Regulating a Mystery:
Science, colonialism, and the politics of knowing in the Pacific halibut commons

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Dedication

To Laurence, the best partner I ever had.
And to Strider – I miss you every day.

Abstract

Recognizing that environmental management is as much about managing people as managing biological resources, researchers in environmental studies have begun to pay increased attention to the human dimensions of natural resources and the environment. However, few of these scholars and managers have focused on the historical context of environmental management and the ways that history shapes people's interactions with natural resource issues. In this dissertation, I utilize a historical approach to examine the experiences of community members from the Alaska Native fishing village of Old Harbor as they interact with the regulatory and knowledge processes of the international Pacific halibut *(Hippoglossus stenolepis)* fishery.

I argue that the colonial history of the United States is perpetuated into the present in the processes that guide the management of fish resources in Alaska. Specifically, I argue that this colonial legacy is exhibited in the politics surrounding Pacific halibut management where Western ways of knowing halibut come to dominate decisions made about the resource while Alaska Native ideas and interests in the fishery are pushed to the periphery. This has required Alaska Native halibut fishermen from communities such as Old Harbor to engage with new forms of natural resource science and management in order to participate in processes governing the use of their local resources. I show that in Old Harbor, the marginalization of local ideas about halibut resources has contributed to significant emotional and material impacts for community members including alienation from regulatory processes that impact their fishing activities and loss of access to fish resources that are essential to their livelihoods.

To explore these issues, I employed an interdisciplinary methodology that included ethnographic experience in the community of Old Harbor and the regulatory agencies that manage the fishery, examination of historical and current halibut policy documents, participation in a fisheries science investigation into the growth dynamics of halibut in the waters surrounding Old Harbor, and over 40 interviews and oral histories with Old Harbor community members, halibut managers, and halibut biologists.

I examined the interaction between Old Harbor and regulatory agency approaches to three aspects of the halibut resource:

(1) Biology - ideas about the biological status of fish stocks and surrounding climate. Fisheries science research conducted with the International Pacific Halibut Commission to examine the changing growth patterns in the annual ring structure of halibut otoliths provides important details about halibut growth patterns and life history characteristics. Discussions with and observations of Old Harbor fishermen show that over the course of a long history of seeking these elusive organisms, community members have developed a number of important ideas about the biology, movements, and change of Kodiak area Pacific halibut. When these two as well as a number of other approaches to halibut biology were brought together in negotiations to develop catch limits for the fishery, Western science approaches to halibut biology tended to dominate the discussions. This domination presented challenges for both indigenous and non-indigenous fishermen who understand the resource in different terms.

(2) Place - conceptions and meanings tied to fish in space. Old Harbor fishermen and halibut managers exhibit different approaches to the halibut fishing geography. Top-

down spatial decisions made by managers and biologists – about issues ranging from where to place regulatory areas, at what scales to assess halibut, and where to hold policy meetings – have significant impact on the lives and geographies of Old Harbor fishermen.

(3) Property rights – understandings of fish ownership. Old Harbor ideas about fish property rights differed in many ways from those inherent in the 1995 Individual Fishing Quota (IFQ) program that privatized the halibut fishery. The import of a private-property system under the IFQ program worked to erode Old Harbor ideas and systems of property rights within their local fisheries. As a result, the IFQ program contributed to a dispossession of Old Harbor's fish resources and to devastating impacts on the livelihoods of community members.

Ultimately, this dissertation advocates that historical and geographical perspectives are essential for understanding natural resource issues. A historical orientation reveals a significant colonial legacy and social justice implications inherent in Pacific halibut management. While Western-oriented management of the halibut fishery has often marginalized Old Harbor approaches to fish, Old Harbor fishermen have responded to subvert, resist, and change halibut management processes in efforts to legitimize and institutionalize their own visions for the resource. They have continually brought their history and places to the management forum and never accepted domination by Western agency ideas about fish. Their efforts combined with the perspectives of managers and biologists who are concerned with protecting the resource provide a path towards imagining a form of fishery management that is both ecologically sustainable and socially just.

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INTRODUCTION

Laurie: Do you think it's important that they keep doing all the fisheries science and counts and stuff?

Fisherman: I don't see why they do that. It's a waste of time. I mean it's – nature's out there. That's the one that's doing all the work. I mean what are we gonna do to improve the fish?

Wife: Could we ask the fish? [mocking] Could you come here? We'll fish you.

Fisherman: You know, if they come, they come, if they go, they go. I mean how can we regulate a halibut or a salmon to OK you come here next year or whatever?

Wife: You might as well scuba dive and tell the fish to come here.

Fisherman: Regulating a mystery.

-Excerpt from interview with Old Harbor fisherman and wife, 12 October 2008.

