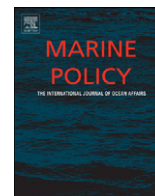




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# Cadastralizing or coordinating the clam commons: Can competing community and government visions of wild and farmed fisheries be reconciled?

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## ARTICLE INFO

### Article history:

Received 9 July 2010

Received in revised form

9 August 2010

Accepted 9 August 2010

### Keywords:

Clam aquaculture

Political ecology

Privatization

Common property theory

## ABSTRACT

This paper considers socio-political, ecological, and economic dimensions of local efforts to negotiate local control over state-sponsored development of clam aquaculture in one region of British Columbia, Canada. Aquaculture is conceptualized as a type of cadastralization, following James Scott's characterization of state efforts to make the productivity of landscapes more measurable for purposes of rent generation and taxation. The discussion invites a rethinking of community resistance to development as less about the notion of development itself than about the terms under which it occurs, since the community engages in its own form of cadastralization as a negotiating strategy. The concept of cadastralization enriches common property theory approaches to ownership and management by highlighting the key role of technological innovations in allowing global market forces to more easily penetrate local property relationships. At the same time it enables new forms of resistance and assertion of local visions of development.

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## 1. Introduction

The global economic downturn rocking world markets calls attention to the dangers of excessive use of market-based regulatory instruments for resource ownership, management, and development which have been increasingly permitted or advocated by federal and provincial governments in Canada and worldwide. In their most highly developed form, these approaches privatize access, exclusion, management, and alienation rights to a resource, relying largely on individual self-interest to produce desired economic outcomes. The case examined here concerns privatized ownership and management through the state-required adoption of standardized technologies deemed to be more productive (and thus, more generative of opportunities for taxation, rent generation, and the assumption of management costs by private parties). James Scott [1] has conceptualized the imposition of privatization through standardization by government as “cadastralization,” a seemingly irresistible path of development, governance, and ownership. At the same time, Scott himself [2], and other political ecologists in anthropology and geography [3] have also shown how cadastral approaches which ignore the specificities of local social, economic, and ecological systems continue to be challenged by aboriginal and

other communities which have competing claims and alternative visions of resource management and development. This discussion explores how these competing visions and claims have interacted at both community and regional levels in the clam fishery on the West Coast of Vancouver Island (WCVI), British Columbia, Canada. It illustrates a unique approach by communities to reconciling local and government approaches to development, one which might ultimately be successful in this context and elsewhere.

The contemporary clam fishery on the WCVI provides an ideal opportunity to examine how the struggle between competing visions has emerged and evolved. In this example the tension lies between efforts to sustain opportunities for local community-based and regional management of wild clam fisheries, and the introduction and expansion of clam farming (aquaculture) on wild clam beaches. Clam farming physically displaces wild clam diggers in some cases, while in others it may allow the same individuals to dig, but changes how and by whom a clam beach is owned and managed. Clam farming has been shown to alter the ecology of a wild clam beach [4], and thus cadastralization of clam beaches involves linked ecological, socio-political, and economic dimensions of transformation.

Resistance to clam farming on the WCVI is particularly interesting and revealing because of the sophistication of local parties who use cadastralization processes for their own purposes: to reconcile and coordinate wild and farmed clam production. To them, experimentation is also considered

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important for defining the appropriate level and pace of involvement in clam farming, for evaluating its costs and benefits, and for deciding to what extent this technology and governance arrangement are appropriate for local circumstances.

## 2. Methods

The discussion focuses on two sites, following Marcus [5]; both illustrate the nature of the different visions as well as opportunities to coordinate them: (a) one site is a WCVI aboriginal community which had developed a local sustainable clam fishery but, with persuasion, chose to replace this fishery with community-based aquaculture. As the problems with clam aquaculture become more evident, this community currently aspires to have the costs and benefits of each approach evaluated, and to consider possible combinations rather than to have one simply replace the other and (b) a second site is the regional WCVI Clam Board. This body, representing diggers and regulatory agencies, proposed mechanisms for the integrated management of wild and farmed clam fisheries on the WCVI in order to resolve conflicts among users and optimize the benefits of each.

This analysis is based on 5 months of ethnographic field work (2004–2006 by the first author, overlapping with the work of the second author 2005–2007) in one WCVI community, 30 local semi-structured interviews in that community, 25 non-local semi-structured interviews with a broad range of staff of senior government and aboriginal agencies, community-based and consulting actors conducted 2004–2009 in multiple locations on Vancouver Island and by telephone, attendance of four WCVI Clam Board meetings 2003–2004, interviews with eight of its members, and review of several WCVI communities' shellfish culture business plans. Multiple in-depth discussion of issues over a 5-year period occurred with one-fifth of those interviewed. Discussions and reviews of earlier drafts also occurred with WCVI parties involved in the building of the WCVI Aquatic Management Board ([www.westcoastaquatic.ca](http://www.westcoastaquatic.ca)), which initiated the efforts to coordinate visions and explore the benefits of shellfish aquaculture. Policy discussions with fishing communities on the WCVI and more broadly over two decades also informed this discussion [6].

## 3. Cadastralization: privatization serving government goals

James Scott's [1] definition of cadastralization is useful for analyzing the efforts of the provincial government to replace the wild fishery with farming. Scott examined how the European state in the 18th and 19th century gained control of complex local traditional property rights that had evolved over time on varied landscapes. (Below these traditional rights are equated with ones developed informally in one local clam fishery and in local planning processes). The state's first step in taking control was to produce a cadastral map of landscape by imposing a grid which reduced landscape complexity (understandable to locals, but "illegible" to the state) to uniform units of management. The second step was to impose uniform state-approved practices which were believed to be far more productive and desirable (such as monoculture forest plantations). The cadastral mapping process coupled with new regulations eliminated local customs and rights, redefining landscape as private property, thereby simplifying the formerly fuzzy boundaries and complex overlapping rights of communal property, and making property and landscape "legible" to the state. Legibility allowed the state to see complex landscapes in simple fiscal terms, to calculate how productive they were and how much rent or taxes could be

generated from them—enabling greater control and extraction of value from lands previously of unknown value.

