound, that sort of +6 to
24 +12 or +13?

25 A Yeah. Well, out in the Straits of Juan De Fuca, of course,

1 the mean high water is about +8. So it would be, out in
2 the Straits, a smaller tidal amplitude. You've got a
3 thinner band. It's still the upper third.

4 Q Okay.

5 A And then, in Seattle, it's +11 or plus -- down about +6 or
6 +5 for sand lance. The sand lances spawn a little lower on
7 the beach than surf smelt do.

8 And then, if you get down to Olympia, you've got +13
9 to +7 or something like that. Very, very nicely nourished
10 beaches down in the South Sound. But it's that upper
11 third.

12 But in terms of tidal elevation, you'd have to take
13 site-specific data, because it varies.

14 Q Now, you talked a bit about the impacts of shoreline
15 armoring on forage-fish habitat.

16 A Yes.

17 Q To your understanding, does aquaculture activities, or
18 shellfish farming activities, require any sort of shoreline
19 armoring?

20 A Generally, I wouldn't think they would, unless they were
21 building docks and things for -- for handling barges at
22 high tide and stuff. There are some aquaculture sites down
23 in South Sound that are heavily armored. But it was for
24 erosion prevention and housing and that sort of thing.

25 Q So the armoring is not necessarily related to the shellfish

1 farming?

2 A No. Their activities extend landward only as far as
3 they're able to grow their animals. And so they don't --
4 can't grow their animals all the way up under the trees.

5 Q Now, you expressed a concern about geoduck ingestion--

6 A Yes.

7 Q --of forage-fish larvae. The forage-fish larvae -- where
8 in the water column would that larvae be? Is it sort of
9 spread -- would it be spread uniformly throughout the water
10 column? The upper part? The lower part?

11 A On a micro scale, that's not known. But the concern for
12 aquaculture impacts would be that the hatching larvae at
13 high tide are in a relatively thin layer, surface layer, of
14 the water column that moves down-beach, across and through
15 and amongst the tubes or the beds or the racks or whatever
16 you've got. And if there isn't enough wind to stir things
17 up, the larvae might be subjected to this ingestion
18 potential through several tidal cycles before they get
19 dispersed out away from the animals.

20 Q So the two concerns that you've really highlighted, I
21 think, in your testimony were that -- were the ingestion of
22 larva, and then the potential impacts of turbidity or
23 sedimentation from the harvest getting up to the spawning
24 habitat. Is that --

25 A Let's see. That, and the -- probably ancillary to those is

1 the modification or the impact of the farm arrays,
2 structure arrays, on the behavior of the fish, pre-spawning
3 and post-spawning.

4 Q The burrowing activity they do?

5 A The burrowing activity for sand lances, the roving activity
6 for surf smelt, that sort of thing.

7 These are all things that are unknown right now, but
8 they are knowable by doing better, more-detailed
9 observations of the behavior of the fish in various degrees
10 of farmed shoreline, I think.

11 MR. PLAUCHÉ: I have nothing further. Thank you,
12 Mr. Penttila.

13 THE HEARING EXAMINER: Ms. Guernsey, do you have
14 anything?

15 MS. GUERNSEY: No.

16 THE HEARING EXAMINER: Ms. Hendricks, do you have
17 anything further?

18 MS. HENDRICKS: No.

19 THE HEARING EXAMINER: I just had one question.

20 THE WITNESS: Oh, okay.

21 THE HEARING EXAMINER: Just more of a curiosity.

22
23 VOIR DIRE EXAMINATION

24 BY THE HEARING EXAMINER:

25 Q As I understood your testimony, then, the larvae, once

1 they're, I guess you would say, hatched.

2 A Yes.

3 Q And you said they moved back and forth among the tubes and
4 that they are subject to being ingested for two to three
5 tidal cycles.

6 A Unless the -- unless the tide currents disperse them.

7 Q Earlier?

8 A Earlier than that. They eventually do wind up away from
9 the arrays of animals. But they have to run that gauntlet
10 for -- for some amount of time at a very helpless stage.
11 They also get big enough, one would presume, that, in a
12 couple, three weeks, the yoke sac is absorbed. They get to
13 be an inch long or so, and perhaps they have -- perhaps
14 they have enough swimming ability to escape such impacts.

