SHELLFISH AND COASTAL CHANGE:
Pacific Oysters and Manila Clams in BC Waters

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People have been harvesting and processing intertidal shellfish from the coastal waters of the place we now call British Columbia for at least ten thousand years (Fedje 2005, 187-203). Some estimates suggest that Indigenous peoples have been intentionally altering and extending intertidal spaces to cultivate elevated densities of clams and cockles for at least two or three thousand years (Lepofsky and Caldwell, 2013, 7).[1] Over the last century several clam species have been targeted in a commercial fishery in which licence holders harvest by hand within designated regions (Mitchell 1995-96). Although harvests in this fishery have declined since the late 1980s, the annual cost of a licence has stayed fairly low, and, especially relative to other commercial fisheries, the proportion of First Nations clam licence holders has remained steady (Pinkerton and Silver 2011). Finally, beginning in the late 1970s, the provincial government has made available almost four thousand hectares of intertidal and nearshore space in the form of private marine tenures for shellfish aquaculture. Within these privatized coastal spaces, tenure-holders adopt intensive culture and husbandry techniques to grow a variety of permitted shellfish species. In short, people and intertidal shellfish (hereafter "shellfish") have a long and tangled history in British Columbia. Rather than treating them as inert natural resources passive in human affairs, this article attends to shellfish as active participants in the province's coastal spaces and politics.

INTRODUCING PACIFIC OYSTERS AND MANILA CLAMS

In 2010, the BC shellfish aquaculture sector produced ten thousand tonnes of product with a final wholesale value of $32.5 million. Together, Pacific oysters (*Crassostrea gigas*) and Manila clams (*Venerupis philip-*

[1] Of particular relevance here are "clam gardens," or intertidal spaces modified to increase habitat and support higher densities of shellfish (Williams 2006; Lepofsky and Caldwell 2013). The presence of clam garden sites has only recently been recognized in settler society (Harper 1995). Research regarding their functionalities in the past and their implications for contemporary questions of Aboriginal rights and title is nascent.

pinarum) comprised 89 percent by volume and 78 percent by value of the harvest (BC Ministry of Environment 2010). As with most resource industries, there are different views of shellfish aquaculture and its future in British Columbia. Some maintain that great economic potential rests in tenure expansion and the high-volume production of oysters, clams, scallops, and several other species. Others raise uncertainties about possible environmental impacts (Bendell-Young and Ydenberg 2001) and the long-term socio-economic viability of small shellfish businesses, especially in remote coastal communities (Joyce and Satterfield 2010; Silver 2013).

Taxonomically speaking, *C. gigas* and *V. philippinarum* are bivalve molluscs, or invertebrates whose shells consist of two plates hinged together by a ligament. Both are broadcast spawners, meaning that males and females emit gametes into the water where fertilization then occurs. Fertilized eggs develop into drifting larvae that are dispersed by water currents (Ketchen, Bourne, and Butler 1983). After a few weeks, larvae settle on intertidal substrate and begin to display adult characteristics (ibid). Without human intervention, Pacific oysters generally prefer to settle on the surface of gently sloping muddy intertidal flats, and Manila clams prefer to burrow in loose sand-gravel beaches. The number of juvenile Pacific oysters and Manila clams that settle in a given area fluctuates from year to year as larval dispersal and survival is affected by tides, storms, and predators. Moreover, time to reproductive maturity and the occurrence of spawning events may vary further according to local water temperatures. Ketchen et al. (1983, 113) suggest that slightly warmer water temperatures in the Strait of Georgia facilitate faster shellfish growth and more consistent reproduction than elsewhere in the province.

Both Pacific oysters and Manila clams are filter feeders. This means that they suck in, strain out, and digest phytoplankton and zooplankton suspended in the water column that submerses them at high tide. According to some gourmands, and many a marketing campaign, filter feeding produces something akin to the wine connoisseur's *terroir*, whereby fleshy inner shellfish bodies subtly reflect the biophysical specificities of their precise place of residence. Sensory-derived distinctions of place appear to bode particularly well for oysters grown in British Columbia's "nutrient rich, cold and clean waters" (Pacific Kiss 2011) because their international reputation for quality and sustainability can help to earn a price premium in non-local markets (Walker 2010). This is important as, upon export, BC shellfish compete with shellfish from the United States, Europe, and even Asia.

Calculations and discourses that articulate material relations between farmed BC shellfish, the places where they grow, those who cultivate them, and common production techniques are also central to arguments made domestically for high-volume shellfish cultivation and the expansion of shellfish aquaculture tenures. Carefully employed by sector advocates, these calculations and discourses make cultural meaning of nature (cf. Mansfield 2003; Prudham 2009) in powerful ways that often position the property relations, farmers, growing techniques, and species of the sector in a positive light relative to other uses and users of coastal space in British Columbia. Yet the history of Pacific oysters and Manila clams in the province is far more complex than is usually elaborated in digital images, public relations messaging, and government committee sessions. Indeed, the emergence of today's shellfish aquaculture sector can be traced back to the early 1900s, when Pacific oysters and Manila clams, both species classified as native to Asia, were introduced to BC waters.