In this case, it is argued that the creation of a system allowing private tenuring which involved farming practices being imposed on formerly wild clam beaches can be seen as cadastralization. Under the right circumstances, farming makes wild clam beaches more controllable, predictable, and abundant in their production of economically valuable species. Furthermore, the province charges an annual tenure lease and other fees to clam farmers that are substantially greater than the wild clam license fees charged by federal fisheries managers (DFO). Clam tenures convey to the tenure holder access rights to the beach, rights to exclude others from the beach, management rights (deciding when and how to plant and harvest clams, including harvestable size), and alienation rights (leases may be sub-leased or sold).<sup>1</sup> In the process, both federal and provincial governments can download onto clam farmers the costs of exclusion of poachers and testing for water quality. Water quality testing by government had been seen as one of the major cost constraints to expanding shellfish aquaculture [10].

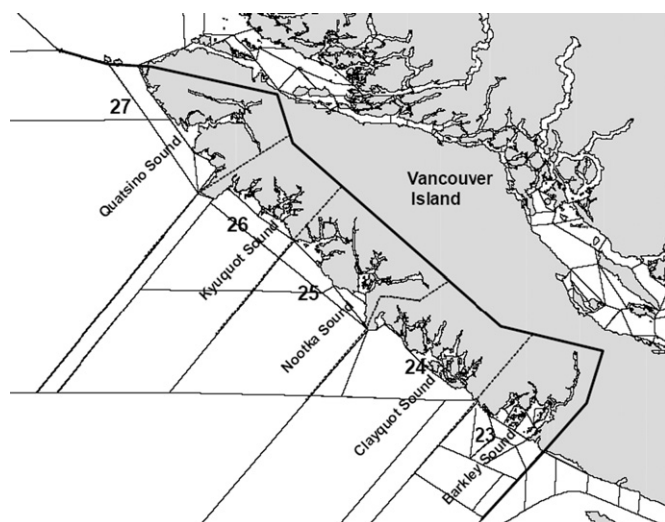
While property rights theorists [7] consider these a complete set of rights for predicting behaviour, the cadastralization concept adds an additional key dimension. Clam tenuring/farming not only redefines formerly public or communal property as private, but also radically changes management *practices and technology*. A clam tenure holder, according to the "diligent use" condition of tenuring, is required within the first 12 months to begin to strip a beach of all wild clams and plant it with seed clams. This kind of technological change creates vulnerability for clam beaches to penetration by global market forces in addition to that already created by changes in property rights in that the ecological system is modified to suit capital over the long term. As noted by Suryanata and Umamoto [11]: "...aquacultural development represents a major breakthrough because it allows industrial capital to regulate the conditions of production. Key in this process is the ability of industry to substitute labor, technology, and capital for some of the natural processes necessary in the production of fish and shellfish...It gives the industry flexibility in distributing production, temporally as well as spatially, to provide a best fit to a global pattern of resource availability and market demand." As is shown below, alienation rights and the adoption of global technologies *together* lead non-local aquaculturists to consider local social and ecological conditions irrelevant, as they now have the right and ability to buy, lease, and produce anywhere.

While cadastralizing policies have frequently been employed in terrestrial settings, the push for cadastralization of coastal resources is more recent. Many countries have only just begun to pursue non-traditional nearshore and offshore industrial developments in sectors such as aquaculture and energy development or carbon sequestration [12].

## 4. Wild Clam Fishery Management: the role of the WCVI Clam Board

Although the federal Department of Fisheries and Oceans (DFO) began managing the clam fishery in 1951 through mandatory catch reporting, the only management measures in

<sup>1</sup> See Schlager and Ostrom [7] for a discussion of this hierarchy of rights. The alienation rights conferred by clam tenures was a major concern on the mainland central and north coast, where aboriginal communities proved hostile to shellfish aquaculture [8]. For example, the Kwakwaka'wakw on northeast Vancouver Island have successfully refused all proposals to move towards tenuring clam beaches in their territories. One of their concerns is the potential for ownership of local tenures to end up in non-local hands, a pattern that they witnessed with salmon farming tenures in the area [9].



**Fig. 1.** Clam management Area F, including sub-areas 23–27. Areas 23–26 are Nuu-chah-nulth traditional territory.

place until the 1980s were size restrictions and closures due to contamination or paralytic shellfish poisoning. On the WCVI, the main commercial clam fishery targeting Manila clams (*Tapes philippinarum*) was quite small until the 1980s. A rise in market demand and prices culminated in 1988 with landings exceeding 800 metric tons, followed by a rapid decline.

In 1989 DFO responded by implementing area licensing (the WCVI became Area F as shown in Fig. 1) and finally in 1997 announced a comprehensive Clam Reform package involving: limited entry licensing, regional management boards, Aboriginal (individual) Commercial Licenses, aboriginal communal commercial licenses on beaches fronting aboriginal reserves (areas for exclusive aboriginal use), and increased clam aquaculture opportunities. The measures in this package responded to pressures for the empowerment of local and regional management bodies, as well as pressures from the province and the shellfish industry to expand shellfish aquaculture from the more polluted waters on southern BC to cleaner waters further north. This discussion examines the playing out of these pressures on what was by 2007 a \$15 million industry in BC (wild and farmed combined).

In the wild clam fishery, DFO struggled with mechanisms to manage sustainably. Even with limited entry and area licensing, the areas within which diggers were licensed to fish (about 3/4 of the WCVI, 310 km of coastline) were large enough to allow one sub-area or even particular beaches to be overused. One of the new regional boards that the 1997 Clam Reform called for was the Area F (WCVI) Clam Board<sup>2</sup> [13]. Formally enacted in 1998, the Clam Board was empowered to set the overall harvest limit for each of its five sub-areas (see Fig. 1) based on historical harvest, and anecdotal discussion of current and possible future changes in productivity, but with little or no stock abundance data. The only direct harvest regulatory mechanisms at its disposal were the number of days digging in each sub-area and the DFO-set legal size limit of harvestable clams. However, the Clam Board was to play a key role both in supporting communal wild clam management in one community, and in advocating the coordination of wild and farmed clam management.