15 Q Do you have any idea what percentage of the larvae that
16 geoducks might ingest --

17 A No, I don't. This is a matter of field observations and
18 lab study and stuff perspective.

19 THE HEARING EXAMINER: Thank you, sir.

20 (Herein concludes the first excerpted
21 portion of the transcript and begins the
22 second excerpted portion of the
23 transcript.)

24 ///

25 ///

1 CAPT. CHARLES MOORE, having been first duly
2 sworn upon oath by the Hearing Examiner, testified as
3 follows:

4
5 THE HEARING EXAMINER: I need you to pick up the
6 microphone there. It has a battery pack, and there's a
7 little clip on there. If you could clip that onto your tie
8 or your jacket there, up close.

9 And then if you could state your name and address and
10 spell your last name for us, please.

11 THE WITNESS: Charles Moore, M-o-o-r-e; 345 Bay
12 Shore, two words, Avenue, Long Beach, California 90803.

13 THE HEARING EXAMINER: Ms. Hendricks.

14 MS. HENDRICKS: Captain Moore, because of not much
15 time left for our side to present our case, I'm not going to
16 go through your long list of accomplishments, but we do want
17 to introduce you as a witness, that he is a world-renowned
18 plastic-debris expert. His resumé shows that, and it's in
19 the exhibits. And we're asking him to comment specifically
20 on the debris that he sees that comes off a geoduck farm.
21 And then he also has general comments.

22 THE WITNESS: Okay. So I guess it's ad lib, is it?

23 MS. HENDRICKS: It's ad lib.

24 ///

25 ///

1 NARRATIVE TESTIMONY

2
3 THE WITNESS: Okay. Well, this is my first time
4 seeing the -- I guess, the collected debris that is supposed
5 to have come from one of the geoduck aquaculture
6 installations. Is that what I'm looking at here?

7 THE HEARING EXAMINER: You should have been here
8 yesterday.

9 MS. HENDRICKS: Yeah. We had quite a pile.

10 THE WITNESS: Yeah. Well, the future looked bright
11 at the dawn of the plastic age, and one of the principal
12 reasons was that people thought the world would be a cleaner
13 place with plastic.

14 In the early 1950s and late 1940s, the introduction of
15 plastics was heralded as the dawn of a new age, and that
16 certainly was the case. But the wished-for cleanliness has
17 not come along with the use of plastics. Principally
18 because of their low cost and ease of disposal, and, many
19 times, improper disposal.

20 And sometimes this disposal is accidental. As a matter
21 of fact, the law prohibiting dumping plastics at sea has an
22 exclusion for accidental loss so that fishermen or
23 container-ship operators who accidentally, in a storm or
24 through an accident in their business, lose plastics are not
25 penalized, so that we have a tremendous load of plastics

1 spilled accidentally at sea, and it doesn't even have to be
2 reported.

3 And I'm sure that the aquaculture operators don't intend
4 to lose this material to the marine environment in their
5 operations. It's a cost to them. And we've documented
6 losses from the plastic industry of the basic plastic resin
7 feedstock, the plastic pellets, of, in the case of PVC, the
8 plastic resin powder that is lost accidentally in very large
9 quantities; surprisingly, about 10 percent of the plastics
10 we find in the ocean, no previous use by a consumer. They
11 were simply accidentally discharged at plastic converters'
12 and processors' plants by careless unloading of railcars and
13 trucks.

14 So what we're seeing here, I don't believe is an
15 intentional problem for the marine environment, created on
16 purpose by the operators of these farms. Nevertheless, the
17 consequences of accidental loss are extremely large and need
18 to be addressed by the plastics industry and by those who
19 use plastics, because plastics in the marine environment
20 have been found to cause a myriad of problems, principally
21 in terms of large pieces of plastic.

22 We're looking at what we call entanglement and
23 ingestion. Entanglement and ingestion are the two major
24 deleterious consequences of the loss of plastics to the
25 marine environment. And the trophic level, meaning the

1 place in the marine food web, in which plastics affect the
2 marine creatures appears to have no lower limit or upper
3 limit. There's no particular niche in which plastics only
4 affect a certain biota.

5 The first generation of plastics in the marine
6 environment in the 1950s has gone nano and has now degraded
7 to the point where there are individual molecules of
8 plastic. But because the plastic polymer is so large--many
9 thousands of monomer plastic parts link together to make the
10 polymer--the individual plastic molecule has to undergo
11 further degradation in the marine environment before it can
12 return to its basic constituents of carbon dioxide and
13 hydrogen and oxygen and a few minerals.

