

**Adapting to the Reintroduction of the Sea Otter: A
Case Study with the Ka:'yu:'k't'h'/Che:k'tles7et'h'
First Nations**

by
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Approval

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Ethics Statement

The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

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or

- b. advance approval of the animal care protocol from the University Animal Care Committee of Simon Fraser University

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Abstract

Sea otters became extirpated in BC by the early 1900s, but 89 were reintroduced to the northwest coast of Vancouver Island between 1969-1972, and as of 2013 there are now over 5,500 sea otters on the west coast of Vancouver Island. Sea otters are voracious predators, weighing as much as 100 pounds and consuming as much as 25% of their body weight every day, and are in direct competition with First Nations for both culturally and economically important sea food like sea urchins, crab, clams and abalone.

Although First Nations would like to hunt sea otters to protect important beaches and reefs this is currently illegal because sea otters are a protected species. This research examined the current sea otter management regime as well as alternative management options to explore the idea of managing sea otters using a small-scale harvest. This research also explored kelp harvesting as an economic opportunity to help mitigate the loss of revenue from clams.

Keywords: First Nations; Sea otters; Kelp harvesting; Ka:'yu:'k't'h'/Che:k'tles7et'h', Co-management; Political ecology

Dedication

This project is dedicated to the late Dr. Wolfgang Haider. I'm very thankful that he accepted me into the REM program and that I had the opportunity to have him as my supervisor for my first year in the program.

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I am very grateful to my senior supervisor Evelyn Pinkerton who was extremely supportive and helpful with finding me a new project when I was forced to change projects following the death of Wolfgang Haider. I am also grateful to my other committee member Anne Salomon for all of her feedback.

I am thankful to the Ka:'yu:'k't'h'/Che:k'tles7et'h' for their friendliness and willingness to talk with me while I spent 13 days in Houpsitas conducting interviews, and for the edits that Ron Frank did on my paper. I am thankful to everyone else who allowed me to interview them especially Dr. Louis Druehl who was extremely helpful with answering all my questions about kelp harvesting.

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List of Acronyms

ACCL	Aboriginal Communal Commercial Licences
CPs	conservation professionals
DFO	Department of Fisheries and Oceans Canada
FSC	Food Social and Ceremonial
MoUs	memoranda of understanding
NTC	Nuu-chah-nulth Tribal Council
PBR	Potential Biological Removal
SARA	Species at Risk Act
SDI	Shellfish Development Initiative
SFU	Simon Fraser University
SORT	Sea Otter Recovery Team
TASSC	The Alaska Sea Otter and Steller Sea Lion Commission
UNDRIP	United Nation Declaration of Right of Indigenous People
WCVI	West Coast of Vancouver Island

Chapter 1.

1.1. Introduction

Sea otters were extirpated from British Columbia by 1929¹ but 89 were then reintroduced from 1969 to 1972 near the Bunsby Islands on the West coast of Vancouver Island (WCVI). A film made in 1970 followed one of these reintroduction efforts. The narrator stated that “the sea otter is funny, fat and friendly, with some odd and original habits and no vices to speak of” and “with his chubby charm and friendly disposition, it’s easy to see why men are prepared to work so hard to bring him back to his home in British Columbia.” The film exudes zeal for the reintroduction, and the narrator is constantly portraying the sea otters in a positive light. Near the end of the film when the sea otters are finally released, the narrator says “their new home was beautiful, but sea otters don’t have much of an eye for beauty. What they do have is an eye for is food. And food there was, in quantities they had never seen before” (Wiley 1970). This statement is a perfect foreshadowing of what has now become a resource management issue between the Nuu-chah-nulth First Nations and the federal government of Canada.

Twenty-seven years later, in 2007, for an article in *The Tyee* entitled “Too many sea otters?” Lana Okerlund interviewed Leo Jack, a member of the Ka:’yu:’k’t’h’/Che:k’tles7et’h’ First Nation (the northernmost nation of the Nuu-chah-nulth), located less than 15km south of the Bunsby islands. “Sea otters have changed things quite a bit around here,” said Jack. “They eat everything that we used to eat.” He reminisced about collecting abalone and sea urchins for communal feasts. “The whole tribe would come together to eat them. Elders would go nuts over that stuff. Now they’re all gone. My mom would take me out on the rocks in the summer, early in the morning when the tide was out. We’d walk along the rocks and get a bucket of abalone. We’d eat them raw or fry them up with butter. Now my kids don’t know what they even taste like.”

¹ DFO’s Sea Otter Management Plan (Fisheries and Oceans Canada 2014) states that “The last verified Sea Otter in Canada was shot near Ka:’yu:’k’t’h’, British Columbia, in 1929” but residents Ka:’yu:’k’t’h’ have said that there were still some sea otters around until the 1950s

The film does not show any expectation of detrimental impacts from reintroducing sea otters. Also, it provides no evidence of consultation with local people when this reintroduction happened and when I conducted my interviews no one I interviewed believed that there had been any consultation during the reintroduction. There is also no evidence that there was consultation in 1981 when the Bunsby Islands became a protected area² for the main purpose of protecting sea otters. Although the Federal government now acknowledges that residents have been impacted by sea otters (DFO 2007), The Department of Fisheries and Oceans (DFO), the government agency mandated with managing sea otters, has yet to implement any policies to help mitigate this impact.

The impact on the Ka:'yu:k't'h'/Che:k'tles7et'h' by the reintroduction of sea otters is the result of just one of the many government policies used for managing natural resources that have limited the Ka:'yu:k't'h'/Che:k'tles7et'h''s ability to maintain economic and cultural autonomy in their traditional territory. Using the analytical approach of political ecology and the Ka:'yu:k't'h'/Che:k'tles7et'h' as a case study, this project will look at how government policies have impacted the Ka:'yu:k't'h'/Che:k'tles7et'h''s relationship with the marine environment and examine some options for mitigating these impacts.

1.2. Political ecology

A term first used in the 1970s and '80s (Wolf 1972; Blaikie 1985; Watts 1986), political ecology is a theoretical approach that assumes that no environmental issues are apolitical. Escobar (1998) acknowledges that "biodiversity" has concrete biophysical referents" but goes on to say that "it must be seen as a discursive invention of recent origin." Escobar (1999) argues that humans cannot be separated from nature, since the idea of nature is a human construct.

Political ecology often explores situations in which the property rights of local people have been impacted and limited due to the regulation and use of resources by external parties such as corporations or government (Hempl 1996). The institutions that are making policy decisions about these resources are therefore distanced from the

² This is acknowledged by the government in a report for B.C Parks' (Blood 1992).

resource users (Adger 2001). These environmental issues often stem from top-down technocratic decision making that emphasises natural science findings regarding the environment, but political ecologists argue that it is necessary to have a more politically aware understanding of the plurality of perspectives (such as local people, government, politicians, scientists and development experts) regarding the environment since, in fact, our understanding of environmental issues are overwhelmingly influenced by social constructs (Blaikie 1995).

Although political ecology has traditionally emphasised the importance of understanding issues at a local scale in the belief that “organization, policies, and action at the local scale are inherently more likely to have desired social and ecological effects than activities organized at other scales”, it has also been argued that scale is just another social construct that should be examined critically (Brown 2005). Political ecology has therefore also been used to examine global environmental problems (Adger 2001).

There had been a traditional focus by political ecologists on third world countries, since it was argued that the impacts of colonialism, local poverty, and the power imbalance between governments and local communities are inherently different in third world countries. But McCarthy (2005) argues that similar issues can be found at the local scale in first world countries including “informal property relations, micro politics, socially unequal distributions of risks and benefits, attachments to particular livelihoods, unjust exclusions from protected natural areas, general lack of local communities’ abilities to exert self-governance powers over local resources.” The basis for McCarthy’s argument is his research on the Wise Use movement of the rural American west in the 1980s and 1990s which involved white settlers who felt disenfranchised over loss of resource rights.

In Canada, First Nations communities are still recovering from colonial policies that have disadvantaged them when compared to the general population. Some of the most harmful policies, enacted during the first half of the 20th century, included being disenfranchised³ in federal and provincial elections, mandatory attendance of children at residential schools⁴ and the banning of the potlatch⁵. There are also a number of policies

³ First Nations gained the right to vote in Federal elections in 1960 and the right to vote in Provincial elections between 1949 and 1960 (depending on the province).

⁴ Compulsory attendance ended in 1948 although the last residential closed in 1997.

that have specifically impacted First Nations living on the coast; these policies will be explored in more detail in Chapter 2.

The legacy of the various government policies is evident in a variety of societal issues facing First Nations. For instance, 50% of status First Nation children live below the poverty line compared to a rate of 12% when Indigenous, racialized and immigrant children are not included (Macdonald & Wilson 2013); the median income of First Nations is \$17,621 compared to \$27,622 for the non-aboriginal population of Canada (Statistics Canada 2015) and 8.7% of First Nations aged 25-64 have a university degree compared to 26.5% of the non-aboriginal population of Canada (Statistics Canada 2016).

This legacy of oppression has a huge and recurring negative impact on the relationship between First Nations and the federal government. It has also greatly limited the ability of First Nations to exercise control over natural resources within their traditional territories. This legacy of oppression is something that has been acknowledged by Canada's most recent prime ministers as they have apologised for these past injustices and promised to do more to rectify these inequities (Indigenous and Northern Affairs Canada 2008; CBC 2017). On February 14th 2018 Justin Trudeau committed to using a new Framework to "support the rebuilding of Indigenous nations and governments, and advance Indigenous self-determination, including the inherent right of self-government." And the mandate letter to the minister of DFO highlights the need to work with Indigenous Peoples to better co-manage the oceans.

Keeping in mind the current Prime Minister's promise to pursue reconciliation and advance Indigenous self-determination, this project will explore a number of policy decisions enacted by DFO and explain how they have negatively impacted First Nations with the hope that by understanding the impacts of these policies they can be addressed.

1.3. Summary of 699

Chapter one has discussed how the interaction between the federal government and First Nations in regards to access and control of natural resources is a political

⁵ The ban ended in 1951

ecology issue. Chapter two discusses the methods used for the research in this paper, which included interviews with residents of Houpsitas (the name of the Ka:'yu:'k't'h'/Che:k'tles7et'h' village), interviews with owners of kelp harvesting businesses, and a literature review of sea otter management plans. In chapter three this paper will examine the cumulative effects of a host of government policies that combined with the sea otter policy is preventing First Nations access to numerous Food Social and Ceremonial (FSC) and Economic fisheries on the WCVI. The purpose of chapter three is to give context for why the current sea otter management plan is so harmful since the consequences of the plan are not acting in a vacuum. The sea otter issue will be discussed in depth in chapter four and alternative forms of management will be explored. Chapter five discusses the possibility for the Ka:'yu:'k't'h'/Che:k'tles7et'h' to harvest kelp as a new form of economic venture to help mitigate their loss of access to other marine resources. Chapter six, the final chapter, contains recommendations and suggestions for further research.

Chapter 2. **Research Methods and Limitations**

2.1. Methods

This paper is built around a case study of the Ka:'yu:'k't'h'/Che:k'tles7et'h''s adaptation to government policies that have limited their ability to access marine fisheries. This paper focuses heavily on how the current sea otter management regime is impacting residents, especially their harvesting of clam fisheries. The majority of my research on this topic was done through semi-structured interviews conducted in Hupsitas by myself and my supervisor Evelyn Pinkerton over 13 days in February 2016. While in Hupsitas 15 people were interviewed, and one member of the Ka:'yu:'k't'h'/Che:k'tles7et'h' First Nation was also interviewed in Campbell River on the way back to Vancouver.

The interviews were from half an hour to an hour and a half long. The majority of the interviews were conducted with one person at a time, but in several cases two people were interviewed at the same time and in one case there were three. Most of the interviews were conducted in a person's house or in the house where we stayed while in Hupsitas. One interview was conducted in the band office, and the interview conducted in Campbell River was done in a restaurant. Interviews were usually arranged by visiting the potential interviewee at their house and asking if they were willing to be interviewed. In some cases interviews were then immediately conducted and in some cases interview times were agreed upon. All interviewees were shown a form (approved by the SFU office of ethics) explaining the nature of the research, and that the interviewee could at any time request for their interview to not be used in the research. All interviewees verbally consented to being interviewed. Interviewees were asked if their interview could be taped, and in the cases when the interviewee agreed to this, the conversation was recorded. As a thank you all interviewees were given a bag of coffee once the interview was finished.

The majority of the interviewees were chosen by Pinkerton based on her personal relationship with them and her expectation of who would be willing to be interviewed, but some of the people interviewed were chosen based on the suggestions of other residents in Hupsitas, and some interviewees were people who happened to

be in the house of a planned interview when an interview took place and wished to also participate. Some of the people we hoped to interview were not available because they were not in Houpsitas while we were there. Informal conversations were also held with staff of the Ka:'yu:'k't'h'/Che:k'tles7et'h' Fisheries Department, members of the clam co-management committee, and other employees of the band office.

The interview questions were partly inspired by the interview and survey questions used by Elizabeth Stewart in her 2006 master's thesis *Views on Sea Otters in Nuu-chah-nulth Territories*. Stewart had interviewed and surveyed Nuu-chah-nulth from a number of different nations but had not gotten any responses from the Ka:'yu:'k't'h'/Che:k'tles7et'h'; therefore, by using similar questions to those used by her, the interview done in my research helps to build on Stewart's previous research. Both Pinkerton and Neil Ladell (Pinkerton's PhD student) offered feedback on how the interview questions should be worded. Both have spent time in Houpsitas working with the Ka:'yu:'k't'h'/Che:k'tles7et'h', so their feedback was extremely important.

On the first day in Houpsitas a meeting was held with the Ka:'yu:'k't'h'/Che:k'tles7et'h' clam advisory committee to get more feedback on the questions. The questions also evolved throughout the interview process when it became evident that some questions could be more clearly phrased or when new information came to light. For instance, in the initial set of interview questions there were no questions about how green crab was impacting the clam fisheries, but after talking with the clam advisory committee as well as the Ka:'yu:'k't'h'/Che:k'tles7et'h' Fisheries department a question was added about green crab to get a better understanding of the impacts of this new predator.

To expand my understanding of both sides of the sea otter management issue a number of government policy documents were examined (primarily written by the Federal Department of Fisheries and Oceans), as well as a number of previous interviews with First Nations, including Stewart's master's thesis, a summary of consultations done with First Nations in 2004 and various newspaper articles. A cursory examination of clam fisheries management policy was also done to understand both historic changes in clam management as well as to see if the government was taking sea otter predation into consideration in their current clam management plans. Policy documents for the management of sea otters in Alaska were analysed to give insight into

alternative approaches for managing sea otters, and I also talked and emailed with a researcher in Alaska, Sonia Ibarra, who is studying the impact of sea otter and human harvest on clam size and abundance.

During my interviews I also asked some questions focused on understanding people's knowledge of kelp species as well as their potential interest in learning how to do kelp harvesting. With the loss of access to marine resources, Pinkerton suggested that kelp harvesting could be a potential alternative economic venture for people living in Houpsitas. Since sea otter predation on sea urchins increases density of some kelp, such as giant kelp, she believed that increased access to kelp for the purpose of harvesting could be an inadvertent benefit of the sea otter reintroduction that the residents of Houpsitas could take advantage of.

Prior to traveling to Houpsitas I talked with Dr. Louis Druehl, an emeritus professor of marine botany from SFU, a kelp researcher, and the owner of Canadian Kelp Resources, a company that harvests both wild and farmed kelp and sells dried product. He told me about his kelp harvesting company and what kinds of kelp he harvested. This allowed me to discuss the idea of kelp harvesting with residents of Houpsitas when conducting my interviews. I talked to residents about his company, the kind of kelp he harvested, and how he dried and packaged his kelp. I also asked people if they had any personal experience harvesting or drying kelp and if they were familiar with the species of kelp that Dr. Druehl harvested (I brought a book with pictures and descriptions of the kelps that I showed to residents during the interviews).

Dr. Druehl offered free training to two members of the Ka:'yu:'k't'h' /Che:k'tles7et'h' First Nations if they were willing to travel down to Bamfield where Dr. Druehl lives. Consequently, one of the purposes of meeting with and talking to people in Houpsitas was to see who might be interested in having the opportunity to participate in this training. I talked with Dr. Druehl multiple times on the phone and communicated with him over email leading up to the training, and I then spent a day in Bamfield on June 6, 2016 talking with him in person when one Houpsitas resident went to Bamfield to do the training. While in Bamfield I also talked with the trainee about his experience.

Two other owners of kelp businesses were also interviewed for this research. One, an owner of a partly operational kelp farm located near Houpsitas, was interviewed

in a restaurant in Campbell River on the way to Hupsitas in February 2016. The other was interviewed over the phone in February 2016. A literature review of kelp harvesting as well as an internet search of kelp harvesting businesses in British Columbia was also done.

2.2. Limitations.

There was a narrow window of opportunity to conduct this research during a winter break, due to the death of my former supervisor and the constraints of limited funding for a new research topic. Therefore, the majority of the people interviewed were chosen at the suggestion of Pinkerton; which meant that her personal relationship with residents of Hupsitas influenced who was interviewed, and it is difficult to know how representative this group was of the overall opinions of residents of Hupsitas. Also, the majority of the members of the Ka:'yu:k't'h'/Che:k'tles7et'h' First Nations don't live in Hupsitas, and the views of non-residents may be different from residents. The majority of the residents that were interviewed were older residents, and only two people interviewed were under 30, so the views of younger generations were not heavily represented. However, the younger generation would have less familiarity with the clam and other shell fisheries before the sea otter population expanded, and would therefore be less able to answer comparative questions.