<sup>2</sup> The WCVI (Area F) Clam Board is composed of licensed clam digger representatives from the five WCVI sub-areas (all of which are Nuu-chah-nulth except for the northernmost, which is Kwakwaka'wakw), the Nuu-chah-nulth Tribal Council, the BC Shellfish Growers Association, processors, DFO, and BC Ministry of Land and Water). Nuu-chah-nulth diggers hold ca. 80% of the 333 commercial clam licenses on the WCVI.

## 5. Wild and Farmed Clam Management in one WCVI Community

A unique feature of the 1997 DFO Clam Reform was the potential that it created for aboriginal communities to apply for a commercial communal clam license on beaches fronting their reserves. Receiving the communal license stipulated a stock assessment (an inventory of mature and immature clams), an agreement with DFO on a target sustainable harvest rate (and resulting quota), and management of the “when and who” of harvest by the community. If the beach tested as contaminated, a partnership with a licensed depuration facility was also required so that clams could purge themselves of harmful bacteria and viruses before final retail sale. Arguably, these measures constituted a considerable advance toward sustainable management and the communal licenses offered significant opportunities for local involvement in management and resource development.

The WCVI Clam Board supported the creation of two quite successful communal commercial clam licenses in the traditional territory of the Kyuquot and Checklesheht people who live in the community of Kyuquot in Kyuquot Sound/Checklesheht Bay (Area 26 in Fig. 1). They are the most northern of the 14 Nuu-chah-nulth nations whose territory encompasses most of the WCVI.

The Kyuquot-Checklesheht fisheries management authority sustainably managed the clam fishery on these two communally licensed beaches (9.8 ha total) for 4–5 years, 1999–2004, achieving a stable harvest at a precautionary rate which increased clam abundance on these beaches. The communal licenses allowed the local authority to: (1) exclude outsiders, (2) regulate the number of community members who dug clams during any one 3–4 days harvest period, (3) regulate the intensity of the harvest by monitoring the number of sacks dug and the activity of each digger, (4) monitor quality standards (mud and gravel in sacks) and orderliness of sale to processor-buyers, (5) set harvest and allocation rules in bi-annual meetings with diggers, (6) enforce compliance with rules through threat to revoke license and public exposure, (7) protect beach habitat through education about leaving batteries and trash on beach, proper disposal of engine oil, (8) monitor water quality [14]. This example illustrates that it was possible to regulate a wild clam fishery effectively when political arrangements and local capacity permitted it.<sup>3</sup> Indeed, such rotational cropping of shellfish populations within collective forms of restraint where people assert their right to develop at their own pace has been documented worldwide [15].

However, the community-managed wild clam beaches under the federal DFO communal license were upstaged by new provincial efforts and funding to turn wild clam beaches into farms (clam aquaculture) through tenuring (leasing) beaches from the province. As excitement about the potential of clam aquaculture grew, and as Treaty-Related Measures<sup>4</sup> start-up funding was made available to apply for tenures and to train and pay salaries for the first 2 years, the community was persuaded to tenure these same two productive beaches with well-developed standing stock. In other words, the community

<sup>3</sup> These conditions are most evident in the most northern sub-areas, while the two southern sub-areas have to contend with greater competition among both aboriginal groups and other users for access to clam beaches. The conditions of aboriginal communal tenuring required that a clam beach be sufficiently large to make a commercial communal license attractive, but not so important in the sub-area that there is major use by parties other than the aboriginal group whose reserve it fronts. An application for a communal license in the more populated southernmost area was rejected by DFO on these grounds, causing the community to apply for an aquaculture license as their only means of reserving the beach for themselves.

<sup>4</sup> A Treaty-Related Measure is without prejudice to aboriginal rights and treaty negotiation, but is assumed to point in the direction treaties intend to go.

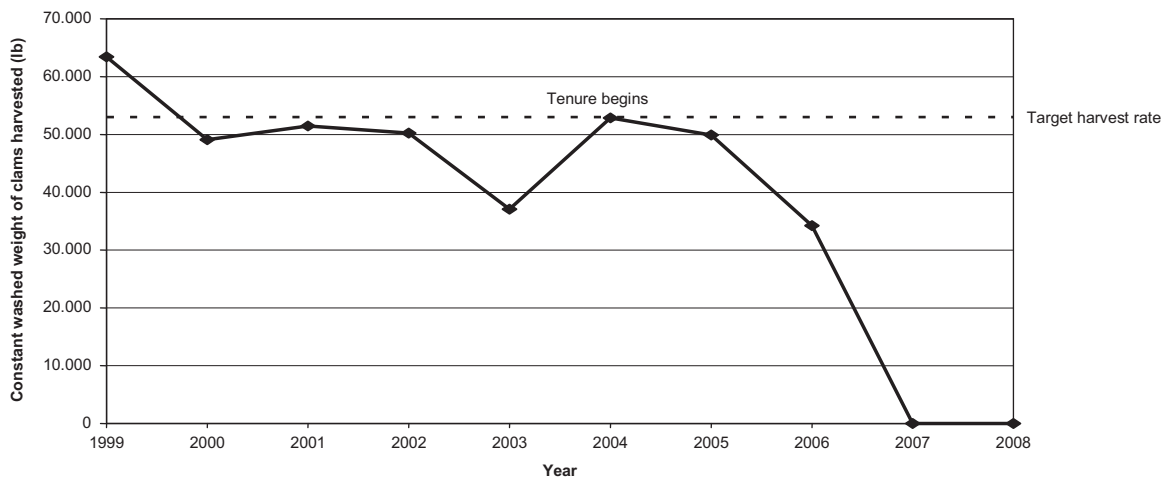


Fig. 2. Malksope beach clam harvests by weight (1999–2008).

Source: DFO, British Columbia Ministry of Lands and Water BC, sales data from Kyuquot-Checklesheht Band office and from buyer.

traded their well-functioning communal license system for a private tenure system based on the hope that (a) their wild clam beaches would become even more productive and wealth-generating as clam farms and that (b) they could redefine clam tenures as *de facto* communal property and continue to manage them much as before. That is, while the legal structures governing the tenure would operate like private property, the internal arrangements for managing and sharing access to the tenure would continue to operate according to community norms of equitable access and transparent and accountable management decisions, even if these decisions were made by a designate instead of a collective. Both these hopes turned out to create greater challenges than anticipated, however, as they involved adopting both new technology (stripping parts of the beach, seeding, netting, etc.) and also new managers.