14 So the persistence of plastics in the environment is a
15 big issue, and the fact that it can start at the nano scale
16 and go all the way to the great whales, causing death
17 through entanglement and, now, increasingly death through
18 ingestion.

19 As we saw in the gray whale, which is a mysticeti whale,
20 meaning that it feeds by filtering seawater and sediments
21 through its baleen, we really didn't expect to see this kind
22 of problem. Yet, the whale that washed up on a West Seattle
23 beach last year had golf balls; heavier-than-water plastics;
24 clothing, which is PET, polyethylene theraphthalic, which is
25 heavier than water. It had jogging trousers in its stomach.

1 It had surgical gloves. These kinds of plastics that are
2 heavier than water are both in these bags and there are
3 floating plastics in these bags.

4 The zip ties are polyethylene and, many times, they can
5 float. The nets -- they look to be possibly polyethylene.
6 They can float. I don't know if they're nylon. Nylon would
7 sink. Polyvinyl chloride would sink. The PCV would sink.
8 I'm not sure about other plastics that might be used that
9 are biopolymers.

10 We haven't done a lot of work with those. We're
11 currently working with the marine degradables. But no
12 matter whether the plastic is designed to degrade in the
13 marine environment or persist in the marine environment, it
14 goes through a stage in which it becomes an entanglement or
15 an ingestion hazard.

16 So those are the two key points, that it persists, it
17 can entangle creatures and kill them in that way. And the
18 figures are in dispute as to how many thousands are dying
19 each year because of it. But I make the case that the
20 plastic footprint, quote, unquote, is killing more marine
21 creatures right now than the so-called carbon footprint.

22 When we look at, say for instance, polar bears dying
23 from a lack of habitat, I believe that the deleterious
24 consequences of plastic in the marine environment are
25 greater, killing more marine animals, than habitat loss and

1 climate change. So it's a serious issue.

2 And in addition to entanglement and ingestion, there is
3 the further hazard of transport of toxic chemicals. And
4 perhaps this is one of the more-serious ones in the current
5 situation, because of the tidal flux and the fact that many
6 pollutants are located at what's known as the sea-surface
7 microlayer, which is the very thin layer on the surface of
8 the ocean where atmospheric pollutants condense and where
9 the lighter-than-water contaminants, oily contaminants,
10 things like pesticides and herbicides float.

11 Those are preferentially attracted to plastics.
12 Plastics have two mechanisms by which they take in
13 pollutants from the marine environment. One is known as
14 absorption, with a "B," and the other is adsorption, with a
15 "D."

16 And those two mechanisms -- one -- the polymer, being
17 such a long chain, is organized in a kind of a crystalline
18 structure which has spaces between it. So to absorb into
19 the crystalline structure, a good deal of pollutants get
20 into it that way. But also because it has these holes in
21 its surface, because the polymer chains are open and porous
22 -- they have kind of holes where pollutants, at the
23 microscopic level, adhere, so they absorb to the surface
24 very readily.

25 So as the tide rises and falls and exposes the plastic,

1 especially even more so than the tubes themselves, the nets
2 and the zip ties will absorb even greater amounts of these
3 pollutants from the sea-surface microlayer and then are
4 capable, when they get away, as they have here, and begin to
5 break down, desorbing into whatever eats them.

6 And the examples, as I say, of plastics being ingested
7 by sea creatures mount. Every week, new papers come out. I
8 just read a paper on marine catfish, who live on the bottom,
9 being consumers of the nylon nets that the fishermen use to
10 try to catch them. The particles of nylon that break off
11 the nets were consumed by the marine catfish.

12 So it's not simply that it blocks their intestines and
13 doesn't provide nutrients and it's not digestible. It's
14 also this transport mechanism for pollutants.

15 Now, some might say that we don't need to worry about
16 your gray whales or your dolphins, because they could pass
17 pieces of plastic. But you see this hag's hair of debris
18 here. It -- it's mixed together. It's got a lot of
19 different components. So what you end up getting--and we
20 see this in the marine environment constantly--is knitting
21 that the ocean is capable of doing. The currents, the
22 roiling.

23 I mean, you all experienced the tsunami recently, and
24 you certainly saw pictures of that roiling, churning water.
25 That's just a macroscale of something that's happening all

1 the time, and these plastics are being woven together into
2 these boluses.