I am not an ecologist and do not have any personal experience with kelp harvesting, so the conversations I had with residents about kelp were limited by my own lack of understanding of kelp ecology and kelp harvesting. Some of the residents I talked with knew a lot more about kelp than I did and had experience working on kelp farms.

Since the kelp companies in BC are small scale businesses, the web presence of these companies was lacking and their websites were often outdated, so there was not a lot of information on local kelp companies. Although there has been a decent amount of research done on kelp harvesting in some countries, there is very little that has been done for the West Coast of Canada, so it was difficult to do any market research specific to BC.

I emailed DFO with the intention of setting up an interview with them to learn more about their sea otter management plan and to see if they had any plans to deal

with the concerns of First Nations who have been impacted by sea otters. But after an initial email response to me, they didn't respond to my follow up email with a list of questions that I was interested in having answered. If DFO had been willing to answer my questions, I feel this paper would have been able to give a more complete view of this issue, but due to their lack of response, there is more emphasis on First Nations' opinions than on Canada or B.C. governments' opinions surrounding this issue.

Chapter 3. Federal Policies that have impacted the Ka:'yu:'k't'h'/Che:k'tles7et'h'

3.1. Description of Houpsitas

The Ha'houlth (chiefly territories) of the Nuu-chah-nulth encompasses approximately 300 kilometres of the Pacific Coast of Vancouver Island, from Brooks Peninsula in the north to Point-no-Point in the south and includes inland regions (see Figure 1). This area is divided up into 14 Nations that correspond with traditional chiefly families. There are approximately 10,000 members with around 6,300 living off reserve in communities across North America (Nuu-chah-nulth Tribal Council 2018).

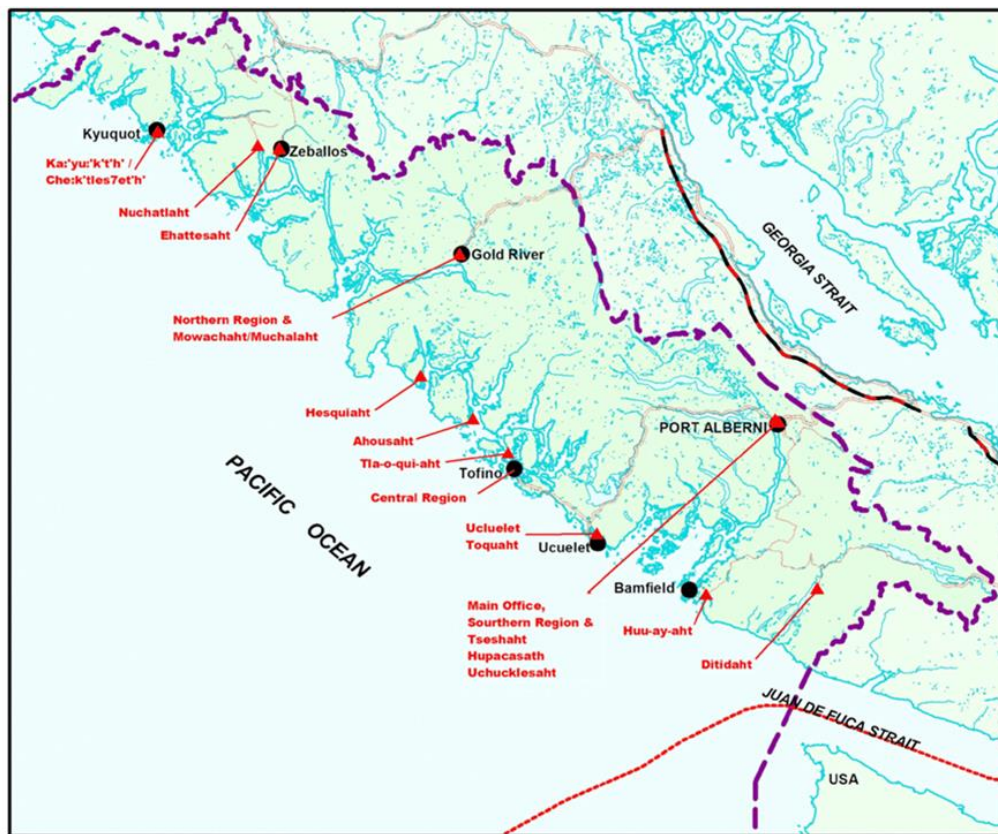


Figure 1: Nuu-chah-nulth Territories (Nuu-chah-nulth Tribal Council 2012)

The village of Houpsitas is home to both the Ka:'yu:'k't'h' and the Che:k'tles7et'h' people as their territories have been amalgamated. The combined membership for the

Ka:'yu:'k't'h'/Che:k'tles7et'h' is about 500 members, with approximately 150 members living on-reserve. Most of the off-reserve members are spread throughout Vancouver Island (Campbell River, Nanaimo, Courtney and Victoria), Vancouver and Seattle (The First Nations of Maanulth Treaty Society 2017).

As can be seen in Figure 1, Houpsitas (called Kyuquot on the map) is the farthest north of all of the Nuu-chah-nulth villages. It is also the most difficult to access and requires either taking a float plane from Gold River or driving along a logging road for 72km and then taking a water taxi for around 30 minutes. This remoteness means that it can take about four hours to get from Houpsitas to Campbell River which is the closest large urban center with shopping markets. This is both a big expense due to using boat fuel and gas and is an inconvenience especially for residents who do not own a boat or a car. This remoteness has traditionally necessitated a strong reliance on marine resources, since there is a large cost, both time and financial resources in traveling to Campbell River to buy groceries.

3.2. Impact of government policies on access to marine resources

Government policies have systematically eliminated access to marine resources for the Ka:'yu:'k't'h'/Che:k'tles7et'h' throughout the latter part of the 20th century. The Ka:'yu:'k't'h'/Che:k'tles7et'h' had been very active in the salmon, herring, halibut and ground fish fisheries and “in the 1970s there were over 30 commercial fishboats on reserve, many employing a deckhand or two” (Pinkerton & Salomon 2017). But the DFO-imposed license limitation program initiated in 1968 and implemented at the beginning of the 1969 season created the situation in which smaller boat licenses were eliminated or bought up so that larger boats could be used. This resulted in a substantial decrease in the availability of licenses for smaller operators, and local residents became priced out of the industry (Hayward 1981). In the halibut fishery, licensing became privatized in 1992 in the form of individual transferable quotas, and until the Nuu-chah-nulth Tribal Council (NTC) purchased a few licenses in the early 2000s, there were no quotas owned by any Nuu-chah-nulth (Pinkerton & John 2008).

It should be acknowledged that in the last 25 years DFO has created some new policies to try to give First Nations greater access to fisheries. The Aboriginal Fisheries

Strategy (AFS) was created in 1992 and was used to create an aboriginal fishery for food, social and ceremonial (FSC) purposes. In 1994 the Aboriginal Transfer Program (ATP) was launched, which facilitates the voluntary retirement of commercial licences and the issuance of licences to eligible Aboriginal groups. The government's decision to create these programs followed the 1990 Supreme Court of Canada ruling in the Sparrow decision. "This decision found that the Musqueam First Nation has an Aboriginal right to fish for food, social and ceremonial purposes. The Supreme Court found that when an Aboriginal group has a right to fish for food, social and ceremonial purposes, it takes priority, after conservation, over other uses of the resource. The Supreme Court also indicated the importance of consulting with Aboriginal groups when their fishing rights might be affected" (DFO 2012). It is also possible that that new DFO policies giving more commercial access to First Nations will be created following the recent court decision with five Nuu-chah-nulth Nations in which the judge ruled that the Nations have a right to a "community-based artisanal fishery that harvests and sells fish to a low level of commercial activity" (Ahousaht Indian Band and Nation v Canada 2018).

Another method that the Canadian government is using to give First Nations greater access to fisheries is the British Columbia Treaty process. First Nations that sign treaties are allocated constitutionally protected quotas for their FSC fisheries and can negotiate a side agreement (not constitutionally protected), called a harvest agreement which gives the nation commercial licenses. But the treaty process has not proven to be very effective since only nine nations (out of approximately 200) have signed a treaty since the process started in 1992 (BC Treaty Commission 2018). The main driver of change has therefore been court decisions and, although they have undeniably improved recent fisheries access for First Nations, if the government wants to follow through with its promise of reconciliation, it needs to be actively working with nations to determine ways to give more access to fisheries rather than relying on the courts for their decisions.

Clams have always played an important subsistence and cultural role for the Ka:'yu:'k't'h'/Che:k'tles7et'h' and they have been an important commercial resource since the beginning of the 20th century (Silver 2010). It should be noted that the commercial clam fishery was also culturally important as it was "the only commercial fishery pursued as a family fishery by all ages and all genders" (Pinkerton & John 2008). With the erosion of other fishing licenses from the 1960s onward, the importance of the

commercial clam fishery increased, and there was a substantial increase in commercial landings in the mid-1980s (Ladell et al. 2014).

But just like finfish fisheries, clam fisheries were also becoming more regulated. The federal government first began recording clam landings in 1951 and regulated clam harvesting by creating size restrictions and instituting area closures for harvest management or for contamination (DFO 2015). Beginning in 1988 clam openings were reduced and staggered. Closures were due to high levels of bacterial, viral, heavy metal, or dioxin contaminants. As a way to mitigate the impact of these contaminants, the federal government approved depuration of intertidal clam fisheries which allowed some beaches that had been closed to re-open with a DFO depuration license (Silver 2010). Depuration is done by bathing clams in disinfected flowing water for 48 hours, which purges them of their contaminants. Harvesters participating in depuration harvests were required to sell their product to a licensed depurator. This extra processing greatly reduced the profit for harvesters.

Along with closures, clam licenses (Z2 licenses) and area management were also instituted in 1989 in an attempt to deal with oversubscribed fisheries. Anyone could apply for a clam license and they cost \$90 (Silver 2010). The coast was divided into seven areas and diggers now required a Z2 license instead of a personal commercial fishing licence. Then, following a consultative process from 1992 to 1998, a licence limitation program was imposed in which a number of licences were negotiated with various First Nations. These licences were called Aboriginal Communal Commercial Licences (ACCLs) and were developed to recognize historical First Nation representation in the fishery. These ACCLs were identical to regular Z2 commercial clam licences except the chief and council could designate the licence holders annually (DFO 2015). As of 2008 the Ka:'yu:'k't'h'/Che:k'tles7et'h' controlled approximately 36 ACCLs (Pinkerton & John 2008).

In the 1990s and into the early 2000s clam diggers in Houpsitas could generally make \$400 to \$850 (and sometimes as much as \$1,000) a night, and the average income per license in 1998-1999 was \$2,685 (Pinkerton & Silver 2011). This opportunity for income was very important since during the winter many residents were otherwise unemployed.

The increasing regulation and licensing of commercial clam fisheries negatively impacted the Ka:'yu:'k't'h'/Che:k'tles7et'h', and residents initially resisted or tried to ignore these regulations. But due to strong leadership by the Ka:'yu:'k't'h'/Che:k'tles7et'h' Fisheries department residents came to accept these regulations and were able to maintain a healthy commercial clam fishery throughout the 1990s and early 2000s (Pinkerton & John 2008). Then at the beginning of the 2000s the provincial government began heavily promoting to First Nations the idea that they should switch from commercial clam fisheries to clam aquaculture (Pinkerton and Silver 2011).

The reason for the provincial government's interest in clam aquaculture was a 1997 report by Coopers and Lybrand which suggested that by 2007 the wholesale value of the shellfish aquaculture industry could be worth \$100 million (\$46 million from clam production and \$53 million from oyster production). In 1998 in response to this report the Provincial Ministry of Agriculture created the Shellfish Development Initiative (SDI) with the plan to double the amount of Crown Land available for shellfish aquaculture within the next 10 years (Silver 2010). First Nation participation in expansionary efforts became a central priority for the SDI since it was thought that this kind of aquaculture would be consistent with First Nations' traditions and socio-cultural norms. Because a number of First Nations territories were adjacent to productive beaches, and there were a number of ongoing treaty negotiations, it made sense to the provincial government to allocate First Nations treaty-related shellfish tenure memoranda of understandings (MoUs).

The Ka:'yu:'k't'h'/Che:k'tles7et'h' negotiated MoU shellfish tenures with the BC Ministry of Agriculture and Lands between 2000 and 2001 (Silver 2014). Capitalization of the tenures began in 2003-2004, and netting was purchased for placement on the intertidal clam tenures. A consultant was hired and a business plan was created. This plan suggested that all existing stocks of wild-growing clams should be removed from the intertidal tenures and that profit from them should be reinvested in the business. In subsequent years the clam stocks on the beaches would be sustained through the seeding of the beaches. The two beaches that the consultant chose for the shellfish tenures were Malksope and Chachalot (which had previously been managed for a sustainable wild harvest under the Ka:'yu:'k't'h'/Che:k'tles7et'h'-DFO communal licenses), since they had already been surveyed and had readily-available data.

The seeding of these beaches has not resulted in a more productive industry and, in fact, since these beaches became seeded very little harvesting has been done. There was no harvesting from 2007 to 2009 (Pinkerton & Silver 2011) and little harvesting has been done since. In the winter of 2015-2016 only three people harvested clams due to an inadequate number of clams remaining on the beaches (Evelyn Pinkerton pers. comm., 2017).

Pinkerton and Silver suggest there were a number of problems created by shifting from a commercial harvest to clam aquaculture including: “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.” But they also argue that the provincial government was fundamentally wrong in its opinion that clam farming was better for First Nations than harvesting wild stocks. They point to four reasons why the provincial government promoted clam aquaculture to First Nations and state that none of these claims were accurate. The claims made by the province were:

- (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

In regards to point (1) Pinkerton and Silver state that the tenuring and subsequent seeding and mono-cropping of a productive beach actually reduces the amount of available beach for wild stocks, so wild stocks do not benefit. For point (2) 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 seeded clams planted on a particular beach will reach maturity. For point (3) the necessity of maintenance and harvesting once every 5-7 years is very different than harvesting moderate amounts of clams every year, so is not similar to traditional harvesting regimes. For point (4) the additional cost of seed, predator netting, and water quality testing is, in fact, quite a large expense and requires high initial capital investment.

The Shellfish Aquaculture industry was worth \$31.5 million in 2012 (British Columbia Ministry of Agriculture n.d.), which is well below the \$100 million predicted in the Coopers and Lybrand report, and shows that the rosy picture sold to First Nations by the provincial government was an unrealistic prediction founded on unsubstantiated claims.

To create an aquaculture beach it is necessary to harvest all the wild clams so that the beach can be reseeded with new clams. It was assumed that once this was done the beaches would then be highly productive. There are two major reasons why this has not been the case. First, the predicted time for the clams to mature was between 3 and 4.5 years since that is how long it takes on the southern coast of Vancouver Island, but the average time was instead found to be between 6 and 7 years (Ladell et al. 2014). Second, there has also been a substantial reduction of clams because of increased animal predation.

One of the main predators of clams has been sea otters, and although there have been sea otters living in the area for over forty years, their population is much higher than it used to be and it is likely that they have exhausted other prey (which is consistent with what First Nations are observing) so are now focusing more on clams. This predation of preferred species is consistent with a study by Laidre and Jameson (2006) that found when sea otters move into new areas they initially go after easy prey like sea urchins and it is only when the abundance of this easier prey is too low that they move on to other species such as clams. As can be seen in Figure 2, sea otter population increases did not have a noticeable effect on clam landings until 2003, but following 2003 there is a strong inverse correlation between increasing sea otter population and decreasing clam landings. Six out of seven of the most important clam beaches have had regular sea otter presence since the 1980s, but it is primarily in the last 15 years that residents of Houpsitas have noticed sea otters having a substantial impact on clam population (Ladell et al. 2014).