I can still remember when I first heard this quote while I was transcribing interviews on an uninspiring day in my Seattle office nearly a year after I had returned from my fieldwork in Alaska. I paused, unsure of what I had just heard, shifted my foot to the rewind button on the transcribing pedal, and listened to the passage again. And again. And there it was. This expression of pure poetry calling out to me from an encounter recorded many months ago across a kitchen table strewn with smoked salmon, pilot bread crackers, and tide charts. I don't remember thinking anything of this dialogue when I conducted the interview. At the time I was too concerned with collecting more data and gathering more evidence to catalogue Alaska Native fishermen's thoughts about changing fishery policies and environments. But back at my office, the phrase cuts me like a knife. *Regulating a mystery*. In three short words this fisherman was able to sum up what I had spent hundreds of soon-to-be deleted pages attempting to explain. He was able to bring together the disciplinary, temporal, and spatial threads I had been following to examine the experience of a fishery. I could finally see that what connects the multitude of interests in the Pacific halibut fishery is their continued and elusive attempts to know this underwater species. Their entwined lives are then marked by the special kind of politics that emerges when they participate in processes to regulate use of this entity for which, inevitably, a complete and singular understanding is never possible.

What I love about this exchange between a fisherman from the Sugpiaq fishing village of Old Harbor, his wife, and me is that it is at once completely absurd and totally accurate. The fisherman's wife comically presents the image of a fisheries manager scuba diving and yelling out to fish to come to him so that he can assess them. From the couple's perspective, trying to get a handle on fish populations is as futile as diving underwater and starting to call out to fish. What is so funny is that this is not nearly as ridiculous as some of the things that fishery scientists have done in order to try to understand what is happening with fish populations. They have attached satellite tags the size of giant hotdogs to the back of fish and observed as fish drag them across the Pacific Ocean. They have hand sewn tiny digital tags into the lower jaw of thousands of live halibut, released them back into the water, and then hired an array of people to stand at every port (for five years!) and scan the heads of millions of fish with a digital wand, hoping to re-find these tagged fish. And, amazingly enough, to assess reef fish populations in the tropics, fishery biologists do literally scuba dive underwater, swim in a straight line, and count the number of fish that they encounter – calling out to the fish while diving is an optional part of this methodology.

The statement that the fisherman makes, that the work of fisheries biologists and managers is like “regulating a mystery”, is not something that fisheries scientists themselves would disagree with. They know that their assessments are best estimates at what is happening with the unknowable population of fish beneath the ocean’s surface, although they often refer to this mysteriousness with a different name – uncertainty. The opening quote above highlights two important points for the purposes of this dissertation. First, it draws attention to the notion that fish populations are incredibly difficult to get a handle on. Fish are invisible underwater and constantly moving, making it impossible to ever fully enumerate them. This aspect is central to the experience of all users who are connected by the resource. Secondly, the quote helps demonstrate that there can persist many different ways of interpreting the same resource. To describe the elusiveness of fish populations, a fisherman from Old Harbor uses the term mystery, whereas a fishery scientist from Seattle uses the term uncertainty. Each of these users approach and interpret the resource from their unique cultural and historical vantages. Different groups connected to the same fishery have different ways of imagining their relationship with these shared fish populations.

This dissertation takes the notion of “fish as mystery” as a starting place for analysis. The mystery encapsulates the idea that there will always persist a distance between fishermen, biologists, managers and complete knowledge of the mobile, elusive species they seek to understand. This mystery is filled with different visions by different users. For example, biologists might fill the mystery with forms of fisheries science while fishermen might fill it with stories or ancestral knowledge of fishing spots. The halibut fishery commons presents a particular problem because many users must share a resource for which they have different knowledge and understanding. This establishes a space for politics and the possibility for disenfranchisement when certain ideas about the resource come to marginalize others in the regulatory processes of the fishery.

I examine what I refer to as the "politics of knowing" within the halibut fishery. By politics of knowing, I refer to the politics that emerge when different ways of knowing natural resources are debated and negotiated in processes of environmental management. In the context of this dissertation, I ask three central questions. (1) How do different communities connected to the fishery come to know and relate to halibut resources? (2) How are different ways of knowing halibut deliberated, structured, and privileged in the regulatory processes of the fishery? (3) What are the implications of this power-structuring or privileging of certain approaches for communities connected to the resource – particularly those whose ideas about halibut are pushed to the periphery? To explore these questions, I focus on the experiences of community members from the Alaska Native fishing village of Old Harbor as they interact with the regulatory and knowledge processes of the international Pacific halibut *(Hippoglossus stenolepis)* fishery.