To attend to shellfish as active participants in British Columbia's coastal spaces and politics, I trace the longer history of Pacific oysters and Manila clams in British Columbia and place it in conversation with calculations and discourses that make meaning of shellfish and the contemporary shellfish aquaculture sector. Foregrounding *C. gigas* and *V. philippinarum* offers a new perspective on the evolution of shellfish aquaculture in the province. As I show, the environmental preferences and physiological traits of shellfish matter a great deal to the way that the sector is perceived, organized, and operated today. In turn, this perspective problematizes arguments that suggest that there is something inherently more environmentally and culturally appropriate about Pacific oysters, Manila clams, and shellfish aquaculture more generally than may be found in other users and/or uses of coastal space. Most broadly, I reveal that thinking in different ways about agency and the circulation of power can extend scholarship regarding the spaces and politics of nature in British Columbia. Before further elaborating the case study background and methodology, I first situate this article in discussions of the politics of nature in British Columbia and in the literature on assemblage thinking.

NATURE, ASSEMBLAGES, AND REGIONAL POLITICS

Reinforced by marketing slogans like "Super, Natural British Columbia," British Columbia is renowned for its dramatic physical terrain and its "globally significant" biodiversity (Davis 2011). Simultaneously, its political economy is deeply implicated in contemporary claims, often

contested, for lands, seas, and resources (Blomley 1996; Low and Shaw 2011–12; Deur et al. 2013). A great deal of wealth and, in turn, conflict over lands and resources is rooted in the reality that early settlers not only rejected non-European ways of relating with nature, governance, and land tenure arrangements but also the responsibility of negotiating treaties with Indigenous peoples (Harris 2003; Harris 2008; Deur et al. 2013). Although the BC treaty process has been under way since the 1990s and greater procedural attention is now paid to Aboriginal rights and title, the language and objectives espoused around negotiation tables, in boardrooms, and even in environmentalist campaigns continue to reproduce Eurocentric constructions of, and objectives for, "nature" (Braun 1997).

Scholarship tracing nature-society relations in British Columbia reminds us that what is today represented or understood as pristine, sustainable, and productive is inevitably tempered by complex histories, ecologies, and power-laden social relations (e.g., Braun 2002; Rossiter 2004; Schreiber and Newell 2006; Dempsey 2011). Two very important points are clear: (1) that human–non-human interactions in British Columbia reach back millennia and (2) that claims about "nature" and the environment are always situated and often do political work. However, scholarly investigations of the spaces and politics of nature in British Columbia have tended to make humans and their actions analytically central.

Recent studies – of human-grizzly bear relations in the Great Bear Rainforest and human-cougar relations on Vancouver Island – suggest that seeing non-humans as active constituents in space and politics can advance our understanding of the ways that humans and animals contingently transform these places and each other. Respectively, Dempsey (2010) and Collard (2012) find that the material traits, preferences, and actions of grizzlies and cougars inflect the communication, negotiation, and pursuit of scientific, management, and leisure activities. Dempsey (2010, 1153) writes:

> Environmental politics … is *more than* a conflict or compromise between economic, social, and environmental priorities, or between the human actors or institutions sitting at the negotiation table maximizing gain and minimizing loss. While I focused narrowly on the grizzly bear, in tracing its relationships with others – relationships where the bear has *affect*, other actors came out of the woodwork too: for example, settler histories, fear, guns, conservation science and expertise, and private and public capital.

Attending to grizzly ecology, the calculations and maps made by conservation biologists, stories of deadly human-cougar encounters, and the value that grizzly bear charisma brings to environmentalist boycott campaigns, Dempsey's and Collard's work foregrounds the difference that animals make to the spaces and protracted politics that characterize and, over time, transform their home-range environs.

Informed by poststructuralist thought, and often centrally inspired by Donna Haraway's (2003, 2008) assertion that the world as we know it is brought into being through co-constitutive human-animal relations, scholarship on the roles of non-humans in the maintenance of social-environmental orders is thriving (e.g., Wolch and Emel 1998; Mansfield 2003; Robbins 2007; Kosek 2010; Sundberg 2011; Hovorka 2012). Empirically, much of this work is interested in how assemblages (cf. Deleuze and Guattari 1988), or "associations between entities – humans, animals, plants, machines, devices likes maps or diagrams, and other things" (Sundberg 2011, 4), stabilize social-environmental structures and outcomes. When taking an assemblage approach, one must begin by thinking of agency as bound in contingent historical and spatial relations *among* entities rather than as a necessarily individual and/or human trait. From here, the analytical point is to understand and articulate the structure or outcome of interest in terms of the work that goes into "draw[ing] heterogeneous elements together, forg[ing] connections between them and sustain[ing] these connections in the face of tension" (Li 2007, 264; see also Sundberg 2011). As Dempsey (2010) and Collard (2012) remind us, the "work" may sometimes be material and sometimes semiotic (i.e., ordering through image and discourse); in some cases it may be intentional, in others, not.