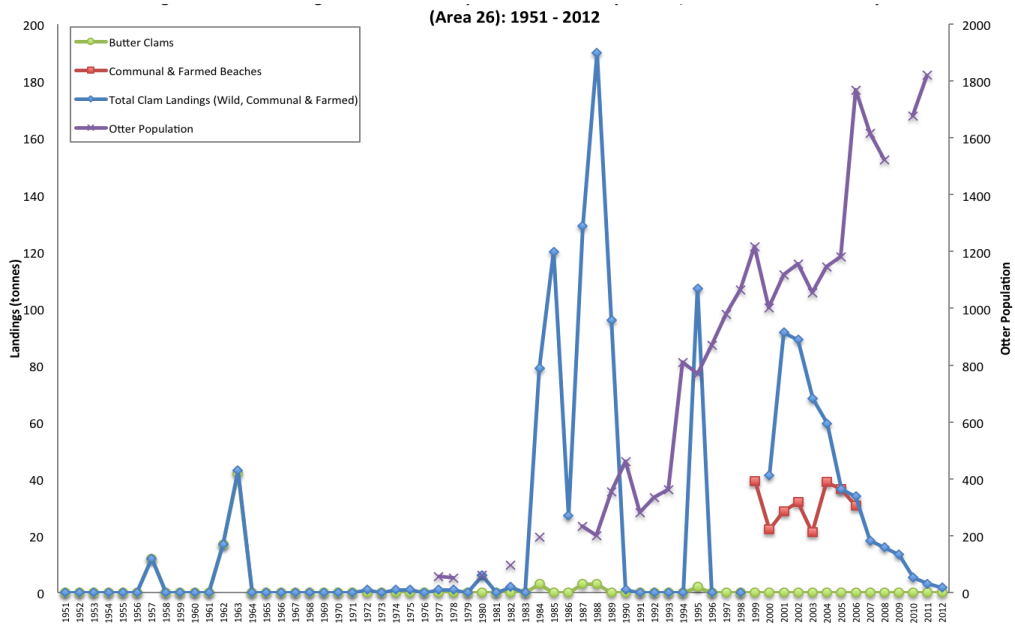


Figure 2: Clam Landings and Sea Otter Population in the Ka:’yu:’k’t’h’/Che:k’tles7et’h’ Territory (Area 26): 1951-2012 (Ladell et al. 2014)

The beaches are now covered in large predator pits (greater than 30 cm width) caused by the sea otters digging for clams (Ladell et al. 2014). There are also numerous small predator pits which may be the result of clam predation from ducks, starfish, raccoons and other animals. It has been hypothesized by members of the Ka:’yu:’k’t’h’/Che:k’tles7et’h’ Nations that when sea otters dig up beaches it makes smaller clams more accessible to other animals; this hypothesis is supported by research (Kvitek et al. 1992). As of 2012 none of the beaches surveyed had a high enough density of clams to be suitable for the re-opening of a long-term harvest and only two were thought to have any short term economic value (Ladell et al. 2014).

During my interviews a number of people suggested that surf scoters were also a contributing factor to the decline of the clams. Surf scoters are a large black sea duck that preys on invertebrates. Interviewee 1 thought that their predation on clams was having a larger impact on clam abundance than the predation by sea otters. This interviewee said that the last time he had gone duck hunting near Malksope (one of the two clam aquaculture beaches) he saw thousands of scoters. He believed that there were a lot more scoters than there used to be since not as many people were hunting them. Interviewee 3 suggested that the reason that the inlets were decimated was

because of the ducks eating the small clams. Interviewee 6 also thought that the scoters were a bigger issue than sea otters for the clams. But interviewee 8 thought that the ducks weren't a significant predator of clams, and mentioned that one of the guys that works at the fish farm was always shooting ducks and eating them and had said that "all that was in them were mussels and fish, there wasn't clams in them". DFO acknowledges that surf scoters can be an issue for clams and mentions that there have been reports of large numbers of them on the beaches in Area 26 (DFO 2015), which is the area surrounding Houpsitas. Surf scoters have been shown to be able to deplete clam populations and "assume a significant predation role in soft-bottom intertidal areas" (Lewis et al. 2007).

A relatively new problem for the clams is the proliferation of the invasive European green crab. This species was first reported near Houpsitas in 2005 (Gillespie et al. 2007), but it is only in the last few years that the population has exploded. I was told by the Ka:'yu:'k't'h' Fisheries Department that green crabs were everywhere, and while I was in Houpsitas they bought 30 new traps to try to deal with them. This increase in green crabs is a bad sign for the clam fisheries since clams are one of its primary prey and once green crabs are entrenched in the ecosystem it is hard to remove them. For this reason DFO refers to the green crab as one of the ten "most unwanted" invasive species in the world (DFO 2018). DFO has implemented management policies to mitigate the spread of green crab with the hope it will not reach the east coast of Vancouver Island, but does not have any management strategies for dealing with areas that have already been inundated with them. Green crabs have been shown to have a very high predation rate on clams and have negatively impacted clam fisheries and aquaculture (Walton et al. 2002; Gillespie et al. 2015).

The Heiltsuk First Nation who live on the central coast of BC have for the last decade been taking the local management of green crab into their own hands by implementing an active green crab eradication project whereby the Heiltsuk have aggressively trapped green crabs. Data suggests that green crab are spreading more slowly than expected on the central coast (MaPP 2018) so the Heiltsuk's efforts may be proving successful. Due to this success, in May 2017, the Central Coast Indigenous Resource Alliance (CCIRA, which is comprised of the Heiltsuk, Kitasoo/Xai'Xais, Nuxalk, and Wuikinuxv First Nations) is working with all of its Nations on monitoring and removing this species (MaPP 2018).

There has also been some success in using specialized traps to remove green crab from estuaries in Kekimkujik National Park near Halifax, Nova Scotia. Over a few years more than two million green crab were caught in one estuary by just a few people using small, motorless boats and both eel grass and soft-shell clam populations have been recovering (Thomson 2016). More research should therefore be done to understand all the different management methods currently being used on green crab, as well as what kind of traps are proving to be most effective for catching them.

Beyond just learning the best way to catch green crab it may be worthwhile to look at options for using green crabs as a food source. On the east coast of the U.S. there have been experiments with deep-frying green crabs just after they have moulted, using a machine to create mince from the crabs (the simplest way to get meat from the crabs), using the green crab eggs as crab caviar (Brown 2017), and creating crab stock from green crabs (Warner, 2015). These experiments have been done by chefs, citizen scientists and academics, and the results have been positive with people enjoying the taste of all of these uses. These studies have indicated that if green crab was available as a food product there would likely be a market for it (Galetti et al. 2017). Although there has yet to be a commercial fishery created from this, there seems to be growing interest and good potential for further experimentation.

Because both surf scoters and green crabs have only recently been recognized as an issue for clam management in Houpsitas, there has not been much discussion about ways to manage them or to mitigate their impacts on clams beyond the recent purchase of crab traps. But these predators appear to be becoming a major problem, so it is imperative that some form of management is implemented if the Ka:'yu:'k't'h'/Che:k'tles7et'h' wish to be able to maintain their access to clams. Sea otters on the other hand have been an ongoing problem since the 1990s, and there has been quite a lot of discussion about how the Ka:'yu:'k't'h'/Che:k'tles7et'h' would like to manage them: the following chapter therefore examines the sea otter problem in more depth.

Chapter 4. **The sea otter problem**

4.1. Introduction

Conservation often creates conflict in resource management, and the reintroduction and subsequent protection of the sea otter is a prime example of this issue within BC. There are multiple groups who are impacted by the return of the sea otter including, but not limited to, conservation professionals, First Nations, other people involved in commercial shellfish harvesting, and tourism operators. This chapter will only focus on two of these groups: conservation professionals, since they have been actively involved in helping to create and influence government policy, and the Nuu-chah-nulth First Nations who live on the WCVI and who historically managed sea otters and are experiencing the greatest negative impact from the reintroduction of them.

This chapter first gives a brief history of sea otters within BC. It then describes how the current conservation plan for sea otters is causing conflict. Further, it discusses the views of both conservationists and the Nuu-chah-nulth on sea otters. To this end, I draw from a variety of sources with a focus on a master's thesis written by Elizabeth Stewart in 2005 titled "Views on Sea Otters in Nuu-chah-nulth Territories", as well as from my own fieldwork done over a week and half in February 2016, where I conducted 16 interviews with Nuu-chah-nulth from the Ka:'yu:'k't'h'/Che:k'tles7et'h' Nations and had informal talks with the Ka:'yu:'k't'h' Fisheries Department and with other residents. Finally, this chapter will use Part One of Pinkerton's five-part co-management framework as a way to evaluate and compare the current sea otter management plan with a sea otter management plan proposed by the NTC as well as the Alaska state sea otter management plan.

4.2. History of sea otter management within BC

Sea otters do not have many natural predators in BC. There is evidence that orcas in parts of Alaska have been preying on sea otters following the collapse of their preferred prey of sea lions and harbour seals (Estes et al. 1998), but when there is a healthy population of sea lions and seals, orcas are not very interested in sea otters. One of the people interviewed in Houpsitas, mentioned that he had seen the occasional

orca going after a sea otter, but it was very rare, and he thought the orca's main purpose in pursuing the sea otter was to help teach its children how to hunt rather than the orca actually being interested in the sea otter for food.

Sharks are known to occasionally kill sea otters in California but this represents a small amount of mortality (Kreuder et al. 2003), and BC doesn't have the same density of large sharks inhabiting the nearshore ecosystem where sea otters live. There is evidence of some eagle predation on sea otter pups but it isn't very large (Fisheries and Ocean Canada 2014). Recently there has also been evidence of occasional wolf predation of sea otters in Kyuquot Sound (Garstin 2016) but based on sea otter growth rates this predation does not appear to be large. Consequently, humans have historically been the main predator of sea otters, and Indigenous people have hunted them in BC for at least 12,000 years (Salomon et al. 2015). Archeological evidence in BC, California and the Aleutian Islands suggests that for thousands of years sea otter populations were actively managed through hunting so that areas near villages had lower sea otter abundance and higher abundance of shellfish than areas further away from villages (Erlandson et al. 2005; Erlandson et al. 2008; Szpak et al. 2012; Corbett et al. 2008).

With a dramatic increase in hunting due to the fur trade starting in the mid-1700s, sea otters were hunted almost to extinction. Sea otters became protected with the implementation of the International Fur Seal Treaty of 1911, which prohibited non-natives and anyone hunting for commercial purposes from hunting sea otters in international waters (three miles from shore). Nonetheless, this did not prevent the sea otter from being officially extirpated from BC when the last verified sea otter in Canada was shot near Houpsitas in 1929 (DFO 2014)⁶.

In the 1960s the Canadian government decided to reintroduce sea otters to BC, and between 1969 and 1972, the Alaska Department of Fish and Game, British Columbia Fish and Wildlife Branch, Arctic Biological Station, and Pacific Biological Station transplanted 89 sea otters from Alaska to Che:k'tles7et'h' Bay on the WCVI (Bigg & MacAskie 1978). Although the first few years following the reintroduction did not result in a large growth in population, in the subsequent years the sea otters proliferated with

⁶ DFO's Sea Otter Management Plan (2014) claims that "The last verified Sea Otter in Canada was shot near Kyuquot, British Columbia, in 1929" but residents of Kyuquot have said that there were sea otters around until the 1950s.

an estimated population growth of 18.6% per year between 1977 and 1995 (Watson et al. 1998). The current growth rate is estimated at 8% per year (DFO 2014) and the most recent survey done by DFO in 2013 counted 5,612 sea otters on Vancouver Island (DFO 2015). Populations of sea otters along the central coast of BC have also rebounded, either from migration from Alaska, WCVI, or from remnant populations that were not in fact extirpated (DFO 2015). Although the sea otter population on the central coast is starting to negatively impact First Nations on the central coast, the sea otter problem on the WCVI has a much longer history and the otter populations are currently separate, and therefore this discussion will only be focusing on the issues surrounding the management of sea otters on the WCVI.

The reintroduction and subsequent conservation of sea otters has been highly successful when considered from a conservation perspective. Sea otters were officially designated 'Endangered' in April 1978. Since then, their status has been down listed twice, to 'Threatened' in April 1996 and to 'Special Concern' in 2007 (DFO 2015).

Even though sea otters have been in BC since 1969, a comprehensive management plan for sea otters was only created relatively recently when DFO formed the Sea Otter Recovery Team (SORT) in 2002 to develop a sea otter recovery strategy. This strategy was updated in 2007 to come into compliance with the Species at Risk Act (SARA). Since SARA came into effect in 2003, sea otters have been officially protected under the act, and it is currently illegal to hunt or harm them (DFO 2014).

4.3. Sea otter controversy

Sea otters are a keystone species that trigger trophic cascades via direct effects on sea urchins and indirect effects on kelp (Estes & Palmisano 1974; Pace et al. 1999). In the absence of predators, sea urchins, a primary prey source for sea otters, decimate kelp forests and create urchin barrens. In contrast, sea otter presence and predation on sea urchins allow kelp forests to flourish, which has been shown to help enhance nearshore productivity and produce positive habitat for a number of fish such as some rockfish species (Markel & Shurin 2015). Sea otters not only have positive contributions to kelp forest ecosystems; they are also a charismatic megafauna that have been shown to have a positive impact on the economy through increased tourism (Loomis 2006). A perfect example of the positive public perception of sea otters was illustrated when a

video of two otters holding hands at the Vancouver aquarium was posted on YouTube (Otters holding hands 2007). This video quickly went viral; it was shown on multiple news channels and now has over 21,000,000 views.

Although the success of the sea otter has been viewed positively by the government, conservationists, and the general population, both coastal First Nations and others who participate in subsistence and commercial shellfish fisheries have a much more negative perception of sea otters. Although First Nations are generally quite supportive of having the sea otter back in the ecosystem, they are unhappy with how they are being managed and feel that the sea otter's ability to access shellfish is being prioritized over their access to shellfish. Shellfish are the main prey of sea otters and, with an increasing sea otter population, there has been increased competition between humans and sea otters for shellfish. Sea otters eat 20-25% of their body weight every day, and can weigh up to 50kg, so a large population of sea otters consumes a substantial amount of sea food (Reidman & Estes 1990). Although sea otters have specific prey that they prefer, they are very adaptable and have been found to eat over 100 different species of invertebrates throughout their range (Reidman & Estes 1990). Once the abundance of the most preferred prey, such as sea urchins, reach a low enough population, sea otters diversify their diet to include various bivalves, especially clams, as well as snails, chitons, crabs, sea stars and fish (Estes et al. 1981).

With the absence of sea otters between 1929 and 1969, the population of their prey (such as sea urchins, abalone, clams, crabs and chitons) increased (Tegner & Dayton 2000). These sea animals had been an important food source for the Nuu-chah-nulth for thousands of years (McMillan & St Claire 2003), but this growth in abundance became increasingly important as the Nuu-chah-nulth became more and more reliant on these resources with the loss of access to finfish fisheries due to limited entry programs, new vessel hold requirements, and vessel buy-back programs in the 1960s and due to individual transferable quotas and area licensing policies in the 1990s (Pinkerton and Davis 2015, Salomon et al. 2015). With the proliferation of the sea otter starting in the late 1970s, the Ka:'yu:'k't'h'/Che:k'tles7et'h' First Nations (which reside just south of Che:k'tles7et'h' Bay) began to notice a serial decline in these sea foods. A resident of Houpsitas who was born in the 1980s told me, "I've never eaten butter clam. I've never eaten abalone. And only when I was really young I got to eat sea urchins, unless they were brought in from another area. And then the only urchins I've seen were really small,

and there's hardly any of the green ones left and you rarely see the purple ones and if you do they're tiny" (interviewee 7). As the sea otter population and range has increased, Nations south of the Ka:'yu:'k't'h' /Che:k'tles7et'h' have also experienced a reduction in marine resources.

4.4. Stewart's research

For her master's thesis, Stewart used two methods for learning about people's perceptions of sea otters: she conducted eleven interviews and she also mailed out a survey. Six of the interviews were with members of the Nuu-chah-nulth First Nations and five were with conservation professionals (CPs). Just over half of the interviews were done face to face, with the rest of them being done over the phone except for one of the interviews with the Nuu-chah-nulth Dr. Richard Atleo, which was conducted by email. Questions were sent ahead of time to interviewees that wanted them. By doing interviews Stewart was able to react to responses during the interview, clarify her questions, and discuss topics in more depth.

Stewart mailed out a survey to all the Nuu-chah-nulth reserves and mailed the same survey to a number of CPs. Stewart received 65 Nuu-chah-nulth and 50 CP responses to her surveys. Her survey had 20 statements and respondents were asked to rate each statement on a scale of 1 (strongly disagree) through 6 (strongly agree).

Interestingly, although Stewart mailed 30 surveys to the Ka:'yu:'k't'h' /Che:k'tles7et'h' reserve, she didn't receive any responses (all her survey responses came from Nuu-chah-nulth in areas south of Ka:'yu:'k't'h' Sound). Stewart was told by Roger Dunlop, the NTC Fisheries Biologist for the northern region, that the Ka:'yu:'k't'h' /Che:k'tles7et'h' did not want any further community consultations about sea otters. Therefore the 16 interviews that I conducted with the Ka:'yu:'k't'h' /Che:k'tles7et'h' help to broaden the understanding of the Nuu-chah-nulth's perceptions on sea otters. It is important to acknowledge that my data collection is 12 years later than Stewart's, and therefore her results may not necessarily represent current views of CPs or the Nuu-chah-nulth. However, the opinions of the Nuu-chah-nulth I interviewed were very similar to the opinions expressed by Nuu-chah-nulth to Stewart, and since the sea otter population has continued to increase (DFO 2014) it is likely that the opinions expressed to Stewart are still held today.