3 And the sperm whales that recently washed up dead along
4 the North Pacific coast had these boluses of varieties of
5 debris working inside the stomach, and it pierced the
6 peritoneum into -- through the stomach wall, and the whale
7 died as a result of that.

8 So we can't simply say that the individual particle of
9 plastic or the individual tube or the individual piece of
10 plastic could pass through the digestive tract, because it's
11 more than likely going to be enmeshed in a mass of debris
12 that has been collecting on the bottom or in the mid water
13 or on the surface, depending on the creature and the
14 situation in which they feed.

15 So let's see. Was there anything else I wanted to touch
16 on?

17 The PCV itself has organotins. 90 percent of tin
18 stabilizers are used in rigid PVC. And these organotins in
19 PVC affect the immune function in the endocrine system. So
20 what's going on is a kind of a sandblasting at a snail's
21 pace, is what's going on with this material.

22 And I'm sure it's a pain for the folks that are trying
23 to raise the clams, because it erodes the pipes, and they
24 have to be replaced. And if they go to a marine degradable
25 pipe, that will happen even faster.

1 And this erosion, this slow sandblasting that's being
2 carried on in this marine environment is creating these nano
3 particles right away. It's bringing nano particles into the
4 marine environment, into the sediments, into the benthos,
5 into the habitat of the creatures that live in the mud. So
6 I would be very interested to see if some organotins perhaps
7 aren't being ingested by the aquacultured species. That may
8 be a problem.

9 But in any case, even if these nano particles are
10 carried away by the currents, they're still going to be
11 affecting animals living upstream or downstream.

12 I'm not an expert on littoral processes and coastal
13 sediments. I'm sure that's been addressed by others. But
14 when you're setting up these arrays, you're going to change
15 the habitat. And plastic is certainly a problem, and the
16 fact that, you know, unintentionally -- you certainly don't
17 want to ascribe any mal intent to the operators. It's not
18 in their economic interest or their political interest to
19 have that happen.

20 But as a sea captain, I can just tell you, it's so hard.
21 The marine environment is so difficult to preserve any
22 particular static structure that you're going to have these
23 losses. It's just not possible to create bridges -- I mean,
24 look at what just happened. Look at the tsunami. I mean,
25 people build to last. And certainly, Japanese are excellent

1 carpenters and excellent builders, and it was as if they
2 were just seaweed on the beach. It just lifted everything
3 and moved it around in an incredible way.

4 So certainly, we're going to have these losses. I know
5 that a yeoman's effort will probably be produced to try to
6 stop them. But it's just too hard to stop the contamination
7 of the marine environment with plastic. And it's happening
8 on such a large scale that the problem has exploded in the
9 introduction of a globalized economy; which, I actually have
10 called plastic "the lubricant of globalization," since you
11 can have the cheap labor market in a faraway country wrap
12 its product and have it arrive in a pristine condition in
13 the citadel of consumption. And then it instantly becomes
14 fast-track trash. Once you unwrap it, then it becomes waste
15 and it becomes useless.

16 So that's not the point here. But the point is, we
17 don't need to add to this burgeoning burden of plastics on
18 the marine environment. That's why, every week, we're
19 seeing two new papers written on this. When I first got
20 into this field 15 years ago, there were virtually no papers
21 being written on this issue. And now we're seeing them
22 exploding because of the deleterious consequences of
23 plastics in the marine environment.

24 So I guess I can stop there.

25 THE HEARING EXAMINER: Do you have any questions

1 for Captain Moore?

2
3 DIRECT EXAMINATION

4 BY MS. HENDRICKS:

5 Q First question is: As you're aware, in this case, we -- in
6 order to get an EIS, we need to show proof of probable
7 significant impact on different issues.

8 Do you feel there's a probable significant impact to
9 aquatic life of -- probably significant impacts to aquatic
10 life by this operation -- or these operations?

11 A Well, it's not as if nature has evolved in the presence of
12 plastics or plastic-like objects to be able to discriminate
13 between plastic and natural food. In our study, we found
14 35 percent of the fish we caught to have ingested plastic.
15 It just mimics the texture and the color and the behavior
16 of natural food.

17 And then, on top of that, it is a host for epibions,
18 for organisms that settle onto the plastic and begin to
19 grow. So it does begin to have a coating of food. And
20 that is a strategy that some birds and fish and mammals use
21 to get food, is to eat things that are coated with life.
22 And so plastic becomes one of those things.