The community initially expected to be able to rotate the harvest around the farmed beach and still operate it sustainably. The community did not adopt some standard clam aquaculture practices such as the radical removal of rocks containing barnacles, practices which Bendell-Young [4] believed would reduce the biodiversity of the beach and disturb food webs, as discussed below. Figs. 2 and 3 show that the results have been mixed, with Malksope Beach showing a relatively constant harvest (based on a sustainable harvest rate) for 2 years after tenure began, and Cachalot Beach, which is closer to the community and adjacent to an operating deepwater tenure, showing 3 years of harvests greatly exceeding the target sustainable harvest rate after the tenure began.

It is not yet known whether experimental seeding on both beaches was successful, and there has been no harvesting 2007–2009. As the problems with aquaculture become more evident, this community aspires to have the costs and benefits of each approach evaluated, and to consider possible combinations rather than to have one simply replace the other. Although the community cannot afford the part-time aquaculture business specialist it needs, it has had some access to local aquaculturists who have helped explore options for water quality testing and seeding, in the hope that community investments in boats and deepwater infrastructure established with the start-up funding may be recouped.

Ultimately, the limited success in managing the tenures as if they were communal licenses was affected by several factors: technological problems with fouled predator nets, management problems with clam diggers not following the rules developed earlier permitting a sustainable harvest (or rules not being clear), management problems retaining trained staff to work on the tenures, and new managers of the tenure less experienced in

harvest management. Despite an initial subsidy, the community is not yet able to repay its start-up loan because the benefits of clam farming have been far less than predicted. However, it is argued below that a number of overriding factors accounting for this shortfall are structural in nature, such that success would have been difficult even without technological and managerial problems. In order to explore these structural issues, it is necessary to consider the rationale for government shellfish aquaculture policy alongside community views of the clam fishery.

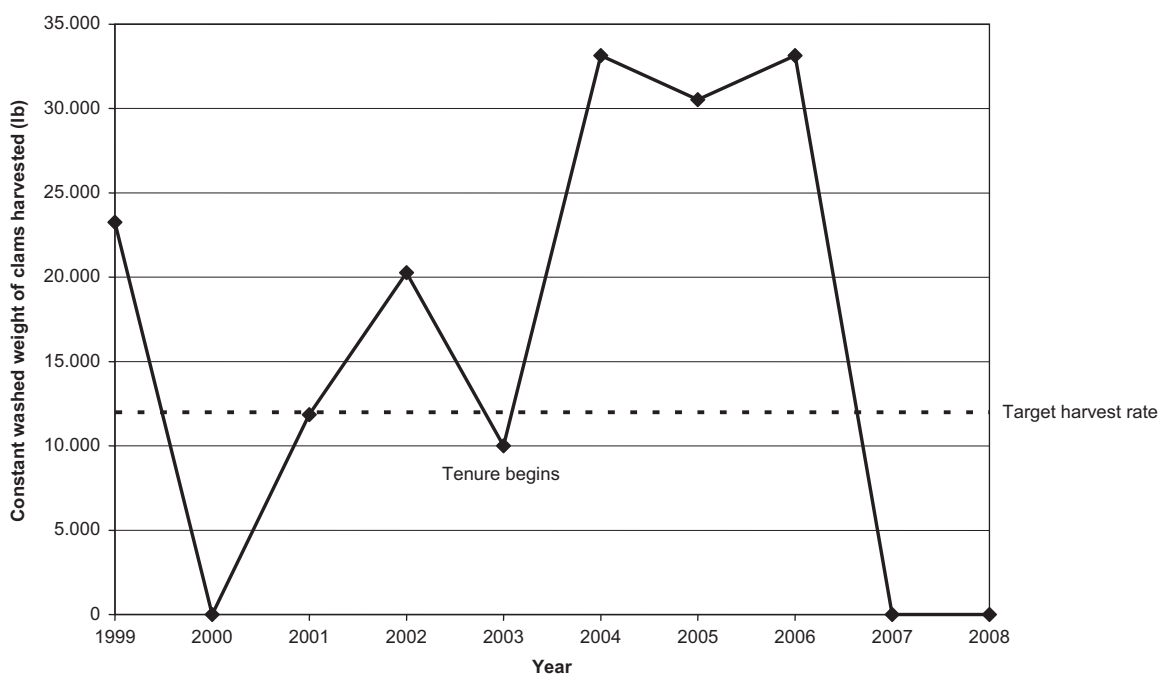
## 6. “Clams are the last fishery that belongs to us”: local views of government policy

WCVI residents think of clam management in the context of the other fisheries which once sustained their communities. Kyuquot is typical of isolated rural communities on the BC coast in that commercial access rights to most other fisheries have been either severely diminished or completely lost, so that clams are considered “the last fishery that belongs to us.” The clam fishery has remained the only fishery which provides a reliable source of winter income, and employment opportunities which are spread widely in the community, to men and women, youths and elders.<sup>5</sup>

A major reason cited in consultants’ reports and government policy documents for why aboriginal communities should become involved in shellfish aquaculture was that wild fish stocks had become depleted and so rural communities had little opportunity to access marine resources [16]. This characterization of the situation masks the fact that the lack of access by rural communities to marine resources resulted not principally from stock collapses (although some fisheries are indeed much smaller than they were historically), but rather from decades of federal policy resulting in the concentration of access rights in the hands of fewer users, ones not resident in rural communities, ones with more access to capital, including multinational fish processing companies [17].

These “fleet rationalization” policies initially took the form of license limitation programs, area management, and vessel regulations in the 1960–1990s, programs which had the effect of greatly reducing the small vessel fleet which tended to fish locally out of

<sup>5</sup> Top producers can make nearly \$1000 per night when prices are good, half that amount during low prices. However, overall average annual income per license was \$2685 in 1998–1999 [13], demonstrating that the clam fishery has the potential to support a wide range of producers from elders to youth, and be a truly community-based fishery.