Table 1: Stewart’s Survey Results (Stewart 2006)

Survey Statements	Percent Agree ⁷	Percent Agree
Section 1	Nuu-chah-nulth	Conserver. Profess.
1.1 I would like to see more sea otters nearby where I live.	26.2	82.0
1.2 The recovery of sea otters is generally negative for people living on the West Coast of Vancouver Island	61.3	20.0
1.3 Generally speaking, I like sea otters	44.6	98.0
1.4 I believe that sea otters have already recovered or are very close to being recovered on the west coast of Vancouver Island	70.3	42.0
Section 2		
2.1 I value the role that sea otters have in the ecosystem.	58.7	98.0
2.2 I believe that there was a balanced marine ecosystem that included sea otters, before the commercial sea otter hunt that finally removed sea otters from B.C.	75.4	96.0
2.3 Sea otters are not an important part of the near-shore ecosystem	35.0	6.0
2.4 I believe that sea otters indirectly increase the amount of fish over time	31.1	86.0
Section 3		
3.1 Fisheries and Oceans Canada and local West Coast Vancouver Island people have a respectful relationship regarding Sea Otter recovery.	26.7	33.3
3.2 The recovery goals defined in the federal Sea Otter Recovery Strategy are: a “sufficiently large” sea otter population that is “adequately distributed”. Survey statement: I feel that those goals are too vague.	66.1	87.8
3.3 I expect that West Coast Vancouver Island community members generally respect the approach the federal government has taken on sea otter recovery.	28.3	26.5
3.4 I believe that Fisheries and Oceans Canada values the knowledge of the West Coast Vancouver Island people, about sea otters.	33.3	40.4
Section 4		
4.1 Decisions about Sea Otter conservation should be based entirely on science.	40.3	48.8
4.2 Marine scientists know how many Sea Otters are enough to be considered recovered.	29.0	32.0
4.3 Knowledgeable, local people know how many sea otters are enough to be considered recovered in their area.	75.0	42.9
4.4 Federal decision-making about sea otter recovery should be made from an equitable viewpoint that considers scientific, local and traditional ecological knowledge.	82.5	97.9
Section 5		
5.1 The recovery of sea otters is negative for people living in the area, who rely on species like shellfish and crab.	79.7	64.6
5.2 I believe that it is okay to put sea otter’s rights ahead of human rights to shellfish.	18.8	66.0
5.3 Sustainable harvest of sea otters would reduce conflicts between local people and sea otters	76.2	37.5
5.4 Compensation for local people suffering from sea otter predations would reduce conflicts between local people and sea otters.	52.4	44.9

There are some fundamental differences between the perceptions of the Nuuchahnulth and the CPs in regards to their outlook on: sea otter recovery; the role of the

⁷ Stewart’s survey used a scale of one to six: 1 strongly disagree; 2 disagree; 3 somewhat disagree; 4 somewhat agree; 5 agree; 6 strongly agree, therefore the percentage represents respondents who indicated 4, 5 or 6

sea otter in the ecosystem; human rights compared to sea otter rights; and a sustainable hunt of sea otters (Table 1). The Nuu-chah-nulth acknowledged that sea otters play an important role in the ecosystem but believed that they have already recovered and that there are now too many of them (Table 1). They also thought that DFO was placing the rights of sea otters above people's rights, that this was wrong, and that there should be a sea otter hunt. CPs on the other hand believed that the sea otter had not yet fully recovered and that there should be more of them (Table 1). They also believed it was more important that sea otters have access to shellfish than humans and that there should not be a sea otter hunt.

Although there is lack of consensus on a number of topics, there were still some areas of common ground. There was a shared opinion that the marine ecosystem was balanced before the fur trade and that it would be beneficial if this state could be replicated (Table 1). Both groups supported more inclusion of traditional ecological and local knowledge, and both groups acknowledged that on the topic of sea otters the relationship between the federal government and First Nations was not very good and that there was a lot of room for improving this relationship.

When interviewing the CPs, Stewart found that 80% of them were very aware of the perceived negative effects of sea otters on people who rely on shellfish, but the CPs were not very sympathetic to the situation. None of the CPs thought that a sustainable sea otter hunt was a solution. One of the CPs suggested that people living in places where sea otters were outcompeting them for shellfish should switch to alternate food sources, like deer. Another CP acknowledged that theoretically anything can be managed sustainably but objected to a fur hunt for ethical reasons. Another was concerned that it would be impossible to fully regulate and enforce a hunt. Two thought that an animal protected under SARA shouldn't be hunted and another suggested that it would be better to create a computer model of the hunt first so that it could be evaluated. One CP "felt that the sea otter would always be protected by federal law because of their susceptibility to oil spills."

Stewart's interviews with the Nuu-chah-nulth illustrate a strong frustration with the current sea otter management plan and the views of conservationists. One of Stewart's interviewees stated that because of the loss of shellfish, "the way of life is going to be lost with these animals [sea otters]." Another interviewee referred to the

uncontrolled recovery of sea otters as a “crime but it doesn’t have a law against it yet.” Similarly, another interviewee was angry with the “experiment” that did not consider the effects on, or voices of, the local people. Two of the respondents felt that the sea otters should be considered an “invasive species” and that the reintroduction and subsequent protection of the introduced sea otters were examples of short-sighted human “meddling”. There was one respondent who generally viewed the sea otters positively, but even this interviewee did not want more sea otters and felt that sea otters should be a treaty issue. R. Atleo made it quite clear that he thought there was an imbalance even though sea otters belonged and that the “recovery of sea otters to the point of dominance over other necessary life forms...[was] eco-cide.”

Some of the Nuu-chah-nulth interviewed questioned the ecological benefits and were not sure about the predicted and expected increase in fish population. But one of the interviewees believed there was an ecological value to sea otters “because they create a habitat”. Three of the Nuu-chah-nulth interviewees saw the sea otter as being so negative that they interpreted its protection as a violation of their rights and their children’s and grand-children’s rights to access shellfish. One interviewee suggested that “it’s a violent act being upheld by an Act in Parliament that says we can’t protect our food, and then the other people say that act is right and we shouldn’t be able to go and prevent sea otters from stealing our food”. All the Nuu-chah-nulth interviewees spoke in favour of a sea otter hunt as an important management tool.

4.5. Interviews with the Ka:’yu:’k’t’h’/Che:k’tles7et’h’ residents

While in Houpsitas I asked a number of similar questions as those asked by Stewart such as: what do you think of sea otters; do you think they bring any benefits to sea life or the community; what are your views on compensation for local people suffering from sea otter predation and would that reduce conflicts between local people and sea otters; what do you think of how sea otters are currently managed; and do you think there should be a sea otter harvest.

Although 13 of the people who were interviewed generally had a negative perception of sea otters and did not like how they were being managed, two people had a positive view of sea otters and one other had a pretty neutral view of them. Interviewee

6 was glad that sea otters had returned and stated, “There was a hell of a lot more people then [pre-fur trade], more sea otters, and they existed together then, so I don’t know why it’s so impossible for us to exist with them now.” Interviewee 6 discussed how the sea otters eating urchins was helping kelp come back, which was “habitat for all these other species of fish” and is “a benefit to fish”. Interviewee 11 had similar things to say, “I think that’s the reason [sea otters] our ocean is coming back to life”, and that “we should be giving them compensation [Canadian government]” for bringing back the sea otter. Interviewee 1 stated “I’m a fish guide; a lot of the clients really like them [sea otters]; they’re spreading out more so, you know, a lot of people need to get used to them I guess; they’re playing their part in the ecosystem; just because of the concentration of them around here, they eat all the food, but a lot of that is coming back and the otters are moving up coast. I mean they [sea otters] don’t bother me; everything’s coming back, everything’s kind of equalizing.”

But there was also a lot of anger and resentment about the return of the sea otter and how sea otters are currently being managed. The following comments show not only the frustration with the sea otter, but also how important particular sea foods like sea urchins are for the Nuuchah-nulth. “This is where the sea otters come in: they decimated our sea urchins, abalone, or anything. Clams, they eat a lot of clams and now that they’re here we can’t get a sea urchin” (Interviewee 3). “The first thing we noticed out here where there used to be sea urchins, it’s all covered in kelp now. People said oh that’s good; it hides the little fish. I got real mad at them. I said I can’t get my sea urchin or a lot of things that connect because of the sea otter” (Interviewee 7).

When it came to how sea otters are currently being managed, a number of people showed dissatisfaction with DFO. “If they find a way for us to get rid of it [the sea otter], it would be ok, or scare them away or something; they’ve been dealing with this a long time, but Fisheries [DFO] won’t allow us to do anything. I guess they’re protected” (Interviewee 4). “The otter has multiplied; the people have been totally ignored: ignored about the kelp, ignored about all the sea foods that are depleting from the otter. And we’ve had meetings, and the Fisheries [DFO] always tells us: ‘oh, we balance it out now, we know what happened. You guys eat half the clams and the otter eat the other half.’ And I thought: ‘bullshit. That’s a bullshit story’” (Interviewee 7). Interviewee 12 was not happy with the current management plan and didn’t think that the proposed Nuuchah-nulth management plan went nearly far enough in terms of the number of sea otters that

would be harvested. Similarly, interviewee 5 did not think that the proposed management plan went far enough and suggested that it would be necessary to kill around half the sea otters.

All of the people interviewed were in favor of some kind of sea otter hunt, and all of them thought that more sea otters could be sustainably harvested than were allocated in the proposed Nuu-chah-nulth sea otter management plan. One interviewee suggested hunting half of them . There were some who wanted all the sea otters gone, like interviewee 2 who said, “They should bring them back where they come from. I’d like to get our seafood back. Our old people, they’d like that too, but now they can’t get it; we used to have lots of sea urchins, abalone, clams, crab; they ate up all that; now we’re out.” But this sentiment represented the minority, with most people generally acknowledging that maintaining some sea otter population and having a sustainable harvest was good. Interviewee 3 stated, “It’s going to get to a point where you can control them by hunting them, and you know you don’t have to take all of it; you just take some of it in order to control how they stay around.” Similarly, Interviewee 1 said, “I believe there is enough of them around to have a sustainable harvest for anybody that needs income.” Interviewee 11 suggested that there should be a “radius from the reserves with the sea otter in between so that leaves the kelp to grow so that it’s plentiful for all the bait fish.” Interviewee 11 suggested having a 5-10 mile radius for harvesting, so sea otters would know not to come into this zone, and that this was how sea otters were managed traditionally, with zones around villages where sea otters were harvested and areas between villages where sea otters were left alone.

When asked about the idea of the federal government compensating people for their loss of access to sea food, although a few people suggested that it might make some people happier, no one put an economic value on the loss. Most people just expressed unhappiness about the loss and that the government should help them get their sea food back. A comment by Interviewee 7 illustrates this sentiment: “I’m not sure what kind of compensation I was asking for because there’s lots. We lived on the ocean whether we ate it or sold it helped us get by. And it’s all of it: it’s the clams, the abalone, and stuff like that, the fish, but now there’s a restraint on all. Like we go out there feeling like we’re walking eggshells looking around who’s going to tell on us. Or what will the Fisheries [DFO] do, not that I care.” Interviewee 15 didn’t like the idea of being bought out, wished that people could eat traditional food, and hypothesized that the government

reintroduced the sea otter as a way to force them to shop at stores like Superstore and McDonalds. Interviewee 13 stated that the federal government should help bring some sea food back. And interviewee 16 seemed uncomfortable about answering the question about compensation and stated that no one liked otters and the Canadian government should get rid of them.

Overall, the responses that I got from my interviews were very similar to what Stewart found from her survey and interviews with the Nuu-chah-nulth. Residents of Hupsitas are unhappy with how the sea otter was reintroduced and how DFO is currently managing the sea otter. People are generally in favor of co-existing with some sea otters but would like to be able to harvest and manage them and would like to regain access to a variety of sea food that is no longer accessible due to the predation of the sea otter.

4.6. Recovery strategy for the sea otter in Canada

“The Recovery Strategy for the Sea Otter in Canada” was created in 2002 and was updated in 2007 to meet the requirements of SARA. The strategy is periodically updated following population surveys. DFO, the Government of British Columbia and Parks Canada Agency have jurisdictional control over the plan. The purpose of the strategy is to achieve the full recovery of the sea otter which will be fulfilled “when its long-term persistence in the wild has been secured” (DFO 2007). To achieve this goal, the recovery strategy adopts a non-intrusive approach with the idea that as long as threats such a habitat loss, human-caused mortality and oil spills are mitigated, the sea otter should recover on its own. This strategy has proven to be effective in regards to increasing sea otter population, and as of 2007 sea otters were thought to have repopulated between 25% to 33% of their historic range in BC, and their population continues to grow (DFO 2015).

As has been discussed, although the recovery of the sea otter is doing very well, this recovery has negatively impacted shellfish fisheries, which has negatively impacted First Nations. These negative impacts are not recent, and the government had full understanding that these impact were likely to happen. In 1981 Che:k'tles7et'h' Bay Ecological Reserve was established by the BC government to provide high quality marine habitat for sea otters. A report written in 1992 for BC Parks on the

Che:k'tles7et'h' Bay Ecological Reserve examined both potential threats to sea otters, as well as how the sea otter had been impacting the local ecosystem (Blood 1992). The report discussed how there had been a dramatic reduction in shellfish abundance in the Ecological Reserve due to sea otter predation and that the results of the research conducted in this reserve revealed that there would be tremendous implications for the future of the shellfish industry in British Columbia as the sea otter increased its range.

The report also admitted that the Ka:'yu:'k't'h'/Che:k'tles7et'h' were not consulted when the ecological reserve was created even though a number of Indian Reserves are either completely surrounded by the reserve or can only be accessed by traveling through the reserve. The report acknowledged that sustenance use of marine resources was important for local First Nations and that they had been using these resources for thousands of years. Since the government knew both that sea otters would be negatively impacting shellfish fisheries and that shellfish fisheries were very important to First Nations living adjacent to the sea otters, the government clearly realised in 1992 when this report was written that if First Nations had not already been negatively impacted by sea otters they soon would be. But this report does discuss the need to mitigate impact on marine resources, and in fact takes a sea otter centric view that there may be a need to further restrict human impact on marine resources (some fishery closures within the reserve had already been implemented) so that the sea otter population can continue to flourish.

Evidence of these predicted impacts on shellfish fisheries were shown to have transpired when the Sea Otter Recovery Team (SORT) hosted a number of workshops with coastal communities in February 2004 to gather information from different stakeholders to help inform the creation of a Sea Otter Recovery Plan. The workshops were held in Tofino, Ka:'yu:'k't'h', Nanaimo, Port McNeill, Prince Rupert, Bella Bella, Skidegate, Masset, Victoria, and Vancouver. Over 130 participants attended the meetings and a report of the feedback was compiled by Dovetail Consultants.

The most contentious issue discussed at these meetings was how both First Nations as well as commercial shellfish fishermen felt that the government was placing more importance on the well-being of the sea otter than on people's livelihoods. One First Nations participant stated that "sea otters can have a big impact. Our biologist points out one geoduck harvest area in the Nuchatlitz alone has 19 million pounds of

geoducks in the books. From 1984 to 1997 two million pounds were harvested, or 140,000 lbs. per year. The quota dropped to 2,000 lb. and is now closed because of otters. At \$8 to \$10/lb., it's a significant loss and cost [\$1,120,000-1,400,000 a year].” Similar issues were raised about the impact on other fisheries such as sea urchins and clams. Because of this economic impact, many of the participants suggested that SORT should conduct a cost-benefit analysis to understand how the sea otter recovery is hurting shellfish fisheries.

The participants at these workshops had a number of recommendations both for mitigating the impact of sea otters and for managing them (see Tables 2 and 3). Some of the recommendations were likely not practical and some of them, even if implemented, would not benefit residents of Houpsitas (such as moving the production of shellfish to the Georgia Strait), but suggestions such as helping communities invest in new forms of economic development, experimenting with using noise or other deterrents, having sea otter exclusion zones, or implementing a small ceremonial harvest are all ideas consistent with what I discussed with people while I was in Houpsitas. There is no evidence that 13 years later any of these recommendations have been implemented.

Table 2: Mitigation Recommendations developed by participants from workshops in 2004 (adapted from Dovetail Consulting 2004)

Mitigation recommendations
Investigate possibilities for switching harvesting to other species than shellfish.
“If sea otters are worth a lot, maybe it makes sense to put sea otters everywhere and harvest them.”
Demonstrate alternatives to eating abalone and urchins, perhaps looking back to what coastal communities might have harvested before sea otters were extirpated.
Find ways to make investments in communities to support alternative forms of economic development.
Keep sea otters out of the inlets (e.g., in Ka:’yu:’k’t’h’ territory) since there are no clams left on the outer beaches.
Expand the shellfish fishery ahead of the sea otters to maximize benefits prior to the arrival of sea otters and the subsequent declines in shellfish stocks. To facilitate this, calculate quotas over a shorter timeframe in areas where sea otters are expected.
Support enhancement of geoducks in the Georgia Strait.

Table 3: Management recommendations developed by participants from workshops in 2004 (adapted from Dovetail Consulting 2004)

Management Recommendations
Set threshold numbers at which management could begin.
Establish exclusion zones, or sea otter free zones in areas that are important or unique for other species or for fisheries. Have meaningful local control over where sea otters go.
"Train them to fish for us, like in ancient China!"
Encourage recovery in places where no-one would mind them.
Develop barriers to prevent otters from interfering with shellfish farms or look into predator control.
Simulate crevice habitat in which shellfish can escape sea otters.
Investigate noise deterrents, such as recordings of killer whales.
Look at possibilities for harvesting sea otters – a commercial harvest of sea otters for their pelts, or harvesting for First Nations social and ceremonial uses. "If there could be a manageable harvest, there may be more buy-in from some communities," lessening the need for enforcement. If First Nations were benefiting from the right to harvest, they might take an interest in policing the harvest.
Review experience with mechanisms for management from Alaska.
Set up a management board that would include industry representatives, as well as DFO, World Wildlife Fund, and others (Parks, local groups, etc.).
Look at the abalone stewardship group for a model of how local involvement in management might work, and seek funding to support local involvement.

A common question at these meetings was how large would the population of sea otters need to be before they would be considered recovered. The Blood (1992) report suggested that once the population of sea otters reached 10,000 they could be removed from the endangered list, but DFO did not give a specific number at these meetings, and does not list one in any of their management plans. At the time of these consultations the only statement about sea otter population that DFO would give was that the "recovery plan hinges on geographical distribution and sufficient numbers to survive a catastrophic oil spill" (Dovetail Consulting 2004).