23 So not only is it significant, it's adding to a burden
24 that is so excessive that it's become a worldwide problem.
25 We just sponsored an international youth summit. In fact,

1 just yesterday, I sailed the Guam team from our hotel in
2 front of the Queen Mary at the mouth of the L.A. river over
3 to my dock. And we had kids from Kenya that were
4 complaining about the plastics getting into the wildlife
5 preserves; were going to build hedges around it because
6 it's getting in there.

7 It's just become this plague on the planet, and kids
8 around the world are now having to deal with it. They're
9 concerned. They're concerned. We had 100 kids from 12
10 countries come to brainstorm ways to deal with plastic
11 pollution. This is plastic pollution (indicating).

12 And it is significant, and it is harming wildlife.
13 And if we're going to wait till we see species crash and go
14 into a decline which we can't arrest, we'll have waited too
15 long.

16 Q Do you feel like this project will add to that plastic
17 burden?

18 A There is no question in my mind, when I see this
19 (indicating), that it will. And as I mentioned, it goes
20 from the nano scale to the stuff that you can see. None of
21 these samples, I imagine, you're bringing here show the
22 thinner wall of this tube. What happened to that material?
23 The wall of the tube becomes thinner with time. Where does
24 that material go? Who is sampling that?

25 MS. HENDRICKS: We don't have any other questions

1 at this point.

2 THE HEARING EXAMINER: Ms. Guernsey?

3 MS. GUERNSEY: Nothing.

4 THE HEARING EXAMINER: Mr. Plauché, Ms. Kisielius?

5

6 CROSS-EXAMINATION

7 BY MS. KISIELIUS:

8 Q Good afternoon, Captain Moore.

9 A Good afternoon.

10 Q My name is Laura Kisielius and -- is this on?

11 A I can hear you great.

12 MS. KISIELIUS: Can they hear? Unfortunately, they
13 have to hear me.

14 THE WITNESS: Okay.

15 THE CLERK: I think I do.

16 Q Okay. My name is Laura Kisielius.

17 THE CLERK: Is it on?

18 THE HEARING EXAMINER: It doesn't sound like it's
19 on.

20 (Pause in proceeding to address sound
21 system.)

22 Q Good afternoon again, Captain Moore. My name is Laura
23 Kisielius. I'm one of the attorneys representing
24 Longbranch Shellfish, who is the project proponent in this
25 hearing. I just have a few questions for you.

1 A Sure.

2 Q Can you tell us briefly about your experience in the field
3 of toxicology?

4 A Experience in the field of toxicology. Well, I'm the
5 coauthor of a paper on the accumulation of persistent
6 organic pollutants in plastics found in the North Pacific
7 central gyre, along the Southern California coast, and,
8 actually, in rail yards where the plastic pellets are
9 discharged into the factories that process them.

10 So I worked with the University of the Pacific, in
11 Stockton, at their Chemistry Department, with the head of
12 the Chemistry Department, Patrick Jones, and his Ph.D.
13 post-doc. Her name is Lorraina Vios Del Rio. She was a
14 student that came on my boat out of the autonomous
15 University of Baja California. That's another one. We
16 were doing studies on the whale lagoons in Baja California.
17 And with her, we have produced a couple of papers on the
18 persistent organic pollutants in plastics.

19 Now, that is not, per se, toxicology. I'm not an
20 expert in the human or animal effects of pollutants in
21 plastic. But I do read, extensively, the literature on it,
22 and there is mounting evidence -- for instance, there's a
23 study in shearwaters that looked at feeding them plastic
24 pellets from Tokyo Bay, and it was found that the specific
25 conjoiners of the PCBs that are coming from the plastic

1 were transferred from those pellets to the birds.

2 So there's mounting evidence that we can link the
3 desorption -- I mentioned absorption and adsorption. We
4 can also link the desorption of these contaminants to the
5 eating of them by sea birds. So that is a paper I'm
6 familiar with.

7 But in terms of being a toxicologist, certainly, no,
8 I'm not, in any sense, a toxicologist.

9 THE CLERK: Okay. Now your battery is out.

10 THE HEARING EXAMINER: Yeah, I think we're going to
11 have to take a break here to change batteries here.

12 (Recess taken from 3:36 p.m. to 3:42 p.m.)