John Allen (2011) suggests that an assemblage approach offers regional studies the opportunity to understand politics as something other than a coherent or bounded arena in which "winners" emerge because they are morally right or because they did a better job of accumulating funds, powerful allies, and public support than did the "losers." He writes: "Regional authority is a relational effect of political interaction between a range of central, regional and local actors, not a bloc of pre-formed decisionmaking [*sic*] powers. It hangs together institutionally, not by the imposition of powers 'from above' or by the diktats of a ruling clique, but through the tangled and cross-cutting political relationships between actors" (155). This line of thinking encourages us to reconsider how socio-environmental orders or outcomes emerge through relationships and intersections between entities – again, humans,

animals, technologies, maps, and so on – over space and through time (Li 2007). Whether studying novel governance arrangements among environmentalists, industry, and First Nations (Davis 2011; Low and Shaw 2011-12), or why particular environmental controversies seem so protracted (Hayter 2003), an assemblage approach encourages us to consider power in decentralized terms. As we will see, the initial introduction and expansion of Pacific oysters and Manila clams, and arguments about their relationships with practices, places, and people, are central to the structure and function of the contemporary shellfish aquaculture sector and, possibly, to maintenance of the "muted" (Joyce and Satterfield 2010, 107) state of politics that some suggest surrounds it.

CASE BACKGROUND AND METHODOLOGY

To obtain a marine tenure for shellfish aquaculture from the provincial government, applicants must pay an initial application fee and incur the costs of any assessment activities. If approved, the tenure holder is charged an annual fee based on assessed land values for intertidal space cultured for shellfish production.[2] In addition to provincial stipulations, farmers are licensed and monitored by the federal department of Fisheries and Oceans (DFO) with input from Environment Canada and the Canadian Food Inspection Agency. The earliest tenures were placed in the Strait of Georgia (Figure 1), which remains today the production core of the BC shellfish aquaculture sector (Salmon and Kingzett 2002). Approximately 50 percent (by volume) of BC farmed shellfish are grown in Baynes Sound alone (BC Shellfish Growers Association 2011, 2). Other prominent producing areas include: the Gulf Islands of southeast Vancouver Island, Pendrell Sound, and Okeover Inlet.

In 1997, a projection in a government-funded consultant's report suggested that, by doubling the space available to shellfish tenures, the wholesale value of the BC sector could grow from $12 million to $100 million within ten years (e.g., Coopers and Lybrand Consulting 1997). Encouraged by this figure, the provincial government adopted an expansionary stance and sought to place more shellfish tenures in new regions, such as the west coast of Vancouver Island and the central and northern mainland coast. Optimism about the sector's economic potential escalated into the early 2000s, and, as illustrated in Figure 2, the relationship between shellfish and the practices, culture, and

[2] In 2005, for example, the provincial government estimated annual lease fees at 4 to 5 percent of $5,830 per hectare, with no fee below $600 per year (BC Ministry of Agriculture and Lands 2005).