This emphasis on the need to survive an oil spill is probably a direct response to the death of at least one sea otter in Che:k'tles7et'h' Bay as a result of the 1988 Nestucca oil spill in Gray's Harbour, Washington (COSEWIC 2007). This was a relatively small spill that traveled from its source in Washington all the way up the length of Vancouver Island. Thus it is understandable that DFO would be cautious about committing to a specific number of sea otters, and that having sea otters occupying a large enough geographical area may be more important than reaching a specific number since sea otters have a high growth rate and local populations could likely rebound quickly as long as some of the population survived.

For the DFO sea otter recovery plan, a single species approach was chosen. But within the plan it is acknowledged that this decision was based on expediency since “the effort to integrate multiple species conservation issues would have been significant and development of such a recovery strategy could not have been completed within the required timelines” (DFO 2007). The strategy also admits that there are compelling arguments to have a multispecies approach instead since studies have shown that some shellfish and even other protected species like abalone cannot recover in areas where sea otters are left unmanaged (Watson 2000; Chadès et al. 2012).

But there is little evidence that DFO has any intention of implementing a multispecies approach. In their most recent management plan for intertidal clams, DFO recognizes that “on the WCVI, First Nations and commercial harvesters have notified the department of impacts to clam populations from sea otters” and that “due to the difficulty in finding clams there has been little interest from harvesters to put any effort into harvesting” in areas 25, 26 and 27 (DFO 2015). But there is no mention within the plan of any actions that would be taken to mitigate this impact or find ways to make it possible for people living in these areas to once again be able to harvest clams.

The sea otter strategy also acknowledged that there is acute interest in small scale harvesting of sea otters for ceremonial purposes by First Nations, that such an action could be permitted under SARA, and that there is scientific confidence that a limited harvest of sea otters would not jeopardize the survival or recovery of sea otters. Specifications, such as harvest limits and geographic distribution, would need to be decided by the minister, but so far such a plan has not been created (DFO 2014). There was discussion between the NTC and DFO in 2009 to allow for the harvesting of twenty sea otters a year, but this tentative agreement never came to fruition (CBC 2009).

Since 2002 there has been some collaboration between DFO and the Nuu-chah-nulth regarding sea otter management. The Sea Otter Recovery Team is composed primarily of scientists from the three jurisdictional organizations, as well as other prominent sea otter scientists, but it does have one Nuu-chah-nulth and one non-Nuu-chah-nulth consultant to the NTC (DFO 2007). There has also been some inclusion of the Nuu-chah-nulth in data collection as part of a Habitat Stewardship Program project with the West Coast Aquatic Management Association in which biologists from the NTC have made annual boat-based counts (DFO 2007). And since 2002 the NTC and West

Coast Aquatic Management Association have developed and presented workshops to their community members to inform them of the biology and ecology of the sea otter (DFO 2007). These meetings and other forms of consultation have often not been well received, which is not surprising considering that there has been little to no implementation of the recommendations that have come out of these meetings.

4.7. Nuu-chah-nulth sea otter management plan

In 2012 the NTC created a draft sea otter management plan that would allow them to have a sustainable sea otter harvest. The plan discussed how Nuu-chah-nulth communities became increasingly dependent on shellfish for food and economic livelihoods, especially as fish stocks declined. But with the recovery of the sea otter, the Nuu-chah-nulth are facing competition for these foods and sea otters have become a controversial topic within Nuu-chah-nulth communities.

Within the plan, the NTC state that they support conserving sea otters, and that this fits within their traditional values of Hishukish tsa'walk (everything is one) and Isaak (respect with caring), but there is consensus that sea otters need to be actively managed just as their populations were managed traditionally by the Nuu-chah-nulth. The plan lays out a framework for Potential Biological Removal (PBR) calculations for annual allowable harvest, as well as harvest regulations, including boundaries, allowable hunter designations, harvest protocols, bio-sampling, compliance monitoring and enforcement. The purpose of the plan is to maintain healthy sea resources, including a healthy and sustainable sea otter population, while providing ceremonial use sea otter opportunities for Nuu-chah-nulth First Nation communities.

This plan emphasises a very collaborative process (see Table 4) in which Nuu-chah-nulth communities would be able to establish localized management regimes created by each community to meet their specific community needs within the identified harvest limits for all Nuu-chah-nulth territory. Each interested community would be able to conduct sea otter surveys within their territory, which would be used to complement NTC and DFO surveys. This information would then be used to determine harvest limits for each area using the PBR calculations provided in the NTC sea otter management plan. Harvest limits and harvest season would be specified in the communal license issued by DFO. All sea otters that were harvested would be tagged, and information

such as sex and size would be recorded to contribute to information on population dynamics.

Table 4. Collaborative and Cooperative Sea Otter Management Arrangements (adapted from NTC, 2012)

Collaborative and Cooperative Sea Otter Management Arrangements
Nuu-chah-nulth Nations support and participate in:
Ensuring important sea otter habitats are properly protected.
Coordinating and supporting research activities on sea otter population biology, population status, habitat, ecosystem interactions and human impacts.
Coordinating and supporting sea otter education programs for Nuu-chah-nulth, about the ecological value of sea otters, and for the public and agencies, about historical sea otter use and management, ecological conditions and their relationship with Nuu-chah-nulth communities.
Working with and educating other interest groups and agencies to reduce conflicts over this sea otter management program.
In support of this management plan, Nuu-chah-nulth Nations will work with:
Other Nuu-chah-nulth Nations to develop a public communication and education strategy.
DFO to conduct sea otter abundance and distribution surveys and biological research.
Uu-a-thluk (Nuu-chah-nulth Tribal Council Fisheries department) to manage the tagging and bio-monitoring operation (tags, training monitors, etc.).
WCVI Aquatic Management Board (AMB)/NTC to establish the management program and research projects.
Other agencies cooperatively as needed.

Based on the sea otter population in 2007 (4,110 sea otters on the WCVI), using the PBR calculation the Nuu-chah-nulth would be able to harvest 74 sea otters per year throughout the entirety of their traditional territory (this number would now be higher since the population of sea otters has increased). This would be a very conservative harvest and is not expected to have a large impact on mitigating the depletion of shellfish (Anne Salomon, pers. comm., 2016). But this would be a major step forward in terms of granting more autonomy to the Nuu-chah-nulth in how they interact with sea otters and it would help them to reengage in important cultural and ceremonial practices and would likely help to reduce some of the animosity towards DFO.

4.8. Management of sea otters in Alaska

As has been mentioned, sea otters were heavily hunted during the fur trade and were extirpated from the BC coast. By 1911 it is estimated that the world population of sea otters was between 1,000 and 2,000 with the majority living in Alaska (Kenyon 1969). With the implementation of the Fur Seal Treaty, the population in Southwestern Alaska and in South Central Alaska was able to rebound. But since there was no

remnant population in South Eastern Alaska, between 1965 and 1969, sea otters were reintroduced from other parts of Alaska. For the purpose of managing the sea otters in Alaska, the US Fish and Wildlife Services has divided the population into three subgroups: Southwest, South Central and Southeast. The Southwest population is classified as “threatened” under the United States Endangered Species Act, while the two other populations are not listed.

Section 101 (b) of the Marine Mammal Protection Act stipulates that Alaska Natives⁸ may harvest marine mammals (including sea otters) for subsistence purposes or for the creation and sale of Native articles of handicraft or clothing⁹ as long as the harvest is not wasteful. PBR rates are calculated so that a maximum sustainable yield is known, but no harvest limit has been implemented even for the Southwestern population (U.S. Fish and Wildlife 2007). Section 101 includes a stipulation that the Secretary has the power to prescribe regulations if merited by changes in stock abundance.

As of 2014 there were an estimated 54,771 sea otters in Southwestern Alaska, 18,297 in South Central Alaska and 25,712 in Southeastern Alaska. Both Southcentral Alaska and Southeastern Alaska have growing populations, whereas the population in Southwestern Alaska has declined more than 50% from the mid-1980s, although the population is now believed to have stabilized (US Fish and Wildlife Service 2014).

All of these regions experience some annual harvest. The mean reported annual subsistence harvest by Natives from 2006 to 2010 for Southwestern Alaska was 76 sea otters, for Southcentral Alaska 293, and for Southeastern Alaska 447 (US Fish and

⁸ Alaskan Native means a person defined in the Alaska Native Claims Settlement Act (43 U.S.C. section 1603(b)(85 Stat. 588)) as a citizen of the United States who is of one-fourth degree or more Alaska Indian, Eskimo, or Aleut blood, or combination thereof (The Alaska Sea Otter and Steller Sea Lion Commission 2005).

⁹ Authentic native articles of handicrafts and clothing means items made by an Indian, Aleut, or Eskimo which (a) were commonly produced on or before December 21, 1972, and (b) are composed wholly or in some significant respect of natural materials, and (c) are significantly altered from their natural form and which are produced, decorated, or fashioned in the exercise of traditional native handicrafts without the use of pantographs, multiple carvers, or similar mass copying devices. Improved methods of production utilizing modern implements such as sewing machines or modern techniques at a tannery registered pursuant to § 18.23(c) may be used so long as no large scale mass production industry results (The Alaska Sea Otter and Steller Sea Lion Commission 2005).

Wildlife Service 2014). The sea otters harvested in Southwestern Alaska were not harvested from the areas with negative growth rates.

In 1988 the Alaska Sea Otter Commission was created as a tribal consortium with the purpose of promoting Alaska Native involvement in policy decisions pertaining to sea otters. In 1998, at the request of member tribes, the Alaska Sea Otter Commission added Steller sea lions to its mission and goals, formally expanding to the Alaska Sea Otter and Steller Sea Lion Commission (TASSC). This organization had been involved in management activities such as the creation of sea otter management plans and a sea otter bio-sampling program. In some instances, tribal governments have created permits for hunting sea otters in their territory and have mapped specific areas where hunting is either encouraged or discouraged, but the tribal governments do not have enforcement powers, and although the U.S. Fish and Wildlife Service encourages hunters to check with a Tribal government before they hunt, it is not a requirement (U.S. Fish and Wildlife Service 2014).

As in BC, clams are important to indigenous people in Alaska and therefore some indigenous groups are using their right to hunt sea otters as a method to protect important clam beaches (Sonia Ibarra, pers. comm. 2016). Sea otters in these areas have learned to associate small skiffs with danger which means that they can be more easily driven away from beaches, which has allowed the creation of sea otter exclusion zones.

4.9. Evaluation of sea otter management plans as forms of co-management

With the election of Justin Trudeau as the prime minister of Canada in 2015, there has been a new emphasis in the government towards improving relationships with First Nations and reconciling past government actions. In his mandate letter to the Minister of Fisheries and Oceans Prime Minister Trudeau stressed the need to “work with the provinces, territories, Indigenous Peoples, and other stakeholders to better co-manage our three oceans” and that “no relationship is more important to me and to Canada than the one with Indigenous Peoples. It is time for a renewed, nation-to-nation relationship with Indigenous Peoples, based on recognition of rights, respect, co-operation, and partnership.”

This emphasis on the need to engage and collaborate with the First Nations has been reiterated many times by the Prime Minister and has been a high profile issue during his tenure as Prime Minister. He used his platform at the UN on September 21, 2017 to discuss past issues between the government of Canada and Indigenous people and declared that “new relationships between the government of Canada and Indigenous Peoples” should be “based on recognition of rights, respect, co-operation and partnership”. In October his government released 10 principles to reflect the United Nation Declaration of Indigenous Rights (UNDRIP) (Federal Department of Justice 2017), and has since committed to implementing the UNDRIP in Canadian law.

This paper has discussed how there has been a complete lack of accommodation with First Nations by the Federal government in regards to managing sea otters. But with a new prime minister and a new mandate it is important to look at other options for the co-management of sea otters between First Nations and the Federal government. Using one component of Pinkerton’s five-part framework, a comparison of the current sea otter management regime as well as alternative sea otter management regimes are evaluated for the purpose of understanding the lack of co-management opportunities in the current system and potential opportunities for increasing co-management of sea otters by First Nations.

Table 5: Comparison of different sea otter management plans as forms of co-management

Nature of the Co-management Institutional Arrangement	The Recovery Strategy of the Sea Otter in Canada (current plan)	Nuu-chah-nulth Tribal Council Sea Otter management plan (proposed plan)	Sea otter management plan in Alaska
<p>What long-term historical developments caused the co-management claim to arise, and what present political situations are affecting it?</p>	<p>Historical developments:</p> <ul style="list-style-type: none"> • Reintroduction of sea otter in 1969-72 • Systematic loss of local shellfish resources <p>Present political situation:</p> <ul style="list-style-type: none"> • Lack of accommodation by DFO due to rules in place by 	<p>Additional historical developments:</p> <ul style="list-style-type: none"> • Colonial interactions including but not limited to residential schools, potlach bans and land disputes • Loss of fishing licenses <p>Additional political situations</p>	<p>Historical developments:</p> <ul style="list-style-type: none"> • Reintroduction of sea otters to South East Alaska in 1965-1969 • Decline of sea otter population in parts of South West Alaska starting in the mid 1980s resulting in this population being

Nature of the Co-management Institutional Arrangement	The Recovery Strategy of the Sea Otter in Canada (current plan)	Nuu-chah-nulth Tribal Council Sea Otter management plan (proposed plan)	Sea otter management plan in Alaska
	<p>conservative government from 2003-2015</p> <ul style="list-style-type: none"> • No recent changes • Sea otters are cute charismatic megafauna which influences public perception 	<ul style="list-style-type: none"> • Court cases (e.g., the Ahousat case) • Some of the NTC nations are part of the Maa-nulth treaty • Reassertion of aboriginal rights 	<p>listed in 2005 as threatened</p> <ul style="list-style-type: none"> • Systematic loss of local shellfish resources especially in South East and southcentral Alaska • 1972 Marine Mammal Protection act allows Alaska Natives subsistence hunting rights <p>Present political situations:</p> <ul style="list-style-type: none"> • In response to the impact on shellfish in 2013 an Alaska state senator proposed a bill that would offer a \$100 bounty for tagged sea otters to Alaska natives but this bill did not get passed.
What immediate crisis or issue caused the co-management claim to arise?	<ul style="list-style-type: none"> • Substantial increase in sea otter population resulting in sharp decline in local shellfish which impacts local economy and livelihoods 	<ul style="list-style-type: none"> • Substantial increase in sea otter population resulting in sharp decline in local shellfish which impacts local economy and livelihoods 	<ul style="list-style-type: none"> • Substantial increase in sea otter population resulting in sharp decline in local shellfish which impacts local economy and livelihoods
What is currently the main focus of the co-management	<ul style="list-style-type: none"> • No co-management Single species 	<ul style="list-style-type: none"> • Protection and sustainability of sea otter 	<ul style="list-style-type: none"> • Protection of sea otters, especially the threatened

Nature of the Co-management Institutional Arrangement	The Recovery Strategy of the Sea Otter in Canada (current plan)	Nuu-chah-nulth Tribal Council Sea Otter management plan (proposed plan)	Sea otter management plan in Alaska
arrangement?	management of sea otters with an emphasis on protection and increased population	population while allowing for small scale harvesting of sea otters for ceremonial purposes	population in South west Alaska, and subsistence hunting rights for indigenous people
What is the scope of the specific co-management activities? (e.g., in what particular management activities is the community involved?)	The Nuu-chah-nulth are involved in: <ul style="list-style-type: none"> • Data collection on sea otter populations • Education to own community and others about sea otters: benefits and reasons for human sea otter conflict • Advising as a member of the sea otter management strategy 	The Nuu-chah-nulth would be involved in: <ul style="list-style-type: none"> • More extensive data collection • More extensive education of own community and others about sea otters' benefits and reasons for human-sea otter conflict, and why there is a legal hunt • Enforcing legal sea otter hunt in local areas (with help from DFO) • Granting licenses (once a communal license is granted by DFO) • Planning of sea otter management plan (needs approval by DFO) 	Alaska Natives: <ul style="list-style-type: none"> • Data collection on sea otters • Hunting rights exclusive to natives • Harvested animals must be reported to the Fish and Wildlife Service • Some Tribes in Alaska have developed management plans, regulations and ordinances governing the take of sea otters in their area.
What stage of development of co-management is described (how old, how developed)? Is it institutionalized (has it become the normal, expected way of operating)?	The current plan has been in effect since 2002 and was updated in 2007 to come in line with SARA. <ul style="list-style-type: none"> • The plan is continuing to evolve and be 	Hasn't been implemented	Natives have had harvest rights since 1972 <ul style="list-style-type: none"> • Some Tribes in Alaska have developed more recent management