13 THE HEARING EXAMINER: We will go ahead and
14 reconvene the hearing, then. Ms. Kisielius, do you want to
15 go ahead?

16 MS. KISIELIUS: Okay. This is on now, right?

17
18 CROSS-EXAMINATION - (continuing)

19 BY MS. KISIELIUS:

20 Q Okay. Captain Moore, is it fair to say that your primary
21 research focus is on ocean surface debris?

22 A It's fair to say that that's what I publish most on.
23 However, we have done some work on the benthos. And our
24 interest lies in heavier-than-water plastics, since, based
25 on resin production in the United States, only 46 percent

1 of plastic resins will float. So it's just that they will
2 probably be closer to shore and coming out the river
3 mouths, get mixed into the sediment.

4 But in this case here, where you have a significantly
5 heavier-than-water plastic in the polyvinyl chloride, and
6 in the fact that, in our research, we found rail yards of
7 factories that make the PVC pipe that were losing a lot of
8 PVC pellets to the environment, we'd really like -- one of
9 our research goals is to survey marine canyons in the
10 nearshore environment for heavier-than-water plastics.

11 But yes, I'm certainly published more on buoyant
12 plastics than on heavier-than-water plastics.

13 Q Okay. And you referenced a study that you performed
14 regarding fish ingestion.

15 A Yes, ma'am.

16 Q Where did you collect those fish specimens?

17 A Those fish were all from what we call the North Pacific
18 central gyre. They were myctophids, principally lantern
19 fish, although one of the major species was a californicus,
20 which is very common in California waters. So these
21 myctophids are -- wherever there's deep water, there is
22 these myctophids. And one of the species does live in
23 California. But we did not collect California myctophids
24 for the study.

25 Q And the North Pacific gyre you mentioned -- how many miles

1 offshore is that, approximately?

2 A Just -- you know, it kind of depends. Since our coast runs
3 not directly north and south, but really southeast. So
4 it's really closer to you guys than it is to me, you know.
5 But it's about half -- just to give you an idea, it's about
6 halfway between San Francisco and Hawaii.

7 Q Okay. Can you tell us what issue the Appellant asked you
8 to analyze with regards to this case?

9 A Well, I was given the documentation of the proposal and the
10 appeal -- you know, was to focus on that proposal. So I
11 read through the proposal to put in the aquaculture
12 operation, learned a lot about the clams; fascinated by the
13 clams because, actually, I found a pirate fishing operation
14 doing geoduck clams in Baja California, Mexico, halfway
15 down the peninsula, in deep water, with scuba gear.

16 So they are a widely distributed clam along the
17 Pacific Coast, and it's quite interesting to learn about
18 the aquaculture operation. So I had been interested in the
19 clams before, but I don't purport to be an expert in that
20 industry or the aquaculture industry. I just have just a
21 smattering of experience with it.

22 Q Okay. And your conclusion regarding the significance of
23 the marine debris -- is that related to a cumulative effect
24 of marine debris from all aquaculture fisheries?

25 A Well, I think we can be both very microscopic in our

1 analysis and very big-picture on our analysis, because the
2 two are intertwined. Plastic is very, quote, unquote,
3 pelagic, you know; especially the lighter plastics.

4 But even the benthos -- I was in a conference at the
5 European Commission in Brussels, a workshop on plastic
6 marine debris, and I was with the equivalent of our NOAA --
7 the French equivalent of our NOAA scientists, who showed a
8 video of the Mediterranean. And the heavier-than-water
9 plastics and PET water bottles had migrated and clumped in
10 kind of a pile in the middle of the Mediterranean.

11 So these roly-poly things, like these tubes and the
12 water bottles, are capable of enormous migration on the
13 bottom, even though they're heavier than water.

14 Q Okay. And have you had an opportunity, or have you
15 quantified the amount of marine debris that may possibly
16 escape from the proposed farm?

17 A No. I don't even know how many actual tubes will be used.
18 I think -- is it one per square foot, approximately?

19 Q That's approximately correct.

20 A Yeah. One per square foot, so -- and then, I mean, it's a
21 simple multiplication factor, but I'm sure it's in the
22 thousands. So I mean, there's quite a few. And then --
23 well, I believe -- let's see. There was 3,000 rubber bands
24 collected from an area near two of the operations that had
25 maybe 10 times that many tubes, was it? Something like 10

1 percent of the tubes had lost a rubber band, if you accept
2 that the rubber bands were from the closest operation and
3 didn't come from far away.