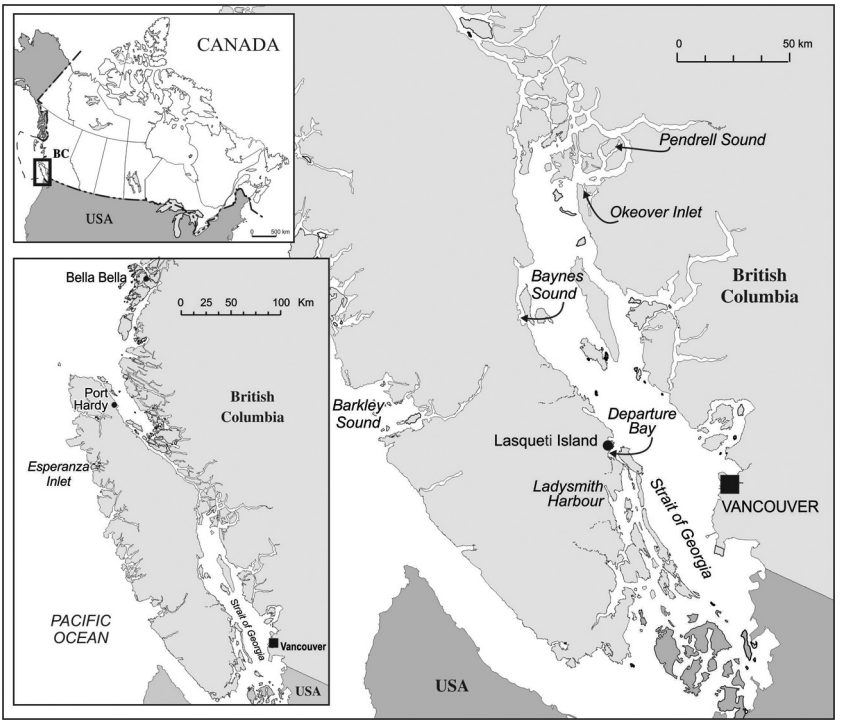

Figure 1. Strait of Georgia and west coast of Vancouver Island regions.

economic needs of First Nations communities emerged, and remains today a commonly articulated raison d'être for an expanded network of private marine tenures.

Between 1998 and 2009, some eighty to one hundred new tenures comprising just over twelve hundred hectares of coastal space were allocated (BC Ministry of the Environment 2010). Reports suggest that many went to First Nations for community development (Doyle 2002), with one estimate suggesting that, "of the 104 new tenures issued since 1998, most have gone to First Nations" (Salmon 2006, 5). However, with the wholesale value of the sector currently sitting at around $32 to $35 million, it is clear that production on these new sites has not ramped up as anticipated. For this reason, questions circulate about the potential for profitability in small, remote communities (Joyce and Satterfield 2010; Silver 2013) and about what the cumulative environmental impacts of successfully scaled-up production might be.[3]

[3] Space limits extended in-text discussion of empirical evidence regarding other ecological impacts of shellfish aquaculture in British Columbia. Bendell-Young and Ydenberg (2001),

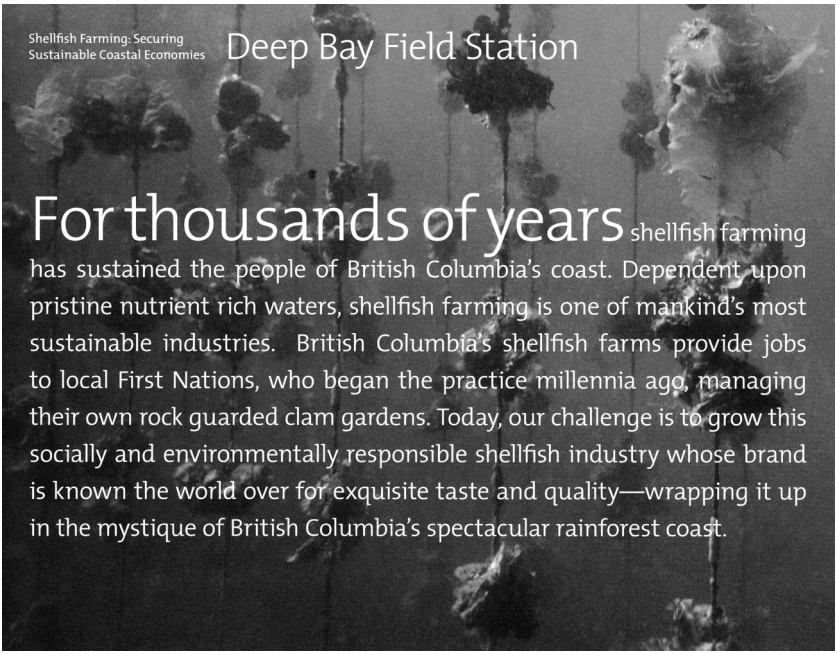

Figure 2. Cover of promotional booklet produced by Vancouver Island University's Centre for Shellfish Research to promote its field station.

My research on shellfish in British Columbia began in Kyuquot, home of the Kyuquot-Checleseht, one of fourteen reserve-based communities of the Nuu-chah-nulth First Nations on the west coast of Vancouver Island. Between 2005 and 2008, I spent three multi-month periods living there, and, through access to the Kyuquot-Checleseht band council's shellfish aquaculture business plan and community interviews about shellfish, I came to understand the diverse local uses and values of wild-growing shellfish and learned a great deal about a more recent band-owned shellfish aquaculture business. In Kyuquot, many people enjoyed harvesting wild-growing shellfish for food and participating in the commercial clam fishery; often, participation was a collective

Jamieson et al. (2001), and Zydelis et al. (2006) suggest that foreign farming structures like netting and longlines may negatively affect marine inhabitants such as foraging seabirds, spawning herring, and eelgrass populations. Greater uncertainty exists regarding the cumulative impacts of numerous shellfish farms in close proximity (e.g., regarding regional carrying capacity), but initial work suggests the potential for: alterations to planktonic communities (Jamieson et al. 2001); changes in intertidal composition, diversity, and competition (Whiteley and Bendell-Young 2007); sedimentation leading to harmful algal blooms (Bendell-Young and Ydenberg 2001); and changes in genetic structures of non-farmed populations (Miller et al. 2006). There is also evidence to suggest that shellfish aquaculture increases preferable habitat for some fish and productivity and/or water quality through nutrient cycling (Jamieson et al. 2001).