Nature of the Co-management Institutional Arrangement	The Recovery Strategy of the Sea Otter in Canada (current plan)	Nuu-chah-nulth Tribal Council Sea Otter management plan (proposed plan)	Sea otter management plan in Alaska
	<p>reassessed as sea otters recover and continue to be down listed</p> <ul style="list-style-type: none"> • The mandate of a total ban on sea otter hunting has been institutionalized since the sea otter was reintroduced in 1969. 		<p>plans, regulations and ordinances governing the take of sea otters in their area. They do not have the power to enforce these regulations</p>
<p>What is the geographic scale of the management unit(s) to which the rights apply? How many km² are affected? Is it local, regional, or national? Is the scale appropriate for the goals of management?</p>	<p>Applies to the entire coast of BC, but is divided up into local regions.</p>	<p>Would only apply to the Nuu-chah-nulth territory on the WCVI (see Figure 1), and each community, with the involvement of their Ha'wiih and fisheries management program, would establish localized management regimes to endeavor to meet specific community needs within the identified harvest limits for all Nuu-chah-nulth and based on the population dynamics of the local sea otter population.</p>	<p>Natives have harvest rights in the entirety of Alaska, although some tribes have local regulations that other natives are expected to follow when hunting in their territory.</p>
<p>What property rights or management rights are held by the community? Are the rights <i>de jure</i> (formal, legal) or <i>de facto</i> (informal)? Is</p>	<p>Legal/formal rights:</p> <ul style="list-style-type: none"> • Aboriginal rights to food and ceremonial harvest of animals of 	<p>Additional legal/formal rights:</p> <ul style="list-style-type: none"> • Enforcement of legal hunt (with oversight from DFO) 	<p>Legal/formal rights:</p> <ul style="list-style-type: none"> • Harvest rights • Data collection • Some form of regulations • Traditional

Nature of the Co-management Institutional Arrangement	The Recovery Strategy of the Sea Otter in Canada (current plan)	Nuu-chah-nulth Tribal Council Sea Otter management plan (proposed plan)	Sea otter management plan in Alaska
<p>there a cluster of rights held by the community that is more powerful in concert because of their completeness?</p>	<p>special concern under SARA (although this has not been implemented)</p> <ul style="list-style-type: none"> Involved in data collection since 2002 <p>Informal rights:</p> <ul style="list-style-type: none"> Largely self-regulated since DFO doesn't visit remote areas like Housitas very often Some illegal hunting is done, but difficult for government to enforce anything 	<ul style="list-style-type: none"> Power to Grant licenses (with oversight from DFO) Architect of policy document Right to plan a sea otter harvest (with approval from DFO) 	<p>handicrafts may be sold to non-native but not pelts</p> <ul style="list-style-type: none"> No enforcement rights
<p>What level of power is held by the community overall? Are the community rights operational, collective choice, or constitutional? Is the power delegated (subsidiarity or vertical) or is power derived from other sources and thus more horizontal (treaty, constitutional rights, property ownership, etc.) which recognize the right to self-government?</p>	<p>Level of power: Low</p> <p>Community rights:</p> <ul style="list-style-type: none"> Some operational rights in terms of collecting data Theoretical operational rights under SARA for ceremonial harvest, but has yet to be implemented. Vertical power, all delegated from government (primarily DFO) 	<p>Level of power: Medium</p> <p>Community rights:</p> <ul style="list-style-type: none"> Communities would gain some power to create local policy. This policy creation would give collective choice rights through the ability to grant licenses to help enforce sea otter hunts Vertical power, all delegated from government (primarily DFO) 	<p>Level of power: Medium</p> <p>Community rights:</p> <ul style="list-style-type: none"> Community has operational right to harvest (but there are a number of restrictions imposed by the federal government) Some Tribes have developed management plans, regulations and ordinances governing the take of sea otters in their area. But

Nature of the Co-management Institutional Arrangement	The Recovery Strategy of the Sea Otter in Canada (current plan)	Nuu-chah-nulth Tribal Council Sea Otter management plan (proposed plan)	Sea otter management plan in Alaska
			<p>the federal government could supersede these regulations and the regulations are not actually enforceable against other natives</p> <ul style="list-style-type: none"> • Vertical power, all delegated from government (primarily Fish and Wildlife Service) • Since only natives living on the coast that have one-fourth blood quantum are allowed to hunt this excludes a number of people who feel they should have the right to hunt
<p>What is the nature of the outcomes described? How many are process outcomes in the form of new human relationships (more trust, frequent communication and active collaboration, creation of new values, understanding, meaning, etc.), and how many are substantive outcomes in the form of agreements and their implementation (rules, monitoring, enforcement)? Robustness and resilience</p>	<ul style="list-style-type: none"> • The education programs started in 2002 may help contribute to improved relationships, but due to historic conflict with the government and a continued perception that the government isn't being helpful, there is a lack of trust; information sharing needs to 	<ul style="list-style-type: none"> • Implementation of this plan would likely increase trust between DFO and the NTC which would likely lead to more communication and active collaboration. 	<ul style="list-style-type: none"> • There seems to be high compliance since there is very little evidence of illegal kills of sea otters, and information is shared with the federal agency. • The cost of hunting (use of boat, bullets, tanning, and modifying of pelts) makes it unaffordable for

Nature of the Co-management Institutional Arrangement	The Recovery Strategy of the Sea Otter in Canada (current plan)	Nuu-chah-nulth Tribal Council Sea Otter management plan (proposed plan)	Sea otter management plan in Alaska
of management system? Of trust?	be improved.		some people living in remote villages who would like to be hunting sea otters (Sonia Ibarra, pers. comm. 2017)

As can be seen in Table 5, within the current management plan, the Nuu-chah-nulth have very limited power and are only involved in data collection and education. There is also a very low level of trust between the Nuu-chah-nulth and the government due to government policies that have negatively impacted the Nuu-chah-nulth. While the current DFO plan discusses the opportunity for allowing some small scale harvesting of sea otters by First Nations, this has yet to be implemented, and even if it were, it is unclear how much autonomy the Nuu-chah-nulth would have in granting licenses and enforcing the harvest. It is also unclear if the level of harvest would meaningfully reduce sea otter impact on endangered shellfish such as abalone, and important food fish such as clams.

In contrast, the sea otter harvest in Alaska seems to be working effectively. There is no evidence that Alaskan Natives are harvesting more sea otters than would be sustainable. There is very little illegal hunting of sea otters; there is evidence of the effectiveness of creating sea otter exclusion zones; and Alaskan Natives have shown the capacity to self-manage and regulate a sea otter harvest. It is important to acknowledge that the population of sea otters in all parts of Alaska is much higher than on the WCVI, so, obviously, the size of a harvest in BC would be much smaller. It has been suggested that, due to the fact that sea otters are non-migratory, and individuals tend to occupy a relatively small range (unless forced out by other sea otters or by lack of food), that they should be managed on a small spatial scale so that local populations are not exterminated (Bodkin and Monson 2002). But there is no reason that these factors could not be taken into consideration when creating a harvest plan for BC.

If the NTC sea otter management plan was accepted and implemented by DFO, this would be an acknowledgement that the NTC does have management rights for this

resource, and this would give them greater autonomy regarding the management of sea otters. They would still require DFO to grant them communal licenses, but they would then have the ability to grant individual licenses and would be involved in enforcing a legal hunt. This would increase trust between the NTC and DFO, and, based on the responses from interviews, it would likely help to decrease frustration among the Nuu-chah-nulth who are being impacted by the sea otter. It is also possible that the hunt could be used to help protect some important food sources, like clam beaches, which could allow some of these resources to recover.

4.10. Conclusion

Sea otters have been a source of controversy in BC since their population began to increase in the 1970s. Although multiple groups have been negatively impacted by the return of the sea otter, the Nuu-chah-nulth have borne the brunt of the impact due to their geographical proximity to where the sea otters were reintroduced and because of their strong reliance on multiple sea foods for which the sea otter is outcompeting them. This has caused the Nuu-chah-nulth to be frustrated and angry with how DFO is currently managing the sea otter, and this anger is compounded by historical colonial interactions as well as loss of access to other resources (such as finfish) due to changes in licensing and fleet rationalization.

Sea otters were historically managed by the Nuu-chah-nulth, and granting them harvesting rights would likely increase trust between the Nuu-chah-nulth and DFO and help alleviate some of the anger around the loss of access to other sea foods. Because the sea otter is a charismatic species, it is likely more difficult for the government to follow through with the implementation of a sea otter hunt. As has been shown by Stewart's work, CPs are opposed to a sea otter hunt even though they acknowledge that a small scale one could be done sustainably, and there is reason to believe the general population may have similar views, based on their prevalence in popular culture and the perception of sea otters as cute and cuddly (as illustrated by the number of links when you type in "cute and cuddly sea otter" in Google). Although there would almost assuredly be vocal opposition to a sea otter hunt, the BC government allows both a wolf hunt and a grizzly bear hunt, both of which have vocal opposition. There is, therefore, precedent for harvesting charismatic megafauna, and it is realistic that a small scale sustainable sea otter hunt for ceremonial purposes could be implemented just as it is in

Alaska. This could help to improve relationships between the Nuu-chah-nulth and DFO and thereby improve the management of the sea otter through better data sharing and improved enforcement of illegal hunting.

Chapter 5. Kelp

5.1. Introduction

As mentioned earlier, one of the purposes of the interviews with Ka:'yu:'k't'h'/Che:k'tles7et'h' First Nation members was to see whether people were interested in going to Bamfield to be trained in wild kelp harvesting by Dr. Druehl. The interviews were also used to find out how much people knew about kelp, and to gain some insight into the compatibility of kelp harvesting for residents of Hupsitas. This compatibility was evaluated using information learned from interviewing Dr. Druehl about his kelp harvesting company (Canadian Kelp), interviewing another owner of a kelp harvesting company that no longer exists (and which will be referred to in this chapter as KHC 2, for "kelp harvesting company two"), and researching kelp companies currently operating in BC.

Although there are many non-kelp species of seaweeds that are abundant on the WCVI and are eaten and sold commercially, this research focused on kelp harvesting for the following reasons: the four species of wild seaweed that Dr. Druehl harvests are kelp, and the training that he offered only focused on kelp harvesting; the species of kelp he harvests have high levels of micronutrients, anti-oxidants and dietary fibre, and are therefore able to fetch a high price as a specialty food; over 90% of the seaweed biomass on the WCVI is made up of three species of kelp, *Luminaria setchellii* (also called kombu), *Macrocystis pyrifera* (also called giant kelp) and *Nereocystis leutkeana* (also called bullkelp) (WCVI Aquatic Management Society 2004); and kelp production bi-products can easily be used for other products like kelp flakes, chips and natural products for spas.

This chapter will examine the potential for kelp harvesting as an economic alternative/supplement to clam harvesting. Since kelp harvesting appears to be a growth industry and is relatively inexpensive to set up, it may provide an opportunity to help mitigate some of the negative impact from the loss of income to the community due to reduced access to other marine resources caused by government policies and introduced predators like the sea otter and green crab. This chapter will discuss the opportunities and challenges of starting a kelp harvesting operation, potential

partnerships and using the feedback from the interviews with the Ka:'yu:'k't'h'/Che:k'tles7et'h' to examine their interest in this venture.

Although the majority of this chapter is focused on understanding and evaluating the opportunity for harvesting kelp in the Ka;'yu:'k't'h'/Che:k'tles7et'h' this chapter begins by explaining what kelp is, providing a high-level view of kelp harvesting and the global seaweed industry (along with Canada's place in this industry), and exploring what it means to practice sustainable kelp harvesting.

5.2. Kelp definition

Kelp and seaweed are often colloquially used interchangeably to talk about marine plant-like organisms (algae). For instance, during my interviews in Houpsitas when I asked people whether they ate or had eaten kelp some people responded by talking about their experience eating dulse which is a red algae and not actually a species of kelp. Technically, the word seaweed is a broad term that refers to over 10,450 marine plant-like organisms which are then divided into four different groups based on colour: blue green-algae, red algae, brown algae, and green algae (Klinc 2013). Kelp are a subgroup of brown algae and belong to the order *laminariales*.

5.3. Global seaweed market

Although many cultures have used seaweed historically, in recent history (and especially throughout most of the 20th century) China has been by far the largest producer of cultivated seaweed (accounting for nearly 58% of global cultivated seaweed production in 2010). Other major seaweed producers include Japan¹⁰, South Korea, North Korea, Philippines, and Indonesia (Nayar & Bott 2014). . Most other cultures have historically relied on seaweed as a food of last resort, and with the increase in trade and access to other food sources, the use and harvesting of seaweed for many countries was significantly reduced throughout the 20th century. This reduction is illustrated in the decline of the dry dulse market in Iceland from 30 metric tons 200 years ago to only 2 metric tons today (Mouritsen 2013).

¹⁰ In Japan seaweeds make up 10% of the population's total nutritional intake (Mouritsen 2013).

Even though seaweed use in many countries had diminished, recently there has been growing recognition that seaweeds are an important food source for dealing with global food security issues (Bjerregaard et al. 2016) since it grows much more quickly than terrestrial plants, does not use up precious terrestrial space, and is quite nutritious. About 80% of seaweed production is used for human consumption (West et al. 2016); other uses include cosmetics (like soap and exfoliating creams), animal food, and fertilizer.

The nutrient composition of seaweed varies and is affected by species, geographic area, season, and water temperature. However, seaweeds generally have a high nutritional value and are rich in vitamin A, E, C and Niacin. Concentration of vitamins B12, B1, pantothenic acid, folic, and folinic acids are generally higher in greens and reds than in browns, but the brown algae possess organic iodine in greater amounts. Seaweeds are similar to oats in protein and carbohydrate values (Klinc 2013). It is due to this high nutrient content that kelp has become so popular in health stores.

There has been a large growth in aquaculture and wild harvesting of seaweed over the last 50 years. As of 2012 the production of seaweed from mariculture had reached 24.9 million tons and was valued at \$6 billion in US dollars, with China dominating this market with 50% of the production from 2003 to 2012. Indonesia and the Philippines are the next largest producers. The total amount of production has been steadily increasing for the last 10 years at an average of 8% each year (FAO 2014).

Around 1 million tons of wild stocks of seaweed are harvested per year (FAO 2014). Since 2003 the top four producers of wild seaweed have been Chile, China, Norway and Japan. Chile produces around 10% of the wild stocks, which are primarily used for creating alginic acid (which serves a variety of purposes but is commonly used as a thickening agent in food or cosmetic products) (Vásquez 2008). Canada currently produces 1% of the wild stock. “In 1997, the North American market for edible seaweeds was worth \$30.6 million” (WCVI Aquatic Management Society 2004).

5.4. Sustainable kelp harvesting

Due to its fast growth rate kelp is ideally suited as a high output sustainable resource, but, like all resources, wild populations of kelp can be negatively impacted by

over exploitation (McLaughlin et al, 2006) and by climate change (Dayton et al, 1999). Since kelp grows in the ocean it has to deal with very different kinds of impacts from climate change than do terrestrial plants. An increase in sea temperature can have highly negative impacts on kelp growth as there are then fewer nutrients such as nitrate, which is necessary for kelp production (Dayton et al, 1999). Marine heat waves have been found to kill off kelp, and these are expected to become more common due to anthropogenic climate change (Smale & Wernberg 2013). In recent years bull kelp forests have seen a reduction of 93% off the California coast, and warmer temperatures are believed to be one of the main contributors to this die off (CDFW 2016). It is therefore imperative to take the impacts of climate change into account when determining a sustainable harvest rate.

There are different methods for practicing sustainable kelp harvesting. One of the more prominently studied forms of kelp harvesting is done in Norway where kelp is harvested on a five-year cycle using sea weed trawlers to harvest *Laminaria hyperborean*. These trawlers harvest from 50 to 150 tonnes per day, with eleven seaweed trawlers operating and a total annual harvest from 130,000 to 180,000 tonnes per year, depending on market demand (Vea & Ask 2011).

This is claimed to be sustainable because, although the entire kelp canopy is removed, by rotating between sites the kelp has time to regrow, and the maximum sustainable yield is not surpassed. But critics call this a myopic definition of sustainability since it only focuses on the resource being harvested and not on the larger ecosystem impacts on other species. There is concern that there may be multi-trophic consequences from the harvest since the harvesting removes all canopy-forming kelp plants, leaving either a barren track or a track that is vegetated by small kelp plants that ensure re-growth. There is some evidence to suggest that this form of harvesting has short-term negative impact on multiple trophic levels with the number of juvenile fish remaining low for several years following kelp harvest. Predators such as cormorants are then impacted by the loss of their food source (Lorentsen et al. 2010). It is unclear if there is a long-term impact from this. It has therefore been suggested that to determine the sustainability of a harvest, a cumulative impacts assessment on the entire local food web must be done (Seeley & Schlesinger 2012).

The large-scale harvesting of kelp that is practiced in Norway is not currently being practiced in British Columbia. There is large-scale harvesting of seaweeds (but not kelp) on the east coast of Canada (Sharp 2006), and there has been recent interest in large-scale harvesting of seaweed in BC, but a pilot project of beach harvesting of seaweeds on the east coast of Vancouver island has created some concern and controversy over the unknown ecological impacts (Birtwell et al. 2013).

There are only three kelp harvesting companies operating in BC (for the purpose of selling high quality food products¹¹) and they are very small-scale, cottage industries. All three companies practice selective hand harvesting of kelp, leaving the stipe (equivalent to the stem in plants) intact and only taking the fronds so that the kelp can easily and quickly recover. Although there have been no impact studies, Dr. Druehl has been practicing this form of harvesting for over 30 years, and it is unlikely that such a small-scale form of harvesting is negatively impacting the local ecology.