**Fig. 3.** Cachalot beach clam harvests by weight (1999–2008).

Source: DFO, British Columbia Ministry of Lands and Water, sales data from Kyuquot- Checkleseht Band office and from buyer.

rural communities. The second wave, based on creating Individual Transferable Quotas (ITQs), began in the 1980s and likewise impacted rural and aboriginal communities most severely. There are no ITQ holders among the Nuu-chah-nulth, who formerly fished many species now managed under ITQs, although a few ITQs have been purchased through government programs.

Both types of fleet rationalization policy – license limitation and ITQs – have been perceived by the Nuu-chah-nulth and their neighboring rural communities as government privatization scenarios which have alienated commercial fishing rights from them, transferring these instead to other users, usually resident outside their territory [17].<sup>6</sup> However, these types of privatization were not as transformative as cadastralization, because they involved only access rights and minor management rights, in contrast to the more powerful exclusion, management, and alienation rights exercised when beaches and sea space are held as long-term tenure. They also do not involve major changes in resource production and extraction technology, a central feature of cadastralization.

### 7. “Community development” through clam aquaculture: federal and provincial visions

High clam demand and prices in the late 1980s led both to overexploitation of wild clams and to experiments in clam aquaculture. In 1984 DFO had been declared lead federal agency for aquaculture, but by 1988, Memoranda of Understanding were signed in most provinces in which the federal government retained the protection/conservation mandate for wild stocks and sanitation, while the provinces controlled licensing, practices, size and location of aquaculture enterprises [8].<sup>7</sup>

<sup>6</sup> The Nuu-chah-nulth launched a court case in 2005 against the federal government for loss of access to their traditional fisheries. The judgment in this case (2009), now under appeal, affirmed their right to fish for clams.

<sup>7</sup> In February 2009 the B.C. Supreme Court ruled [18] that aquaculture falls under exclusive federal jurisdiction, thus striking down substantial portions of the provincial regulatory regime governing aquaculture. DFO was given 1 year to develop aquaculture regulations, capacity to regulate, and coordination with the

In the early 1990s the province of BC faced a situation in which one-third of coastal areas classified as “good” for shellfish aquaculture had been closed for the preceding 40 years due to real or suspected contamination and the lack of capacity to test water quality. The province of BC commissioned a 1997 study by Coopers–Lybrand which became the basis for launching their Shellfish Development Initiative for rural coastal communities in 1998. This initiative extended an existing program to the WCVI and northern Vancouver Island by making additional areas available for tenure. Several federal and provincial agencies commissioned studies and put out policies strongly endorsing shellfish aquaculture as a development strategy for aboriginal communities [19]. BC allocated 800 ha of new shellfish growing area, reserving 500 for tenures to support aboriginal ventures. The industry was heavily promoted and subsidized by federal and provincial governments as a tool for economic growth [8].

The rationale for the strategy described above is remarkably similar across all the government agencies, consisting of the following elements: (1) the wild stocks have been overfished and it is beneficial for pressure to be removed from them; (2) clam farming is far more productive and profitable than wild clam fisheries; (3) clam farming (and other forms of shellfish aquaculture) are compatible with aboriginal values and life style; (4) there are low financial and ecological risks in converting wild beaches to farms. As illustrated below, it is equally remarkable that these claims are either unfounded or greatly exaggerated (see also [20]).

### 8. Claims about clam aquaculture vs. local social and ecological conditions

This section explores the relationship between cadastralization, local social and ecological conditions, and local visions of

(footnote continued)

province. In January 2010, the court extended this deadline and declared that the province also retained jurisdiction over shellfish tenures. The ambiguity about how clam tenures will be regulated is currently under discussion.

development. Further, it considers to what extent aboriginal and local social and ecological conditions are included or ignored in analyses of the feasibility of clam aquaculture on the WCVI by industry and the state. It will show how the data and perspectives *excluded* from shellfish business plans overseen by industry consultants on behalf of WCVI aboriginal communities reflect the same rationale and assumptions of government agencies, allowing the ignoring of relevant attributes of natural and social systems at the local scale. The use of the four government/industry claims or assumptions is considered to be evidence of cadastralization at work.

### 8.1. *The wild stocks are overfished and it is beneficial for pressure to be removed from them*

“With drastic declines in salmon and other fish populations along coastal BC, the leaders of the XX Nation are seeking meaningful alternatives to sustain their communities”. “During the past 30 years, virtually all aquatic resources that once supported Nuu-chah-nulth people have been reduced to a fraction of their historic abundance.”<sup>8</sup> In addition to the claim expressed in the preceding two sentences that clam farming is the only option left for aboriginal people because other *species* have been decimated (rather than reallocated to non-locals, as discussed above), the claim is also made that wild *clam* populations benefit from clam farms, because pressure to harvest wild clams is thereby lowered. One business plan states: “The introduction of Manila clam culture technology in the early 1980s has taken the pressure off the wild fishery, which was in decline.”

However, the opposite is more likely to be the case, given that making a wild clam beach into a farm disrupts wild clam production where a variety of clam species are the norm, versus the monocropping of Manila clams. Further, tenuring a beach makes it unavailable for harvest by wild clam licensees. The initial provincial policy of tenuring less productive wild beaches was soon replaced by a focus on tenuring the most productive wild beaches ([21, interviews]). One interviewee reported that “When pushing for us to tenure the beaches here, the province seemed to be interested *only* in beaches fronting reserves.” These beaches were widely believed to be the most productive wild beaches because aboriginal people had chosen reserves upland from them. This suggests that farmed production, rather than being intrinsically greater than wild production, is subject to the same environmental constraints and opportunities. Province-wide, it appears likely that at least some of the growth of farmed clam production happens at the expense of wild clam production. As shown in Fig. 4, the wild clam harvest has shown a decreasing trend as the farmed clam harvest has increased.