4 So a 10-percent loss. And even though -- now, you
5 know, you may think: Well, rubber, at least being a
6 natural polymer, will degrade faster and not have as many
7 deleterious consequences. But really, with balloons, we're
8 finding a lot of problems. And I would assume that rubber
9 bands would have some of the same problems as balloons.
10 Just -- they just don't digest, you know, when they're
11 taken in. So they become part of this bolus that becomes
12 something that can catch other things and impact the
13 species.

14 But yeah. I'm certain -- don't purport -- I'm
15 responding to the material that I read, but I have no
16 background in the industry itself and don't purport to be
17 an expert in how it's run and, you know, the way it's
18 managed.

19 Q Okay. And I guess, by the same token, have you thought
20 about, or have you quantified, the amount of micro plastics
21 that might escape the farm from the use of PVC?

22 A I'd be very -- well, to do that, I'd need to get the weight
23 of the tube when it was installed and the weight of the
24 tube when it was removed, and then we could get an idea of
25 how much. But I don't know -- I didn't see any studies, in

1 the literature, of that figure, that would give me what I
2 would need. Because, first of all, we'd have to remove the
3 epibions to know -- the sessile organisms that had
4 recruited to the plastic would have to be removed to get a
5 good weight on how much plastic had eroded away. So you'd
6 have to clean the plastic.

7 I mean, you know, it's not something someone is going
8 to do as part of the disposal process unless it's actually
9 being recycled. And I just read a paper on PVC in "The
10 Philosophical Transactions of the Royal Society" that
11 stated that zero PVC was recycled in the United States.

12 Q And my last question. You weren't able to be here for
13 other testimony, but there was a Proposed Condition of
14 Approval on this project that would require the project
15 proponent to patrol the beach for a half a mile in either
16 direction of the farm once a week and then the day after a
17 severe storm event.

18 A Hmm.

19 Q Would that help, in your mind, mitigate any potential
20 impact that escaped marine debris might have?

21 A Yeah. But helping mitigate an impact is not the same as
22 preventing an impact. You know, I don't impugn the motives
23 of the farmers and the aquaculturists, you know. We've got
24 to find good ways to do aquaculture to feed -- if we're
25 going to have seafood in the future, because we're

1 decimating wild stocks. Sylvia Earle says, you know, "No
2 one" -- you know, there's no naturalist to propose that we
3 get our meat by hunting anymore. You know, this is not the
4 way we get our meat. And we're not going to be getting our
5 fish by fishing, in the not-too-distant future.

6 So we've got to find clean, safe ways to do these
7 operations. And we've got to develop better methods. But
8 the fact that you go and retrieve as many as you can of
9 those lost items after they've been lost to the ocean --
10 really, the percentages are not going to be high, of what
11 you're able to recover, unfortunately.

12 I just don't see it being the answer to the problem.
13 I agree that it shows goodwill and that the operators are
14 making a valiant effort, but they're just not going to be
15 able to get enough of it to prevent an impact to the marine
16 biota that are going to be exposed to the ones they miss.

17 MS. KISIELIUS: Thank you very much.

18 THE HEARING EXAMINER: Ms. Guernsey, do you have
19 anything?

20 MS. GUERNSEY: Nothing.

21 THE HEARING EXAMINER: Ms. Hendricks?

22 MS. HENDRICKS: No.

23 ///

24 ///

25 ///

1 VOIR DIRE EXAMINATION

2 BY THE HEARING EXAMINER:

3 Q I just had one question, Captain Moore, and that is: How
4 long does it take some of the plastics here to, I guess I
5 would say, decompose in the ocean, that type of thing?

6 A Well, it depends on the depth at which the decomposition
7 takes place. There is a scientist from Woods Hole that put
8 bread and paper down on the bottom of the deep ocean, and
9 no decomposition. So at the bottom of the deep ocean, it's
10 a forever material, okay?

11 Then there are kids that do science-fair experiments
12 that find bacteria that live to eat polyethylene, and maybe
13 they get 2 percent a year in soil, you know, going away.

14 Now, the ocean environment is a lot colder than an
15 active soil or a compost pile and, typically, it takes a
16 lot longer in the marine environment to degrade. Now, the
17 PVC, the zip ties, and the nets are -- if they're submerged
18 or floating near the surface, are probably at least a
19 century, if not more, to fully degrade.

20 We had an albatross that was found with a stomach with
21 a fragment of a jet -- or not -- I guess it would have been
22 a jet. But anyway, an airplane from World War II, a
23 60-year-old piece of plastic it had picked up, floating in
24 the ocean. And that's the oldest recorded piece of plastic
25 floating in the ocean that has been documented, was about

1 60 years old. And it still had the numbers on it so that
2 it could be traced to the actual airplane that it came
3 from.