endeavour (Pinkerton and John 2008; Silver 2010). Shellfish aquaculture, on the other hand, requires that juvenile shellfish be purchased from a hatchery, carefully husbanded using special techniques/equipment, and rotationally harvested (all in tenured coastal space). Rather than being seen as a livelihood activity in which many community members engaged, this work was envisaged in the consultant-led business plan as being for two or three hired employees.

Findings from this piece of research speak to the role that collective shellfish harvesting plays in meeting human needs on the west coast of Vancouver Island and in the practice of Nuu-chah-nulth culture; they also speak to the opportunities, contradictions, and limitations of shellfish aquaculture as an economic development strategy for coastal First Nations (Silver 2010). However, they do not capture the longer history of shellfish aquaculture in British Columbia or provide an adequate perspective on the ways that this marine activity has been advanced through calculations and discourses that make particular meaning of particular shellfish species and production practices. These gaps motivated me to write this article and to adopt an assemblage approach to shellfish agency.[4]

INTRODUCTION, COLONIZATION, AND THE CALCULATION OF ECONOMIC POTENTIAL

In 1913, a few entrepreneurial residents of Vancouver Island imported a shipment of Pacific oysters from Japan to test how they would fare in local waters (Gillespie 2007). By 1925, there was a colony of these oysters at Ladysmith Harbour, and the Asian imports continued (Ketchen, Bourne, and Butler 1983). Between 1929 and 1932, approximately 4 million oyster seeds were placed in and around southern parts of Vancouver Island (ibid.). Prevailing public attitudes during the Second World War meant an end to the Japanese imports, but significant breeding populations of *C. gigas* had already spread in the Strait of Georgia (Coopers and Lybrand Consulting 1997). According to Ketchen, Bourne, and Butler (1983), the first widespread Pacific oyster-spawning event occurred in British Columbia in 1942. Spawn, sometimes referred to as "spat," was

[4] The analysis draws from my experiences on the west coast of Vancouver Island, published scientific literature and government documents about shellfish and shellfish ecology in British Columbia, testimony by advocates of shellfish aquaculture expansion before provincial and federal committees (e.g., the Standing Senate Committee on Fisheries), shellfish development reports (by consultants and/or government), and relevant images and news stories available on the internet. All data were collected between 2006 and 2012.

reported as being "extensive throughout much of the Strait and even into many bordering mainland inlets" (1111). Large events occurred once again in 1958 and 1961. Although increased water temperature seemed to be an important contributing factor, spatfall precursors and spat diffusion were yet to be well understood (Heritage, Breen, and Bourne 1976). In the Strait of Georgia, Pacific oysters often out-competed other native shellfish and became the dominant constituent in many intertidal spaces (Ketchen, Bourne, and Butler 1983). By 1930, *C. gigas* was the most voluminously harvested shellfish in the province (Gillespie 2007). By 1950, the provincial government had adopted a basic property regime. It enabled a handful of licensed shellfish growers to collect oyster spat, "set" the larvae in empty shells, and grow them out to size on specific intertidal areas.

During the 1970s, North American epicures began to show interest in raw oysters on the half shell, a shift that quickly put oysters on their way from shucked chowder ingredient to gourmet delicacy. In British Columbia, meeting new consumer demands for attractive shells and unique flavours necessitated new economic, scientific, and regulatory relations, human effort centred on securing the highest-quality juveniles, mastering husbandry techniques, and regulating intertidal tenures for individual oyster producers. In 1974, the DFO briefly expanded its spatfall forecasting program with the stated objectives of improving "the basic empirical relations used in forecasting and also discover[ing] optimal forecasting strategies" (Heritage, Breen, and Bourne 1976, 1). However, local spat collection was soon overshadowed by imported seed from the United States as hatcheries and nurseries in Washington State became an important source (Coopers and Lybrand Consulting 1997).