5.5. Interviews in Ka:'yu:'k't'h'

During the interviews when people were asked what their experience was with harvesting and using kelp, everyone responded that they had eaten (herring) roe-on-kelp and many that they had harvested roe-on-kelp. The most commonly used kelp for roe-on-kelp was giant kelp. Only one of the people interviewed currently harvested kelp for subsistence purposes, although three others mentioned that they had eaten kelp when they were young and that back then it had been more common for people to eat kelp. The kelp was sometimes eaten wet, or was dried in the sun before being eaten. A few others mentioned that they had eaten other seaweeds like dulse when they were young. Two of the people interviewed had experience working on one of the kelp farms located between Houpsitas and Fair Harbour.

On the way to Houpsitas I had talked with the owner of one of the kelp farms located near Fair Harbour. He sold only wet kelp to restaurants because he did not own a drying facility (having no land in the area where he could build one). He had another form of income and was unsure if he wished to continue owning his farm since it did not make him much money but required a lot of work. He was based in Campbell River and

¹¹ A company in Sooke, Seaflora harvests kelp for the cosmetic industry (<https://seafloreskincare.com/>)

found that the travel cost, both in time and money, was the main thing that prevented him from benefiting from his farm. He thought that the residents of Houpsitas with their proximity to kelp would be at an advantage, although he still thought that transporting kelp to a market could be a logistical hurdle. For this reason I asked people during the interviews if they thought that the transportation of kelp to customers might be an issue, and whether or not they had any suggestions for how to overcome this logistical issue.

When asked about where they might be able to have a drying facility, people in Houpsitas were unsure because the community has limited available space. This is an issue since there are members of the Ka:'yu:'k't'h'/Che:k'tles7et'h' who would like to live on the reserve, but, due to lack of space to build new accommodation, people are forced to live off reserve. Therefore, finding space for a drying facility could be difficult. One interviewee suggested the idea of putting the drying facility on a barge, and another one suggested building it at Fair Harbour.

Everyone that was interviewed thought that the idea of harvesting kelp in Houpsitas sounded like a reasonable economic venture but many of them were not sure who would have time to start up a business in the summer months since many people work as fish guides, and the fish guide season is the same as the kelp harvesting season (see table 6). This reality was illustrated when it became very difficult to find two people that were available to go down to Bamfield to get the free training at the time it was offered, and, in the end, only one person went to be trained.

Table 6: Kelp Harvesting Season

Type of kelp	Harvest season
Giant Kelp	April-June
Kombu	June-Sept.
Winged kelp-	July-Aug
Bull kelp	July-Oct

I followed up by email with the trainee a year later to ask if he thought the experience was worthwhile. He told me that it was an awesome experience and that the Ka:'yu:'k't'h'/Che:k'tles7et'h' was hoping to get some more people trained and that he was optimistic that a kelp harvesting company could be set up soon. He mentioned that one of the roadblocks to starting had been the lack of space for setting up a drying facility, and that they still had to figure out where they could build one.

5.6. Marketing and distribution

The question of how the kelp might be marketed and distributed is important to consider. A number of ideas were discussed during the interviews in Houpsitas, as well as with Dr. Druehl and the owner of the kelp farm near Houpsitas.

Dr. Druehl has offered to buy some kelp from the Ka:'yu:'k't'h' /Che:k'tles7et'h' and would then market it himself. It would make sense to therefore initially partner with Dr. Druehl and take advantage of this opportunity. This would provide the Ka:'yu:'k't'h' /Che:k'tles7et'h' with a guaranteed income and, because he has a well-established company and cliental, it would help create exposure for Ka:'yu:'k't'h' /Che:k'tles7et'h' kelp. It would also allow the Ka:'yu:'k't'h' /Che:k'tles7et'h' to continue to benefit from Dr. Druehl's knowledge and expertise

Although there are many advantages of partnering with Dr. Druehl, it is possible that overtime the added logistics of marketing through Dr. Druehl (since he lives in Bamfield and is largely retired) may mean that in the future other options should be explored.

Another marketing opportunity, suggested by a couple of the people that were interviewed in Houpsitas, was seeing if it was possible to partner with the Kyuquot Sound Sablefish Fish Farm. Some of the Ka:'yu:'k't'h' /Che:k'tles7et'h' have a very good relationship with the owners of the fish farm (having worked for the fish farm themselves) and believe that the owners of the fish farm might be interested in helping to market and distribute kelp products. Since the fish farm already transports its fish out of Kyuquot, this could be a good opportunity for reducing transportation costs. However, no one was really clear how they thought this relationship might work, so it was not clear whether they envisioned Kyuquot Sound Sable Fish being a true partner in a kelp harvesting business or whether they thought it would be more a corporate neighbour helping members of Houpsitas set this up since the fish farm has the capacity and would want to maintain a positive relationship with Ka:'yu:'k't'h' /Che:k'tles7et'h'.

The owner of the kelp farm near Fair Harbour had also mentioned that he might be interested in helping to sell and market kelp. He had built up a small local client base in Campbell River and on other parts of Vancouver Island and thought that it wouldn't be difficult to expand this clientele. He has a strong understanding of the kelp in the local

area and of the logistical hurdles involved with trying to transport and market kelp locally, but his interest in being involved wasn't totally clear, and since he doesn't have a large client base, a web presence, or a proper business (unlike Dr. Druehl or the Sable Fish company), it is not clear how useful it would be to partner with him.

Another option could be to seek support from the *Uu-a-thluk*, which is an aquatic resource management organization administered through the NTC. Uu-a-thluk is funded through a contribution agreement with DFO and works to build capacity for Nuu-chah-nulth trying to harvest marine resources for commercial purposes. A Nuu-chah-nulth brand could be used for the kelp products, and they could be marketed as organic and from a pristine area.

5.7. Compatibility with people in Ka:'yu:'k't'h'

Table 7: Comparison of Two kelp Business

	Kelp harvesting business (KHB) 1	Kelp harvesting business (KHB) 2
Drying facility		
Cost	Unsure, was done a long time ago and converted existing building	\$33,000-35,000 + labour
Dimensions	<ul style="list-style-type: none"> • 16x24 foot drying area (18 foot ceiling) • 16x10 room for packaging • Loft for storing dried kelp before/after packaging • 8x16 facility with cardboard boxes 	<ul style="list-style-type: none"> • Total size is 20x20 feet. 20x12 feet area used for drying, two stories high. • Third of it used for drying, packaging and a small washroom (12x8 feet).
Requirements for code	<ul style="list-style-type: none"> • Required to build facility to the same requirements of a fish plant to pass food safety inspection agency requirements¹². • Yearly inspection 	
Drying set up	<ul style="list-style-type: none"> • 4 1,500 watt industrial heaters • 4 house fans • 1 large fan at peak of ceiling • Humidistat to turn on large fan • Dry enough kelp to produce 25kg of dry product • Temperature at 38 degrees Celsius • Hangs kelp on cedar poles (anti-microbial properties), but 	<ul style="list-style-type: none"> • Pellet furnace (cheap Charlie) • House fans • Exhaust fan at the peak of the roof • Humidistat to turn on large fan • Dry enough kelp to make 30-40 kg of dry product • temperature at 38 degrees Celsius (less stringent on this) • Hung kelp on metal rods

¹² The requirements can be found on the BC Agriculture and Seafood page: <http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/fisheries-and-aquaculture/seafood-industry-licensing>

	inspection agency would prefer metal	<ul style="list-style-type: none"> Used a boat trailer winch with a system of pulleys and racks to raise the kelp to dry it (3 to 1 pulley system).
Kelp harvesting		
Harvesting procedure	<ul style="list-style-type: none"> One-day harvest, takes 36 hours to dry kelp, and then can go out and harvest again Harvest takes around 3 hours at harvest site + travel time Can collect around 250kg of sea weed at a time Uses one driver and 1-2 other people Uses 20 laundry baskets on boat to store kelp (12kg per basket) Rinses laundry baskets after use 	<ul style="list-style-type: none"> Uses 45 gallon blue barrels (like used for shrimp and oyster culture) Uses trailer to transport boat to his house Hangs kelp outside first to start drying process and to turn kelp black colour (from uv rays)
Boat used	<ul style="list-style-type: none"> 16 ft Boston Whaler 	<ul style="list-style-type: none"> Wielded aluminum skiff, not as big as herring skiff
Employees	<ul style="list-style-type: none"> Has two employees that collect and dry the kelp 	<ul style="list-style-type: none"> Didn't have any employees
Licensing	<ul style="list-style-type: none"> Processing license yearly \$210¹³ Harvest license yearly \$110¹⁴ 	
Selling price of dried kelp (dried)	<ul style="list-style-type: none"> \$6.90 for 21 grams of Giant Kelp \$6.90 for 35 grams of Bull Kelp \$8.90 for 35 grams of Winged Kelp \$6.90 for 42 grams of Laminaria 	<ul style="list-style-type: none"> Sold kelp for \$35-50 kg
Marketing information	<ul style="list-style-type: none"> Primarily outsourced marketing to buyers Has website 	<ul style="list-style-type: none"> Found this to be the hardest part of the business, but didn't have the money to invest in marketing
Buyers	<ul style="list-style-type: none"> Horizon Distributors PSC Distributors Quality foods Health food stores Capers Local restaurants in Bamfield and Tofino 	<ul style="list-style-type: none"> Fair bit of local sales Co-op in San Francisco A store in Victoria Over the internet Pharmaceuticals

¹³ Link to the form for processing license: http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/fisheries-and-aquaculture/seafood-industry-licensing/2017_-_application_-_processor.pdf

¹⁴ Link to form for harvest license: http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/fisheries-and-aquaculture/marine_plant_harvesting_application.pdf

	<ul style="list-style-type: none"> • Over the internet 	
Packaging	<ul style="list-style-type: none"> • Boxes up dried kelp to store before packaging • Uses resealable bags 	<ul style="list-style-type: none"> • Used hand heat sealer for packaging: used bags that were sealed up on all sides • Clear bags so customers can see product
Suggestions for Houpsitas	<ul style="list-style-type: none"> • Suggested using a shipping container to make a drying facility 	<ul style="list-style-type: none"> • Have facility right beside the water with mini-crane to bring in kelp • Have 3 story building with wood stove in basement piping warm air in to second floor where kelp is stored • Could use fibre glass floor • Suggested being large scale in Houpsitas, find a partner • Chemists a possible market
Other information	<ul style="list-style-type: none"> • Is not owners main form of income 	<ul style="list-style-type: none"> • Light but bulky product for shipping • If heat was too hot and it was late in the season the kelp could fall apart • Would sometimes get requests for 50,000 pounds of kelp from Asia, but could never fill this • Tried doing kelp harvesting as a full time job but decided it was not making enough money to make it worth while

In chapter three it was discussed how the transition from commercial shellfish harvesting to shellfish aquaculture uncovered unexpected incompatibilities. It is therefore important to try to evaluate the compatibility of kelp harvesting with the current skills and lifestyle of people living in Houpsitas. To get a better understanding of kelp harvesting I interviewed two owners of kelp harvesting companies (table 3): it is important to note that one owner had another source for his primary income, and the other owner ended his business because he didn't feel he was making enough money to justify continuing. It would be unrealistic to assume that a small-scale kelp harvesting company would make anyone a lot of money, but just as clam harvesting was important for giving people some seasonal income, kelp harvesting could also be used for this.

By far the largest capital investment for a small-scale kelp harvesting company is a drying facility. Canadian Kelp was started in 1982 and modified an existing building, so

the owner was unsure how much a new facility would cost. The owner of KHC 2 said that when his facility was constructed, it cost between \$33,000-35,000. It may be that people in Houpsitas could construct a drying facility using some free local timber, but the facility needs to be built to the same requirements of a fish plant to pass food safety inspection agency requirements, which means it requires a concrete floor and must adhere to a number of other requirements to meet code. Therefore, even if there is available timber, the cost of bringing in other materials (due to Houpsitas' remoteness) may mean it can't be constructed for less.

For starting a new business \$35,000 is a relatively small investment, but this is still a high cost for any one person to invest. It also requires space, and space is at a premium in Houpsitas. To set up a business in Houpsitas, it might make sense if multiple investors could come together to create a small co-operative business where, perhaps, "individuals could lease rafts on a larger float, rooms in a processing plant, or space on a transportation vehicle" (WCVI Aquatic Management Society 2004. As mentioned previously, one interviewee suggested building the drying facility at Fair Harbour, which might work better since there may be more space available and since it would reduce the transportation time and cost if the kelp was dried there, another option that was suggested (due to the lack of available space) was to build it on a barge – so all of these options should be evaluated to see what makes the most sense.

The two drying facilities used by the kelp companies are not huge and have reasonably similar dimensions. The owner of KHC2 estimated his facility could dry a larger amount of kelp (producing 30-40kg of dried product at a time compared to 25kg for Canadian Kelp). This may be because some of the kelp could be hung higher using a pulley system to raise the kelp, whereas Canadian Kelp does not have a pulley system to raise kelp higher than can be hand hung. Hanging the kelp at elevated heights may be a good idea to allow for a more efficient use of the space and a larger production of kelp.

To pass provincial food safety inspection requirements the facility must meet standards similar to a fish plant. These requirements are clearly laid out on the provincial government website, and since many members of Houpsitas have worked in fish processing buildings and have a lot of experience in this industry, building a drying facility to proper standards should not be an issue.

Both facilities used house fans as well as one large fan turned on by a humidistat to maintain air flow and keep humidity low. But the two businesses had different heat sources used for drying: Canadian Kelp uses industrial heaters whereas KHC2 used a Pellet Furnace. The owner of Canadian Kelp believed that being able to maintain a consistent heat was very important for the production of high quality kelp, and that the quality could be impacted by the use of a stove since the temperature wouldn't be quite as consistent, but KHC2 didn't feel that the quality of his kelp was very negatively affected.

The issue of using electric heaters versus using a wood or pellet stove was also discussed during the interviews. Electricity is more expensive in Housitas than on other parts of Vancouver Island with a cost of \$0.39 per kWh compared to the BC Hydro small general service rate of \$0.1173 per kWh. For this reason, houses commonly use wood stoves as heaters. This begs the question: would using a wood stove impact the quality of the kelp? Electric heat is much easier to keep at a consistent temperature than heat from a wood stove. It may be that having some temperature variance may not have a negative impact on the quality of the kelp, but this is something that would have to be learned through experimentation. If a wood stove works sufficiently well for maintaining the quality of the dried kelp, this should not be too difficult or expensive to implement since there is ample free firewood available in the area, and local expertise on designing, constructing, and operating wood stoves.

Interestingly, one of the kelp companies in BC (North Pacific Kelp) doesn't use heat to dry their kelp and in fact does cold drying, so this might be another method that could be tried if using a wood stove does not seem practical. It would make sense to do some research into how this kelp company does cold drying and compare the quality of this kelp to the kelp being dried by electric heat. Another company does both sun drying and indoor drying, so, again, maintaining a perfect temperature may not be necessary in the drying process – perhaps the drying could even be done using a greenhouse. As can be seen in Table 2, kelp being dried by these different techniques are all being sold for close to the same price.

Table 8: Comparison of the price of kelp from three different BC companies¹⁵

Company	Canadian Kelp	North Pacific Kelp	BC Kelp
Established	1982	2009	1995
Website	http://canadiankelp.com	http://www.northpacifickelp.com	http://www.bckelp.com/index.html
Location	Bamfield	Village of Queen Charlotte	Prince Rupert
Drying technique	Dries kelp at 38 degrees	Cold dried	Sun dried or indoor
Type of kelp			
Kombu	\$6.90 for 42g	\$8.00 for 35g	\$6.50 for 30g
Bull kelp	\$6.90 for 35g	N/A	\$6.50 for 30g
Giant kelp	\$6.90 for 21g	\$ 7.95 for 28g	\$6.50 for 25g
Winged kelp-	\$8.90 for 35g	\$8.50 for 35g	\$6.50 for 25g

The owner of KHC2 had some suggestions for how residents of Houpsitas may want to set up their drying facility. He suggested having a wood stove in the basement and piping the warm air to the second floor where the kelp would be dried. He thought that it would be better to have the stove in a separate room and on a separate floor since otherwise the food inspection agency may be concerned about the potential for causing a fire. KHC2 also suggested having the facility right beside the water so that a mini-crane could be used to lift kelp in from boats.

Kelp harvesting requires being out on a boat, often navigating close to rocks. Many residents of Houpsitas own boats, have spent their entire lives on boats, and are comfortable harvesting other marine resources from their boats. This means that there may not be any need to buy a boat specifically for kelp harvesting, and people may instead be able to use their own boats. Although most people didn't have an in-depth knowledge of kelp, to be able to identify and properly harvest it can be easily learned, and the person who got the training from Dr. Druehl should be able to pass on what he learned to other members of the Nation.

Kelp can only be harvested when tides are low, so it is not possible to harvest every day. Dr. Druehl said that the harvesting generally took around three hours at a

¹⁵ This table does not list all products sold by each company. Products listed may not be perfectly comparable due to different processing techniques (for instance, some products are kelp flakes whereas other products are pieces of kelp).

harvest site to acquire 250kg of kelp (the maximum amount that fits into his drying facility). It is reasonable to assume that the kelp is as abundant near Houpsitas as it is near Bamfield; therefore, harvest rates shouldn't be any slower. It then takes about six hours for one person to hang all that kelp in the drying facility. Scheduling work around tidal cycles is something that the people in Houpsitas are very used to since clam digging is also reliant on low tides, and there are only small windows of time when harvesting can be done. This type of intermittent work is consistent with many people's lifestyles.