### 8.2. *Clam farming is far more productive and profitable than wild clam fisheries*

Studies have indeed found that farming clams can increase the productivity of a wild clam beach (most notably by the regular seeding of beaches), but there is considerable variance in claims about the extent of increase, which is context-dependent. For example, studies in Washington State, and the East Coast of Vancouver Island involved warmer and more stable growing conditions than the WCVI. A respected senior provincial government clam scientist summarized the literature by stating that productivity increases vary from 1 to 10 times more productive, because productivity is affected by the “predator profile” of a

beach (the presence of species that eat clams, such as starfish, crabs, moon snails, sea otters, waterfowl), the carrying capacity of the site, its suitability for certain techniques like seeding, the size of clams when planted, etc. [22]. A respected senior federal government clam scientist emphasized that clam mortality ranges from 25% to 75% in a given year, and that Manila clams are very susceptible to freezing in winter, especially if low tides coincide with cold weather and winds. Unsuccessful clam reproduction may be caused by: lack of spawning, low temperatures slowing larval development, currents washing larvae out to sea, etc. Some of these conditions can be improved by planting and some cannot, so productivity depends on what is affecting the beaches.

As a result of all of these factors, the WCVI can experience considerable variation in wild (and cultured) clam productivity on a site-by-site and year-by-year basis. Considering these variables together suggests that there is no guarantee that seed clams planted on a particular beach will reach maturity. However, government reports and shellfish business plans used far more optimistic projections of abundance increases and did not consider either temporally or geographically varying conditions. Plans based their assumptions on “accepted industry standards... for production levels, schedules, costs, and revenues” or “industry experience, technical information from publications, discussion with industry leaders, accepted industry-based information regarding expected growth, survival, and production volumes and values.” For example, one plan cited literature claiming farmed productivity could be 20 times higher than wild, double the most optimistic estimate of the senior provincial clam scientist. Several other assumptions in one business plan had obviously not been discussed with this community’s fisheries manager who believed, for example, that clams in this area reached maturity in 5–7 years depending on the site. The business plan assumed 3–4 years for maturation. Similarly, clam prices were assumed to remain high or rise (but they actually declined); transportation costs were not factored into projections; distance from markets was inaccurately represented; the distance from communities of growing sites which may require costly frequent trips by boat to maintain was not considered; and the lack of water quality and product testing facilities and hydro power was not identified as a challenge, despite Gislason’s [23] finding that these were necessary for successful beach culture. In sum, costs of clam farming were greatly underestimated, and benefits were greatly overestimated, so that whatever realistic difference there might be in productivity and profitability of farmed clams over wild *in this area* would be difficult to determine from the evidence presented.

### 8.3. *Clam farming is compatible with aboriginal values and lifestyle*

As a Nuu-chah-nulth biologist noted, “what matters most to these communities is to have regular digging opportunity every year. It doesn’t work to take it all and then wait 5–7 years. The price is less important than the regular opportunity.” Yet the assumption was made in business plans that aboriginal hunting and gathering traditions of harvesting moderate amounts when nature provides were compatible with farming traditions of meticulous attention to every stage of growth, followed by taking everything. The necessity of frequent or even daily maintenance of sites (to keep clam predator nets free of algae, and to maintain attached deepwater shellfish culture sites) was especially onerous and expensive when the community was a half hour boat trip away from the growing site, which was often the case on the WCVI. A rule for successful aquaculture often cited in interviews was that “to work, it has to be either large-scale or a ‘mom and pop’ living on the site,” i.e., daily detailed procedures and human

<sup>8</sup> From the shellfish business plan of one WCVI community which wishes to remain anonymous.

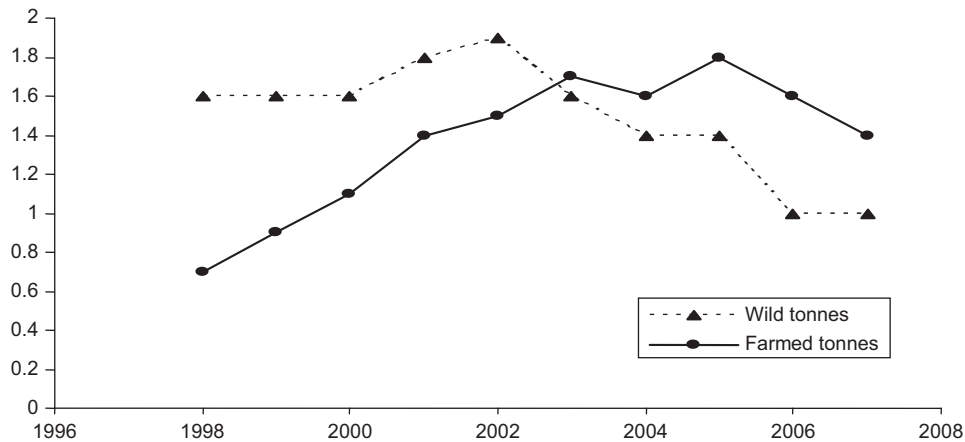


Fig. 4. Farmed and wild clam production by weight (,000): 1998–2007.

Source: BC Ministry of Environment.

presence to discourage predators and poachers. Many interviewees identified these factors as a significant problem in their community's operations. This is not to say that aquaculture is or is not compatible with aboriginal community economic development strategies. It is rather to say that promoting it as such greatly underestimates and/or under-values the other (and sometimes conflicting) subsistence and cultural values reflected in patterns of wild shellfish harvesting on the WCVI. As noted by Peters [24], the separation of tenure or property from their social, cultural, and political-economic matrices tends to produce incomplete understanding of what drives local actions.

#### 8.4. There are low financial and ecological risks in the conversion of wild beaches to farms

The business plans did not acknowledge the high risk and new knowledge nature of an enterprise whose parameters are very site specific, making generalization from other situations tenuous. The financial outlay in applying for and maintaining a clam tenure was substantial.<sup>9</sup> The additional cost of seed, predator netting, and water quality testing put the cost of clam farming beyond the reach of most communities without substantial start-up funding. The WCVI aboriginal communities did receive start-up funding for tenure development and staff training, but most operations have not yet become financially viable, given additional related debts incurred.