4 So it's a cold environment. It's not full of insects.
5 Only one insect, and that's a water strider that we see out
6 in the ocean. Very little fungi. So it's just kind of a
7 dispersed bacterial environment.

8 And to get the kind of degradation you see on land, to
9 where it will meet a standard -- there is a proposed marine
10 degradability standard, and we're working with the Army to
11 test the plastics that claim to be marine degradable now.
12 In fact, just yesterday, in our lab, I got a call from our
13 lab tech, frantically trying to get ahold of the head
14 laboratory scientist, because it was her turn to measure
15 the degradation of the plastic, and she wanted to make sure
16 she was doing it right.

17 So we're, right now, involved in trying to find
18 plastics that will degrade. But for all practical
19 purposes, when you've got this cold environment with sparse
20 microbial life, you're not going to get degradation
21 comparable to that on land. And in the case of plastic
22 polymers, as I said, even once you get it down to the
23 individual plastic polymer, you've still got to degrade
24 that further to get it gone.

25 So even that stuff that's mixing in with the sand --

1 we're getting plastic sand now on the beaches, and the
2 plastic in the water column that we pull out in our nets
3 likely has -- some of it has likely been there since the
4 dawn of the plastic age.

5 And the stuff that's gone nano -- we haven't even
6 gotten the papers written on that yet. People are starting
7 -- Dr. Androtti, an expert on the breakdown of plastics in
8 the marine environment, is starting to try to find nano
9 plastics in the marine environment. But it's not a piece
10 of cake to find these tiny, tiny, little pieces of plastic
11 out in the big ocean.

12 But yeah. You can have all kind of guesses, but
13 they're all guesses. I've seen environmental groups
14 bringing placards to Earth Day events, where they give the
15 number of years for each kind of plastic to break down.
16 That has absolutely no scientific basis. It's all
17 guesswork.

18 And it can -- we have documented 60 years, but, you
19 know, to fully degrade and, after it goes nano, to break
20 down into the molecules that made it in the first place
21 could take centuries and, in the deep oceans, certainly,
22 millennia.

23 Q As part of your research, do you investigate alternatives
24 to plastics that are going to be used in either the ocean
25 or close to it or wherever?

1 A Not -- we are not investigating alternatives to plastics;
2 we're investigating alternative plastics. We're
3 investigating new biopolymers that are made by fermentation
4 of corn sugars that are created as the batch, you might
5 say, is brought up to a large number of organisms. It's
6 then put under stress by withdrawing certain nutrients, and
7 the organisms sequester this plastic as a response to
8 stress.

9 And plants do it, and bacteria do it. And then they
10 harvest this stress-created compound. In the case of a
11 marine degradable, it's called polyhydroxyalkanoate, and
12 PHA is what we're testing now, that may have a marine
13 application.

14 So we're testing alternative plastics. You know,
15 whether they could do this, whether it would be economical,
16 with stainless steel tubes or aluminum tubes, or whether it
17 would be economical with glass tubes, you know, I have no
18 idea. I think it would be an economic decision, though.
19 It would certainly mitigate some of the environmental
20 effects.

21 THE HEARING EXAMINER: Thank you, sir. Anyone else
22 have anything further?

23 MR. PUDDICOMBE: No questions.

24 THE HEARING EXAMINER: Thank you very much, Captain
25 Moore.

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(Herein concludes the excerpted portions of
the transcript.)

1 CERTIFICATE

2 STATE OF WASHINGTON)
3 COUNTY OF KING)

4 I, LINDA M. GROTEFENDT, a Certified Shorthand
5 Reporter and Notary Public in and for King County,
6 Washington, do hereby certify that I reported in machine
7 shorthand the above hearing; that the foregoing transcript
8 was prepared under my personal supervision and constitutes
9 a true record of the above hearing.

10 I further certify that I am not an attorney or
11 counsel of any parties, nor a relative or employee of any
12 attorney or counsel connected with the action, nor
13 financially interested in the action.

14 WITNESS my hand and seal in Renton, County of
15 King, State of Washington, this 30th day of March, 2011.

16
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18
19
20 _____
21 Notary public in and for the
22 State of Washington, residing
at Renton.

23 My commission expires 1-2-2012.
24
25