Kelp doesn't need to be vacuum sealed and can be easily packaged using a heat sealer. A number of people I talked to had experience working at fishing lodges or for the fish farm so have experience handling and packaging food. In summary, the activity of harvesting, drying and packaging kelp all appear to be highly compatible with the current lifestyle of people living in Houpsitas.

5.8. Limitations

The most obvious limitation to setting up a new kelp business has already been mentioned: finding the space and money for a proper drying facility. The size of the facility will determine how much kelp can be dried at a time, and this will ultimately limit the number of people who can work and make money from this venture, so it is important to build a facility large enough to accommodate the number of intended workers, although, at the same time, it would be prudent to not build too large a facility before the market is fully understood. It is also necessary to figure out the best way to dry the kelp, be this with electric heaters, a wood stove, or cold drying. These issues have to be evaluated based on cost as well as quality of product produced.

The other major limitation is the marketing and shipping of the final product. The owner of KHC2 found it very hard to market, and believed this was the hardest part of the business. For this reason it would make sense to work with Dr. Druehl to help a business get established since he has offered to buy some of the kelp and market it. Once the business becomes more established it might make sense to look at other marketing opportunities. As was mentioned, one resident believed that the fish farm may be willing to help transport the product. It was also suggested that perhaps it should be marketed through the Nuu-chah-nulth Seafood Development Corporation. The owner

of the kelp farm that was interviewed also mentioned he might be interested in helping to market the product. The best way to market the kelp is something that should continue to be explored if this business is pursued.

There is no evidence that the kelp market is oversaturated in BC: there are only three kelp companies; they are all small cottage-style industries; and they generally sell over the internet or to niche markets. But there have been situations in the Philippines where communities that shifted from more traditional fisheries in response to declining fish stocks to seaweed farming flooded the market with seaweed and ultimately pushed prices below an economically viable level (Crawford 2002). For this reason, it would be prudent to start small and see what kind of market is available before trying to expand.

The biggest unknown in all of this is how climate change will impact the availability of kelp. As mentioned there has been a substantial die off of bull kelp in California, but I also learned from Dr. Druehl that there was a substantial decline of bull kelp in Bamfield in 2016. It is unclear what manifestations of climate change, such as warmer sea water and ocean acidification, may do to different species of kelp. So it would be prudent to not become too reliant on any single species and to stay informed of ongoing research on the impacts of climate change on different species of kelp.

5.9. Conclusion

It seems safe to assume that in the near future market interest in kelp should continue to grow. A quick google search of seaweed yields numerous magazine and newspaper articles and websites preaching the health benefits of kelp and calling it a superfood. Obviously, foods come in and out of fashion, but with an increasing need for readily accessible healthy food and with the increased recognition of the nutritional value of seaweeds there should continue to be a strong niche market within BC, and opportunities for marketing internationally. As long as the residents of Houpsitas can manage the logistical hurdles of drying, shipping and marketing kelp, this venture seems like a reasonable one that could help replace some of the other economic industries that have been lost due to reduced access to other marine resources caused by government policies and introduced predators such as the sea otter and green crab.

Chapter 6. Conclusions and future research

6.1. Conclusion

In the first chapter this paper described how the reintroduction of the sea otter along with other government policies impacting First Nations can be viewed from the perspective of political ecology. It is evident that a litany of government policies has severely restricted First Nations on the WCVI from accessing traditional marine resources. Although more recently the federal government has used policies such as the Aboriginal Fisheries Strategy, or the BC Treaty Process in an attempt to help increase First Nations access to fisheries, these policies have not been effective at addressing reconciliation and have largely been driven by court decisions. If the government is truly interested in reconciliation then it needs to be proactive in addressing First Nations rights, rather than being combative by trying to deal with these issues in the courts.

First Nations have harvested sea otters for many thousands of years and it was only with the emergence of the fur trade that the sea otter population collapsed. The resurgence of sea otters has been prolific and it is clear that the current sea otter population is thriving. Based on the current population and growth rate of the sea otter, insights from conservation professionals, and evidence from Alaska, there seems to be no reason that the federal government could not allow an experiment with a small scale harvest of sea otters that would allow First Nations to protect important shellfish beaches. The biggest concern from the federal government appears to be the potential impact from an oil spill, but as long as the spatial range of the sea otter population is not reduced from a hunt (i.e., the hunt should be regulated locally so that sea otters aren't eradicated from local ecosystems) then this should not be an issue.

Although a small scale hunt used to protect clam beaches may help to restore the clam populations and rejuvenate the economic viability of the beaches, due to the impact from other predators like surf scoters and green crabs it may not be possible to return to original levels of production. For this reason, it is important to continue to look at other alternative economic opportunities. The idea of small scale kelp harvesting was discussed in chapter 5 and this seems as if it could be a reasonable opportunity to experiment with. There are other cottage style kelp harvesting businesses in BC that are

having success, and due to the increased interest in kelp as a speciality food it does not appear that the market is saturated so this is likely a growth industry. Dr. Druehl seems very willing to share his experience with kelp harvesting and it would make sense that if residents of Houpsitas wished to start a kelp harvesting business that they should continue to consider him a valuable colleague and mentor.

6.2. Future research

6.2.1. Protecting clam beaches

There have been some studies done in Alaska looking at how clam abundance is impacted when sea otters are excluded from certain beaches. Such an experiment has not been done on the WCVI. If a small-scale harvest of sea otters is allowed it would make sense to do a study to understand how best to use this harvest to protect important clam beaches (and other important marine foods). It is important to understand what is required to keep sea otters away from certain beaches, and how well clams recover when sea otters are excluded from a beach. Doing this exclusion study would help illustrate how much impact other predators like surf scoters and green crabs are having on the beaches.

Green crabs have only recently become an issue, so it is important to understand both how they are impacting the local ecosystem and explore methods to effectively mitigate their impact. The Ka:'yu:'k't'h'/Che:k'tles7et'h' recently bought traps for the purpose of dealing with green crab; it is important to monitor how successful these traps are. As has been mentioned it would also likely be useful for the Ka:'yu:'k't'h'/Che:k'tles7et'h' to talk with the Heiltsuk about how successful their green crab eradication program has been.

Since green crab are being trapped it would also make sense to see what culinary opportunities exist for green crab and whether it might make sense to market green crab for food. There has been some success on the east coast of Canada and the US in experimenting with using green crab as a food source, so it would be useful to do some research into how green crab is being prepared and marketed. Even if the green crab does not prove to have an economic market in BC it could still be worthwhile for the residents of Houpsitas to experiment with using it as a local food source, since this could

help replace the loss of Dungeness crab due to sea otters. Since the crabs are being trapped anyway it makes sense to use the crabs rather than just trapping the crabs and letting them go to waste.

In regards to surf scoters, many of the people interviewed believed that their population had exploded due to the reduction in hunting; it might therefore be useful to experiment with ways to scare them away from beaches. During the interviews people suggested using scare techniques like recordings of eagle noises or loud noises, or setting up fake eagles in the trees around the beaches. Airports often use loud noises as one of their strategies for deterring birds although if used too often birds can become habituated and the efficacy is reduced (Transport Canada 1998). The use of dog noises has also been shown to be effective for scaring off raccoons (Suraci et al. 2016) so recordings of eagle noises could be a worthwhile idea to experiment with. If a sea otter hunt is allowed, but restricting sea otter access to clam beaches illustrates that surf scoters are negatively impacting the population of the clams then it would make sense to experiment with methods for scaring them away from the beaches.

6.2.2. Kelp harvesting

Before a kelp business is started a business plan should be created. This plan should list all the costs associated with running this business including electricity used for drying the kelp, gas and boat maintenance from going out to harvest the kelp, the materials and labour used for building a drying shed, marketing of the kelp, and the transportation of the kelp.

It would also be useful to map the areas around Houpsitas that have abundant quantities of kelp. It is expected that the species of kelp sold by Dr. Druehl would be readily available in the area around Houpsitas, but to help in the creation of a business plan, and to understand the costs associated with harvesting the kelp, it would be necessary to understand where and in what quantities the local kelp is available. Having the kelp mapped would also be very useful for understanding the impact that the harvesting is having on the kelp since it could be used to track kelp abundance changes year to year.

It is important to understand how climate change may impact the viability of a kelp business. As has been mentioned over the last few summers there has been a substantial decline in bull kelp in parts of California and in Bamfield. By tracking current studies of kelp and understanding population trends for economically important species the kelp business will be more resilient since expectations about the quantity and harvest season of different species of kelp can be more readily estimated. Mapping of the kelp abundance around Houpsitas will help create this resilience.

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Appendix A. Interview Questions

Sea otter questions:

1. What kinds of sea life are most important to you for either cultural purposes or for income?

2. As I'm sure you know sea otters were wiped out around 1929, do you know anything about how people interacted with sea otters before they were wiped out?

(Prompts: Were there particular places where sea otters were harvested? Were sea otters harvested in any areas to protect other sea life that local people harvested or caught? Were there particular times of the year that sea otters were harvested? Were there specific people who were responsible for harvesting sea otters?) (If so, can you share this with me?)

3 During the period when there wasn't any sea otters was the relationship with sea life different then it is now, has it changed because of the reintroduction of the sea otter.

4. Do you believe that sea otters currently bring any benefits to your community? (If so, what benefits?)

5. Do you think that sea otters bring any benefits to sea life?

6. What are your own feelings about sea otters?

7. What do you believe is the best way for your community to adapt to living with sea otters?

8. There is a clam farm project on Malksope, where over the last two years the KCFN Fisheries clam crew and Neil from Simon Fraser University have been seeding clams and covering them with netting to protect against sea otters and other predators. Do you believe that the predator nets which have been placed on Malksope can be effective at preventing sea otters and scoters from eating the clams planted there in the last two years? {show sample of a net}

9. Do you believe there could be other effective ways of preventing sea otters from eating clams on some beaches? {prompts after answer: *Prompts: What about having a guardian live on a beach, taking turns with another guardian to watch 24/7? Would somebody be willing to do it on a volunteer basis if the community provided food?*

10. What are your views on compensation for local people suffering from sea otter predation and do you think that would that reduce conflicts between local people and sea otters?

11. Did you know that the Nuu-chah-nulth Tribal Council created a draft sea otter management plan in 2012? Have you seen the plan? *Discuss details of the plan*

12. Do you believe this is a reasonable management plan?

13. Do you think that if there was a sea otter harvest that this could be used to protect one or more clam beaches?

14. Are you aware that in Alaska Native Americans are allowed to hunt as many sea otters as they can use or sell the pelts of? What do you think of that plan?

15) Do you think the ducks are as big a problem for clams? What about the green crabs?

Kelp harvesting questions

1) Do you use kelp for anything (like food, roe on kelp, fertilizer, or other uses)?

2) Are you aware that a report evaluating economic opportunities such as kelp harvesting was written by the WCVI Aquatic Management society in 2004 for KCFN? {KCFN government gave us the report and suggested we consult it}?

Discuss the results from the evaluation

**Good fit with local skills and knowledge*

**Relatively low cost, limited investment*

**Marketing partnerships offered and possible (Louis Druehl, , maybe NCN Seafood Development Corporation?).*

**Drying sheds could draw on local ingenuity about wood stoves.*

**Possible challenges with government inspection of processing and harvesting; maintaining sanitary standards.*

**If wild kelp harvesting proves successful, farming kelp might be also tried.*

3) Do you think it would be a good idea to experiment with kelp harvesting and drying on a small scale?

4) Which varieties of kelp do you think it would make sense to harvest?

Varieties Louis Druehl advises are: Giant Kelp (*Macrocystis pyrifera*/M. *integrifolia*), Bull Kelp (*Nereocystis leutkeana*), Winged Kelp (*Alaria marginata*) and Kombu (*Laminaria setchellii*) are the 4 main commercial species. *Show pictures*

5) Would you want me to let the band government know that you are interested in kelp harvesting if there is the opportunity to get training? (Louis Druehl has said he would offer some free training in kelp harvesting, though we don't know to how many people.)

Appendix B: Oral Consent Script

Oral consent script

Hello, I'm Gwyn Thomas, a student at SFU working with Evelyn Pinkerton. I've recently joined the team that you know already as Neil Ladell and Evelyn. She has been discussing with your government what I could do related to the clam project that would be useful, and they came up with a couple of ideas. These ideas came out of the original clam surveys they did a couple of years ago. One idea is to ask people if they are interested in kelp harvesting as a new venture and where and what species would lend themselves well to this. Another is to explore opportunities to exclude sea otters from some beaches.

If you might be interested in training in kelp harvesting at the Bamfield Marine Station, you can let me know and I may contact you in the future to facilitate that. Or, if you are interested in learning more about sea otter exclusion strategies such as are used in Alaska, I may be able to share more information with you after a paper on this topic is given at the Society for Applied Anthropology meeting in Vancouver in March. If you are interested in kelp harvesting training, or in trying new sea otter exclusion strategies, with your permission your name may be given to the band office so that they can contact you to help facilitate this.

By participating in this survey, your confidentiality will be respected and nothing you share with me will be associated with your name unless you request it. With your permission I will record the audio from this interview, but if you do not want to give me permission to record this interview I can write down your responses instead. You are free to end our conversation or withdraw from the survey at any point. Withdrawal from the study will not result in any negative consequences, including social, economic or otherwise. If you choose to withdraw, any information or data you have provided will be destroyed immediately and not used in the study. You may request access to the survey results from me or any of the partners who will receive a copy of anything I produce. The audio files or written notes will be destroyed once the text has been transcribed onto the computer. The transcribed interviews will be stored on a password protected computer in a password protected zip file for 10 years and then destroyed unless you give specific permission for them to be given to a public archive or to one of the research partners.

The survey results, without individuals identified, will be given to the Ka:'yu:'k't'h'-Che:k'tles7et'h'h government after completion, and also shared with the co-investigator on this grant, Dr. Anne Salomon. I will be writing a "699" masters project on the data collected in the survey, combined with data collected from outsiders about techniques for harvesting, processing, and marketing of kelp, sea otter exclusion strategies used in Alaska, etc. My 699 will be reviewed by the K-C government and the clam advisory committee before it is finalized, as well as any academic papers emerging from this research. Taking part in this study is entirely up to you. You have the right to refuse to participate in this study.

Appendix C: Kelp harvesting opportunity information sheet that was circulated in Ka:'yu:'k't'h'

Opportunity to get training in wild kelp harvesting and drying

Canadian Kelp Resources has offered free training to two members of the Ka:'yu:'k't'h'-Che:k'tles7et'h' First Nations at their facility in Bamfield. This training would be around a week long and would be during the first half of May 2016. It may be possible to have transportation and accommodation covered by Nuu-chah-nulth Community and Human Services.

Benefits of training:

- Learn how to sustainably harvest giant kelp, winged kelp, bull kelp and kombu.
- Learn how to properly hang and dry kelp for optimum quality
- Learn how to do quality control (discarding less marketable portions)
- Learn how to store and package kelp
- Learn what is needed to construct a kelp drying facility
- Learn what is required for a small scale wild kelp harvesting business

Expectations of applicants

- Is committed to using the knowledge learned in the training to mentor other people in the community in kelp harvesting and drying
- Is committed to exploring the feasibility of kelp harvesting in Ka:'yu:'k't'h' by using the knowledge gained to try doing some small scale harvesting, drying and selling of kelp (Canadian Kelp Resources has offered to buy some kelp, and there are other potential small scale markets)

Preferred qualifications (Applicants do not need to have all of these qualities. Two candidates with qualifications that complement each other would work well.)

- Own a boat that could be used for kelp harvesting
- Experience starting or running a small business or strong organizational skills
- Good communication skills
- Experience doing manual labour
- Experience packaging food
- Experience using email
- Mentoring/teaching experience

If you are interested in this training opportunity let _____ know and an interview time will be set up.

The following page has a summary of what is required for kelp harvesting and drying.

Summary of main tasks and expenses involved with kelp harvesting

Kelp harvesting season:

- Giant kelp: April to June
- Kombu: June to September
- Winged kelp: July to August
- Bull kelp: July to October

Harvest procedure:

- Harvest takes around 3 hours at harvest site + travel time
- Both winged kelp and kombu need to be harvested at low tide one foot level or lower
- Takes around 6 hours to hang 250kg of wet kelp (for one person)
- Takes 36 hours for kelp to dry (250kg produces 25kg of dry kelp)
- Need to store kelp in dry area
- Can use heat sealer for packaging, don't need to use a vacuum sealer
- Jobs could be divided: some collect kelp; others dry and market the kelp

Main Expenses:

- Processing (drying) license yearly (\$210)
- Harvest license yearly (\$110)
- Construction and maintenance of drying facility (will vary depending on how much material can be gotten locally or needs to be bought; there may be grants available to cover some costs)
- Boat maintenance
- Gas for boat
- Transportation of kelp to market

Example of drying facility:

- Materials \$33-35,000
- Built to code, requirements similar to a fish plant
- Total size 20x20 feet, two stories high; 20x12 feet area used for drying;
- One third used for storing, packaging, small washroom
- Uses pulleys and racks to raise up the kelp to dry it (3 to 1 pulley system)
- Uses a pellet furnace (cheap Charlie) to dry the kelp (but a wood stove would probably work fine)
- Has an exhaust fan at the peak of the roof and humidistat

- Uses house fans to move air around
- Can dry enough kelp to make 30-40 kg of dry product
- Maintains temperature at around 38 degrees
- Link to British Columbia licensing requirements for a facility:
http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/fisheries-and-aquaculture/seaweed_processing_plant_requirements.pdf