Also in 1974, the first submersed oyster production techniques (i.e., longlines, nets, and trays) were implemented in the nearshore just off Lasqueti Island (Clayton 2002). A sector standard today, submersed nearshore production is said to encourage oysters to grow one to two times faster (as filter feeding occurs continuously rather than only when the tide is high), tolerate higher stocking densities per area with lower mortality, and, in some cases, develop what is frequently perceived to be a more visually attractive shell and/or more mild-flavoured meat (ibid.). Taking oyster production out of the intertidal also freed up space, and, as submersed production spread, production on intertidal tenures shifted from Pacific oysters to Manila clams (Broadley, Clayton, and Roland 1988; Clayton, Broadley, and Roland 1990). Arriving mixed in with early shipments of Pacific oysters (Gillespie 2007), Manila clams were first

documented in British Columbia in 1936, also in Ladysmith harbour (Broadley, Clayton, and Roland 1988). During the 1940s, a colony was recorded in Departure Bay, and soon after Manila clams were found to have spread throughout the Strait of Georgia. On the west coast of Vancouver Island Manila clams were intentionally introduced to Barkley Sound, and, by the late 1950s, colonies were reported to exist as far north as Esperanza Inlet. By the 1970s, Manila clams were found in Quatsino Sound and in Bella Bella, and in 1988 there was a colony in Port Hardy (ibid).

Clam farming resembles agricultural monocropping in the sense that intertidal tenures are cleared of debris and other competing species and are "planted" with hatchery-reared juvenile shellfish. Co-culturing oysters and clams on adjacent tenures can help to increase volumes and values of shellfish produced. If successful, productivity gains make it possible, indeed often desirable, for farmers to acquire more growing space (Coopers and Lybrand Consulting 1997). The first sizeable harvests of farmed BC Manila clams occurred in 1984 (ARA Consulting Group, Inc. 1993), and, for a time in the early 1990s, additional intertidal clam tenures in the Strait of Georgia were limited by provincial policy concerned with maintaining public access for the subsistence, recreational, and commercial harvest of wild-growing shellfish (Clayton 2002). By 1995 this policy had been revoked, and, in the same year, the shellfish aquaculture sector produced approximately one thousand tonnes of Manila clams.

It is clear that both Pacific oysters and Manila clams were intentionally introduced to BC waters and that they spread by tides, subsequent human interventions, and as a result of their own reproductive proclivities for particular temperature and substrate conditions. Between the 1950s and the 1990s, various human scientific, regulatory, husbandry, and investment efforts coalesced to increase the volume of shellfish produced on individual tenures and, in turn, to make the product competitive in international markets. Within intertidal and nearshore areas chosen for their productivity potential and privatized as marine tenures, it is now common for farmers to modify marine habitat and to employ technology to encourage faster oyster and clam growth and to enable higher stocking densities. Permitted activities include: modification of the physical environment (e.g, beach levelling and runoff diversion), the removal of non-commercial species, and, the placement of netting, trays, and other structures.

Thus we can see that achieving profitable shellfish production on a tenure site requires more than simply adding juvenile Pacific oysters and Manila clams to longlines or intertidal substrate and waiting for them to grow. Advice to farmers on the BC Shellfish Growers Association's (2007) website cautions its members: "If there is one cardinal rule for growing shellfish in BC it is this: there is no recipe … Techniques that work well in one place may be substandard in another. Each growing site is unique and it is up to the grower to find the best means to produce oysters for any given location." From this perspective the implementation and regulation of a private property regime, and the modification of tenured intertidal and nearshore spaces by shellfish farmers, can be understood as human efforts to meet the preferences of Pacific oysters and Manila clams. Put simply, physiological proclivities specific to Pacific oysters and Manila clams matter to the ecologies, spatial structure, and operations of the shellfish sector today.

The preferences of Pacific oysters and Manila clams were also of central interest in "capability appraisals" meant to identify possible opportunities for shellfish aquaculture in regions outside of the Strait of Georgia. Beginning in the early 1990s, the provincial government funded a series of these studies to identify intertidal and nearshore spaces with the potential to support the intensive cultivation of Pacific oysters, Manila clams, and, in some instances, Pacific scallops (e.g., Axys Environmental Consulting 1997; Cross, Gormican, and Kingzett 1995; Cross and Kingzett 1992, 1993; Kingzett, Gormican, and Cross 1995a, 1995b). One-time assessments of salinity, temperature, tidal exposure, intertidal slope, and tidal depth were taken at many intertidal and nearshore spaces (sites on the west coast of Vancouver Island and the mid-northern mainland coast were significant in the earliest studies). These data allowed areas to be rated as either *high/good*, *medium*, *poor*, or *not advisable* for the shellfish in question. Maps and tables identifying yet-to-be-tenured coastal space with high suitability rankings accompanied most reports.