In 1867, the United States initiated a colonial process by purchasing Alaska from Russia and seizing control of the region's lands and resources with almost no acknowledgement of the Alaska Native groups who had been occupying the territory for generations. Economic gain from natural resource extraction was the primary motivation for this purchase and, over time the United States government invested in measures to accelerate the extraction of Alaska's resources including timber, gold, marine mammals, and importantly the state's rich fish resources. The over-extraction of fish resources contributed to significant declines in Alaska's fish populations which were essential for food and economic growth among Alaska Native communities. In addition, this decline precipitated the formation of fisheries management agencies to restrict and govern the use of the state's fish resources. The decisions made by these agencies applied to all users of the fishery and therefore interjected into the relationship between Alaska Native fishermen and the fish resources they relied upon.

In this dissertation, I argue that this colonial legacy has been institutionalized and perpetuated in the processes that guide the management of Alaska's fish resources into the present. Specifically, I argue that this colonial legacy is exhibited in a subtle but insidious form in the "politics of knowing" surrounding Pacific halibut resources. In halibut management, Western ways of knowing halibut have come to dominate decisions made about the resource while Alaska Native approaches to and interests in the fishery have been pushed to the periphery. This has required Alaska Native halibut fishermen from communities such as Old Harbor to engage with new forms of natural resource science and management in order to participate in processes governing the use of their local resources. I show that in Old Harbor, the marginalization of local practices and approaches to fish resources has contributed to significant emotional and material impacts for community members including alienation from regulatory processes that impact their fishing activities and loss of access to fish resources that are essential to their livelihoods.

Old Harbor fishermen did not stand idly by as their resources were regulated in a manner that didn't favor their interests. They have been increasingly active participants in the processes that make fishery regulation. I will also describe the ways that Old Harbor and other communities have responded to subvert, resist, and change halibut management processes in efforts to legitimize and institutionalize their own visions for the resource. Old Harbor fishermen have tirelessly lobbied managers and policy-makers to ensure that their perspectives are heard and incorporated into management structures. Through their efforts, they have begun a process of turning fisheries management into something new.

Throughout this dissertation, I explore how Old Harbor and regulatory agency ways of knowing this halibut "mystery" are structured and negotiated within the halibut fishery. This includes processes of marginalization and resistance that have taken place during the development of halibut regulation. I examine these negotiations surrounding three aspects of the halibut resource: ideas about the (I) biological status of fish stocks and surrounding climate, (II) conceptions and meanings tied to fish in space, and (III) understandings of fish property rights.

Ultimately, this dissertation advocates that historical and geographical perspectives are essential for understanding contemporary natural resources issues. History shapes the way that different groups relate to natural resources, it shapes their attitudes towards management, and it shapes their relative position of power when they engage in regulatory processes. Similarly, geography and place play a large role in shaping different people's ideas about natural resources. And, through historical processes, certain places can come to develop positions of strategic power compared to other places. Finally, without a historical lens it would be nearly impossible to visualize the way the colonial history of Alaska shapes Alaska Native approaches to fish resources in the present.

The colonial legacy and social justice implications inherent in Pacific halibut management impel us to revisit current approaches to fishery management and consider ways to improve them. Critical scholars who approach issues related to natural resources and conservation in theoretical fields of geography and anthropology often seem insensitive to or unaware of the practical challenges that natural resource managers face (West 2006; Braun 2002; Nadasdy 2004). There can be a tendency for scholarship to critique without doing the work to imagine how management could be better. I am close friends with many scientists and managers involved in the Pacific halibut fishery. I know that they face an enormous challenge attempting to maintain stock sustainability while weighing the social and cultural needs of a diversity of interest groups. Therefore, a goal of this dissertation is to move beyond the critical towards the applied.

In each section, I seek to find concrete ways in which we can confront the colonial legacy of halibut management and work to better overcome social justice challenges while still addressing stock conservation. This involves trying to imagine a form of fisheries management that is able to accommodate, honor, and incorporate multiple orientations towards the "mystery" of this resource.

Structure of the Dissertation:

I will divide this analysis of the politics of knowing within the halibut fishery commons into three broad sections or themes each of which build onto one another. The first broad section called **I. Communicating with a Mystery** will deal with different ways that fishery scientists and fishermen, particularly those from Old Harbor, communicate with halibut stocks in their attempts to learn things about the biological status of halibut resources and the surrounding climate. It will also explore the way that different kinds of halibut knowledge and expertise are privileged and incorporated into management decisions. The second section titled **II. Mapping a Mystery** describes the ways that fishery scientists and fishermen from Old Harbor understand fish in space and explores the political interaction between these different kinds of fishing geographies. The final broad section **III. Possessing a Mystery** will explore different ideas about fish property rights in the halibut fishery. This section will describe how Old Harbor community approaches to fish property rights interacted with the top down agency decision to privatize the halibut fishery under an Individual Fishing Quota (IFQ) program. It will examine the ways that the 1995 IFQ program implementation impacted Old Harbor's local ideas and systems of fish use.