Ecological risks of clam farming are more difficult to assess. So far there are no known introduced diseases in BC in farmed Manila clams and clam farming does not require either feeding or medical/chemical treatments, as is the case in finfish aquaculture. Concerns have been raised about simplification of beaches, loss of biodiversity, and its potential affect on nutrient and oxygen cycling, because standard industry best practices are to remove blue mussels and barnacles that engineer benthic–pelagic coupling, possibly reducing flow of nutrients to benthic communities [4]. It is not clear how much the re-introduced sea otter, which appears to be an active predator on some beaches, or the invasive European green crab, are affecting clam abundance.

But perhaps the most compelling evidence of cadastralization at work is the section of one of the business plans which, rather than

acknowledging the risks and uncertainties related to all four issues discussed above, states that “the most significant risk identified is identification and securing of water-based tenures. Tenure access has been the limiting factor in the industry for over 10 years.” This business plan thus views risk and uncertainty from the perspective of government and the shellfish industry which is seeking new territory for expansion rather than from the perspective of the local community which is supposed to be the main (or at least an important) beneficiary of the plan. Equally significant, it does not consider that the characteristics of natural or human systems matter. The cadastralization paradigm of the provincial government (a paradigm shared by the shellfish industry seeking expansion opportunities), that converting wild clam beaches to farmed is unquestionably the desirable route, apparently informed this writing, creating a powerful and convincing “development narrative” [25]. As a result, the social, economic, and ecological conditions on the WCVI were not appropriately considered as Nuu-chah-nulth communities made their initial forays into clam farming. Thus, information which might have moderated or contradicted projections about levels of productivity, cost/benefit ratios, cultural compatibility, and the impact of farming on beaches was either not sought or was ignored. Cadastralization concerns (pursuit of new space for shellfish tenures) trumped comprehensive investigation and reinforced the “risk society” characteristics evident in the disembedded nature of the business plans’ analyses, which promoted neither diversity nor resilience ([26], after [27]; see also [21]).

Of course, rural communities are deeply concerned about world markets and wish to participate in development. But they are equally concerned with sustainable local livelihoods, and want development on terms that work for them, having suffered a long history of these concerns being ignored by senior governments [28]. Evidence from other cases suggests that communities can contain negative ecological and social impacts of shellfish aquaculture when they have substantial influence on fundamental decisions about development [29], especially when development is driven by community-based conservation [30]. The last section considers the attempts by the Clam Board to address these concerns by reconciling governmental cadastralization with its own vision of development.

## 9. The WCVI Clam Board attempts to reconcile wild and cultured clams

This account of the sustainability of a locally managed wild clam harvest in one community illustrates ways that harvest management can be adapted to local conditions. Simultaneously,

<sup>9</sup> Application fees of \$5150 (until reduced to \$1510 in 2007), an annual rent fee based on 5% of land value (which equaled \$285.50/ha in 2008) with 50% reduction in the first 5 years, a \$1000 performance bond, annual mandatory public liability insurance for \$2 million, and the cost of Canadian Environmental Assessment Agency review for attached deepwater tenures (estimated at \$20–30,000).

the discourse that senior governments and industry insiders were using to promote the viability and potential contributions of clam farming to aboriginal communities reveals that substantial pressure to develop clam farming was applied during the 1990s and 2000s. However, despite the proliferation of new shellfish tenures in various parts of the province [21], opposition and resistance to the expansion of clam farming, and concern regarding the implications it might have for the wild clam harvest, did exist. Resistance was evident in desires to experiment with clam farming on a small scale, to prevent the wholesale conversion of wild beaches to farms, and to reconcile visions for the wild harvest and aquaculture expansion.

One of the most important mechanisms used by the WCVI Clam Board to assert a local vision of development in the face of provincial pressure for clam aquaculture was the “Clam Reconciliation Project”. Their discussion of how to experiment with aquaculture while protecting critical wild harvesting opportunities first arose in the three Aquaculture Steering Committees convened by the Regional Aquatic Management Society (RAMS) on the WCVI to work with the province to develop aquaculture policy for the WCVI. RAMS and its predecessor organizations had worked for 5 years at that point to form a WCVI Aquatic Management Board to bring together all stakeholders to co-manage the WCVI fisheries.

In 1999 RAMS was in negotiation with the province over forming this board, and had reached agreement on a joint policy framework and provincial policy commitments, with which the aquaculture committees needed to be consistent. Decisions to engage the province in these discussions demonstrate that these committees and aboriginal communities felt they had some power to enact their own vision of development, and indeed the high level of civic engagement and intense economic development activity fuelled by a \$1 million RAMS budget appeared to justify that belief.

The earliest aquaculture committee formed in 1999 and, by working with the Nuuchah-nulth Tribal Council, determined that Treaty Related Measures needed to be negotiated before aquaculture could proceed. While aboriginal communities negotiated Treaty Related Measures for the terms under which they would engage in aquaculture, the aquaculture steering committees developed community criteria for the province’s application process, applied the criteria in each area, and adjudicated the first round of tenure applications. The northernmost committee which met 2000–2002 decided, for example, to set a conservative rate of development, allowing only so many applications of a certain size, in order to achieve what they felt was a general compatibility with ecosystem sustainability and other uses in the vicinity. They identified broad areas where shellfish aquaculture would be suitable, may be suitable, or unsuitable. The province was not happy with the conservative rate of development this committee advocated, but did largely follow the committee’s recommendation during the first round of applications. Concerns over how to coordinate the existing wild clam fishery with new tenure applications emerged from committee discussions and from aboriginal communities, and became an issue which was brought to the WCVI Clam Board.

Some areas of the WCVI suffered local conflict when any party, even an aboriginal community, applied for clam tenures on the most productive beaches. For example, diggers threatened to dig illegally on the tenured beaches where they had dug historically, and from which they were now excluded. Those whose former digging opportunity was being displaced by the private tenures demanded that the Clam Board find ways to compensate them for lost opportunity.

The Clam Board identified the need to find a way to establish (1) where clam farming should be allowed, (2) how many wild clam licenses would be displaced by any particular farm, and (3) how the displaced licensees should be compensated (bought out). It established a rating system for Essential Beaches (which it believed

should not be alienated from the wild clam fishery due to their importance), Class A, B, and C beaches, the carrying capacity of each, and thus how many diggers would be displaced if a beach in a particular category were tenured. It also considered ways within this arrangement to allow and regulate the transfer of local clam licenses.