Beyond helping to reveal possible tenure spaces for prospective sector entrants, the inventories and ratings also underpinned the projection for a $100 million BC shellfish sector raised earlier in this article (e.g., Coopers and Lybrand Consulting 1997). Based on an assumption that 10 percent of the coastal space rated as either *high* or *medium* on the west coast of Vancouver Island would be tenured, and that ramped-up production and profitable shellfish sales would follow, the authors extrapolated that the wholesale value would be $100 million within ten

years. Although not directly calculated, the economic potential of the mainland central and north coasts were also implied in the report:

> While further work to compile figures on the total inventory of lands capable of supporting shellfish culture for the entire coast of BC would be informative, it is not felt to be necessary in order to predict the significant economic potential of the industry. Our assumptions about the expansion during the next 10 years are considerably less than the biophysical capable [*sic*] potential in the province. (Coopers and Lybrand Consulting 1997, 19)

Since 1997, the $100 million figure has anchored numerous public statements about economic potential. For example, the former executive director of the BC Shellfish Growers Association argued that shellfish aquaculture presented a highly efficient use of coastal space: "[The] BC shellfish farming industry has the potential to become a $100 million industry over the next 10 years. Currently, it is about $10 million … converting 10 per cent of the ground currently used by the wild fishery to farming will result in at least a tenfold increase in clam production – approximately equivalent to the entire present clam fishery" (Salmon 2000). Thus the traits and preferences of Pacific oysters and Manila clams were quantified and then enrolled in claims meant to "distinguish places as either appropriate or not for certain kinds of production activities" (Mansfield 2003, 329). In this sense, the capability studies, site mapping exercise, and Coopers and Lybrand Consulting (1997) calculations exemplify what Mansfield (2003, 329) describes as "translation between the biophysical world and economic systems of value and exchange." The latter quotation also provides a first illustration of how the shellfish aquaculture sector – a historically and spatially contingent assemblage of shellfish, property regulations, farmers, growing practices, and so on – is positioned as superior to one other use of intertidal space: commercial clam harvesting.

MAKING MEANING: RELATING FARMED SHELLFISH TO PRACTICES, PLACES, AND THE PAST

Backgrounded by green-tinged water and kelp-laden shellfish lines, the passage in Figure 2 asserts that shellfish aquaculture is one of "mankind's [*sic*] most sustainable industries." To resonate with wider, though arguably superficial (Braun 2002), reverence for First Nations traditional ecological knowledge and management practices, the image

and words also suggest that today's farming practices are not so far removed from the carefully managed "rock guarded clam gardens" of British Columbia's past. The pursuit of sector growth is rationalized by suggesting that shellfish farming carries forward "traditional" First Nations human-shellfish relations to the present. Of course, today's sector grows non-native shellfish species that were introduced only subsequent to European arrival. Moreover, at this juncture it remains somewhat unclear whether profitable levels of production can easily be achieved in remote communities and whether new property relations, species, and economic imperatives will remain uncontested, especially by First Nations, over the coming decades (Joyce and Satterfield 2010; Silver 2013).

It *is* clear that the expansion of shellfish aquaculture tenures necessitates vying for intertidal space(s) that demonstrate good existing potential to support shellfish growth; in many instances, potential or newly tenured sites have long been frequented by commercial and subsistence shellfish harvesters (Joyce and Canessa 2009). In this context, claims that shellfish aquaculture can yield more Pacific oysters and Manila clams per hectare than can other harvest-types help to position private tenures as a more preferable and productive use of ocean space. In 2000, for example, the former director of the BC Shellfish Growers Association suggested that the area currently under tenure was "equivalent in area to the new runway at the Vancouver International Airport" and that, therefore, "doubling that land base in the next 10 years to generate $100 million in revenue" made good economic sense (Bowman 2000). While the potential to produce higher volumes of specific shellfish commodities can be accurately interpreted as one possible advantage of private tenures and shellfish aquaculture, concluding that the proposed expansion would necessitate privatizing "a very small part of the 27,000 kilometres of coastline in British Columbia" (ibid.) moves towards the less-defensible inference that pre-existing users would quite easily be accommodated elsewhere along the coast. In another example, the statement "we produce more farmed clams than the DFO-run [commercial Manila clam] fishery" (Stevenson 2006) is followed by the suggestion that "we knew the day was coming because, of course, everyone here likes to agree that DFO mismanages" (ibid). Here we see how sweeping references can work to dramatize more precise production-based arguments made to promote tenure expansion.

Raising the vulnerability of filter-feeding shellfish to flesh contamination is another way of framing farmed shellfish as ideal constituents

of ocean space and shellfish farmers as ideal stewards of the marine environment. A past executive director of the BC Shellfish Growers Association asserted: "Maintaining water quality is certainly a priority of the industry and our association. That is why in this industry there are such good environmentalists. They are the first ones to be sensitive to any shifts or changes in water quality" (Salmon 2000). Comparable logic was employed in 2006 by the current executive director of the association: "I can tell you that we are the canary in the coalmine. If our industry doesn't thrive, it's because the water is in bad shape. Everybody knows that shellfish are positive uptakers and, in fact, are used to clean bays in other parts of the world" (Stevenson 2006). Given that contamination is an affliction that can render shellfish unfit for human consumption, maintaining coastal waterways free of certain bacterial, viral, and heavy metal contaminants is of top priority to shellfish farmers (BC Shellfish Growers Association 2009). Yet periodic assertions regarding the accumulation of marine debris lost from the structures and netted spaces that facilitate shellfish cultivation (e.g., Woo 2011) are a reminder that coastal citizens experience "sustainability" variously and that, at least at times, contestation occurs.

Suggestions that shellfish are ideal intertidal constituents and that shellfish farmers are incentivized to act as stewards and are environmentalists at heart may serve most strongly to distance the shellfish sector from the more well-known BC salmon aquaculture sector. Testimony by the executive director of the BC Shellfish Growers Association to the 2006 BC Special Legislative Committee on Sustainable Aquaculture supports this likelihood:

> Why are we being hit so hard with regulations when it is only shellfish, you say? Go figure. But I can tell you that I give talks all over the province about shellfish farming. I always like to refer to this one talk in front of the legislative buildings with all that grandiose and all the people with the cameras – CBC and whoever. Someone behind a very large camera said: "How do you guys handle escapements, anyway?" You know, I tried to keep a straight face, but shit, it was hard. (Stevenson 2006)

To this, a member of the Special Committee later responded: "You're now formally on record – it's in *Hansard* – that the oysters don't actually break out and escape, which is good too" (ibid.).

Although juvenile shellfish do have the potential to move and interact freely in coastal space, the committee member's response – that oysters

do not actually break out and escape – suggests that, in this political context, the shellfish aquaculture sector is set apart from salmon farming (especially from criticisms regarding the risks of escaped non-native species). More broadly, environmental groups and other salmon aquaculture critics do appear to regard Pacific oysters and Manila clams as more ecologically benign than Atlantic salmon.[5] While the evidence presented in this section does not fully explain how British Columbia's two main aquaculture sectors, and their key species, have come to be understood so differently, it does demonstrate the powerful revisionary potential of claims that a sector, and the entities that constitute it, are "architect[s] of, rather than an obstacle to, a greener future" (Prudham 2009, 1605).

CONCLUSION

While studying shellfish harvest practices and the adoption of shellfish aquaculture by the Kyuquot-Checleseht First Nation on the west coast of Vancouver Island, I often heard compelling assertions that shellfish farming was a culturally and environmentally ideal use of intertidal and nearshore ocean space in British Columbia. Recognizing the long-standing and complex nature of relations between humans and shellfish in the province, I was motivated to attend to the influence of Pacific oysters and Manila clams on the spaces and politics of this region. Rethinking agency and power in decentralized terms revealed the role of these shellfish in the emergence of shellfish aquaculture and in the more recent pursuit of tenure expansion. Specifically, by tracing the history of the introduction and range expansion of *C. gigas* and *V. phillippinarum* and placing it in conversation with arguments that make cultural meaning of shellfish and the shellfish sector today, this analysis demonstrates that the traits and preferences of these introduced species can be read in the regulation, ecologies, spatial organization, and promotion of today's BC shellfish aquaculture sector.

These findings complicate the notion that shellfish aquaculture is inherently environmentally or culturally preferable to other uses or users of coastal space. By demonstrating that this particular assemblage is one contingent outcome in a range of possibilities, I show that the green status and "muted" politics currently enjoyed by the shellfish sector cannot solely be attributed to harmonious ecological and political

[5] For example, the Vancouver Aquarium's *Ocean Wise* list of recommended sustainable seafood currently gives Pacific oysters and Manila clams its stamp of approval. See www.oceanwise.ca/seafood.

conditions structured or governed "from above" (Allen 2011, 155); rather, they might be more accurately understood as the contingent outcome of "tangled and cross-cutting political relationships between actors" (ibid.), including non-humans. Here we are reminded of the possibility that disease spread among farmed shellfish or the assertion of First Nations rights to intertidal space could emerge just as readily (and with negative effect) as might the successful increase of shellfish production on new tenure sites in remote communities. This is an important perspective, especially amidst conjecture regarding the sector's progress towards a $100 million wholesale value and as pressure to allow more tenures and to permit new shellfish species continues (e.g., the discussion of geoduck clams in the *Times Colonist* 2007).

Finally, I suggest that attending to non-human constituents can help to reveal outcomes or actors typically understood as sustainable or destructive, entrepreneurial or backwards, powerful or disenfranchised, and so on as contingent manifestations of much longer processes. A long view of the historical particularities of nature and a decentralized appreciation of agency and power offers us an opportunity to bring new understanding to contemporary economic activities and, possibly, to raise more incisive questions about taken-for-granted species, structures, and outcomes. Scholarship attuned to the effects and roles of non-humans in BC spaces and politics can help us think in new ways about arguments and activities that might otherwise be interpreted as uncomplicated and/or politically neutral.

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