The Clam Board developed four options for reconciling wild and farmed clam fisheries and reached a reasonable degree of internal consensus. Seven members of the Clam Board traveled to the east coast to Vancouver Island to meet with a senior provincial official in early 2002 to present its reconciliation proposal and request that the province not approve any more beach tenures until tensions with the wild clam fishery on the WCVI had been addressed. The province committed to delay approvals temporarily, but stated that it required support of the proposal from all interests, including the BC Shellfish Growers Association.

This support was not forthcoming and the province was therefore unwilling to support the reconciliation proposal. DFO expressed some moral support but took no financial responsibility.<sup>10</sup> However, the province continued to approve tenures after a brief hiatus, and the reconciliation proposal was not adopted. Government’s vision of development continues to trump community-based visions, despite the Clam Board’s willingness to accommodate the requirements of cadastralization by mapping and classifying its own beaches and developing formulas for exchange of rights, thus making territory increasingly legible to the state. It is notable that the Clam Board and the aboriginal communities had enough confidence in their power that they were willing to risk the proposition being offered by the province: that their beaches would be tenured under provincial law and thus leases could potentially be sold.

The refusal of senior governments to respond substantively to the Clam Board’s reconciliation proposal left serious problems unaddressed. Poaching on clam tenures continues to be a problem, fuelled in part by resentment about the failure of governments to respond adequately to reconciliation attempts. One Clam Board member concluded, however, that the major blockage to getting provincial and federal support for reconciliation is the lack of an MOU forcing jurisdictional interaction between the two levels of government. He speculates that there is more openness now, given that clam farm production on the WCVI has fallen far short of predictions, and that the courts have declared that DFO does not have the authority to delegate aquaculture to the province (and must work out some form of power sharing with the province: see footnote 7). In other words, some learning may be occurring which would facilitate the future coordination of wild and farmed clam production.

## 10. Conclusion

This discussion examined incompatibilities between the market-based cadastralization paradigm held by the province of British Columbia for the ownership, management, and development of clam beaches, and the community-based paradigm held by many

<sup>10</sup> DFO did not accept the notion that it had some financial responsibility to buy back clam licenses which would have no value if wild beaches were no longer available, and felt that it was mostly the province which had this responsibility. (The reconciliation proposal contained a formula for the number of licenses which should be bought back in relation to the number and class of beaches which were tenured.) DFO did, however, affirm that it “recognizes the needs of all users and supports the idea of beach classification and the maintenance of ‘essential’ beaches. The Department is prepared to discuss and promote this concept on your behalf with provincial authorities. In terms of addressing displacement, the Department is willing to give further consideration to proposals that reduce participation within existing policy” (DFO Regional Director General in a letter to the Clam Board February 13, 2003).

aboriginal and coastal communities on the WCVI at the local and regional level. Examining these incompatibilities served three goals.

First, conceptualizing the imposition of the provincial paradigm as cadastralization allowed the identification of key elements of this market-based paradigm: (a) *ownership*: private parties gain access, exclusion, management, and alienation rights to a former common pool resource; (b) *management*: landscape is ecologically simplified and greater rent is extracted by government; (c) *technological change*: the required commitment to aquaculture technology, together with this new form of ownership, allows global market forces to more easily penetrate local property relationships. The concept of cadastralization enriches common property theory approaches to ownership and management by highlighting how these three aspects are mutually reinforcing. Together they produce higher ecological, economic, and ownership risks to communities which increase the likelihood that they will lose access and management rights.

Second, an analysis of the assumptions of government reports and business plans compared to local social and ecological conditions revealed that the ideological commitment to aquaculture led to an unrealistic assessment of risks, benefits, and costs, creating difficulties for communities in financial planning and in providing clam access to community members in a regular and sustainable manner. This situation could be considered a good example of the “risk society” tendency to disembled planning from the social and ecological characteristics of local environments, hence reducing their diversity and resilience.

Third, by examining the response of regional aquaculture committees, a regional Clam Board, and a local community to the cadastralization efforts of the province, this discussion has illustrated how WCVI communities at the local and regional level had the foresight to re-embed development planning into local realities. They distinguished the elements of cadastralization that had the potential to be compatible with their own visions of development, if more control over the speed of and rules for the introduction of these elements were to be relinquished. The findings suggests that some aboriginal communities may wish to work within the cadastralization agenda of the province, while simultaneously asserting their own visions for a more diversified and resilient utilization of landscape. This could include experimentation with clam farming, and other shellfish species, while maintaining specific wild clam beaches that have been the mainstay of their remaining fisheries.

Thus the WCVI clam story is not simply another government control vs. community resistance drama. It is instead a story of attempted negotiation, accommodation, and experimentation, of communities working to find their way as they build capacity and as the ecological situation becomes clearer. As the Clam Board renews itself and as the province and DFO review jurisdiction over aquaculture under a court order, this discussion suggests that it is possible for competing community and government visions of wild and farmed fisheries to be reconciled through, for example, a revisiting of the reconciliation proposal of the WCVI Clam Board. This case exemplifies a path for communities and regions to use one of the aspects of cadastralization – making landscape more visible to the state – to assert a local vision of development and thus maintain flexibility and resilience as they progress at their own rate and on their own terms.

## Acknowledgements

The support of the Social Sciences and Humanities Research Council of Canada is gratefully acknowledged, as well as the help of Leonard John, Josie Osborne, Tom Pater, Robert Gunn, Melanie Wiber, Gene Anderson, Charlie Fisher, and a senior government

manager who wishes to remain anonymous in reviewing the paper, and Andrew Day and Roger Dunlop for reviewing Section 9. Special thanks for the hospitality and good counsel of Natalie Jack, for the advice of Kevin Head, for the hospitality of Jeff Rockwell, and for conversations about parts of this paper with the Kyuquot-Checkleseht Band Council, and with members of the community who attended a presentation of some of these results. Klecko, Klecko!

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