A common thread of this dissertation is the notion that there are multiple ways of knowing, accessing, and understanding the "mystery" of the shared halibut species that connects such a multiplicity of interests. To research this topic, I employed an interdisciplinary approach that included methods from fields as diverse as anthropology, history, geography, environmental studies, and fisheries science. I designed my writing approach and narrative structure to reflect this notion of multiplicity. Each of the broad sections includes three different narrative approaches to address their respective themes.

Notes from the Field – In an effort to make this a people and place centered analysis of the politics of knowing in the halibut fishery, I include a chapter of non-fiction writing called *Notes from the Field* at the beginning of each section. These notes serve to familiarize the reader, often through my own lens, with the people and places that make up the fishery. Each *Notes from the Field* chapter uses an anecdote or encounter to highlight how the theme of the greater section is demonstrated in the lived experiences of fishermen, scientists, managers, and community members. These chapters also serve as a mechanism to orient the reader towards my positionality within this research project. All of the connections within the dissertation are the result of my journeys and interactions with different participants in the fishery. Even the scientific knowledge that I analyze in the third chapter was produced by me. Readers should be aware of the very human and embodied lens through which these analyses of the fishery have been generated.

Old Harbor Stories – This dissertation argues that although Western management agency ideas about fish biology and use have come to dominate the management framework of the halibut fishery, they are not the only ideas about halibut that persist within the fishery system. In order to highlight this point, I seek to bring Old Harbor ideas and understandings of fish to the forefront. I open each section with a story I heard in Old Harbor that highlights the ways that community members approach fish resources.

Analysis – Each section of the dissertation contains at least one chapter of analysis where I engage with data and develop theories about the processes at work in the halibut fishery. This dissertation contains five analysis chapters. Chapters 3, 4, and 5 deal with the politics surrounding different approaches to halibut biology, Chapter 8 investigates the politics of place-making in the halibut fishery, and Chapter 11 explores concepts of property rights in the halibut fishery and investigates the impact of the 1995 privatization of the halibut fishery on fishermen from Old Harbor.

Methodology:

I spent five years living within and studying the Pacific halibut fishery system. Studying the experience of a fishery presents quite a challenge because fisheries issues cross disciplinary boundaries and fish and fishery management processes move throughout time and space. My research approach for this dissertation was multi-methodological and multi-sited.

Since the focus of this work is the experience of Old Harbor, an Alaska Native fishing village, much of my research attention was focused on this community. I spent over a year – three summers and one six month period – living in Old Harbor. During these periods of time, I stayed with families and friends who were incredibly gracious to take me in. I also house-sat for periods of time when friends had to leave the village. The majority of the time I lived with Mary Haakason, an elder who took me in, taught me much, and treated me like family. I lived in the village of Old Harbor during every season, including the often cold, sleeting, and dark winter. I participated in community activities, helped work at the village's single general store, went visiting, and whenever possible went fishing and exploring. While in Old Harbor, I conducted and recorded over 30 semi-structured interviews with community members about issues relating to the halibut fishery. I also developed detailed oral histories from three elders over the course of multiple sessions both formal and informal. I worked with a cultural historian and innovator from the community of Old Harbor to organize and engage in focus groups with elders from Old Harbor who still speak the Sugstun (or Alutiiq) language. During the focus groups we learned Sugstun words and place names as well as much about the history of the island. I was also fortunate to witness talking sessions during which representatives of the Alutiiq museum worked with elders to develop a map of Sugstun place names for the region. Finally, when possible, I asked community members to draw personal maps of their Old Harbor fishing landscape.

I also spent a great deal of time working with the fisheries scientists who monitor halibut stocks and make recommendations and policies that govern the fishery. I worked in the research offices of the International Pacific Halibut Commission (IPHC) in Seattle, WA for one year over the course of the project. I collaborated with the IPHC to develop a study of halibut growth through an examination of bone-like structures from the inner ear of halibut called otoliths. The IPHC was generous to allow me to work in an IPHC office and have access to their archived collections of otoliths and laboratory facilities. During my stay with IPHC, I also had the chance to observe how the IPHC operates and creates ideas and theories about fish stocks.

A fishery most takes its form in the frequent but ephemeral meetings and policy processes that take place in different sites throughout the extent of the fishery. During two years in the field I attended as many halibut related meetings as possible. I witnessed two IPHC annual meetings, one in Portland, OR and the other in Vancouver, BC, where catch limits for the fishery were set. I attended two IPHC-sponsored workshops, both in Seattle, WA, that were designed to teach fishermen about aspects of their fishery assessments. I witnessed a meeting of the IPHC research advisory board, during which halibut fishermen had the opportunity to dialogue with halibut scientists and comment on research activities. In addition, I attended two meetings of the North Pacific Fishery Management Council (NPFMC), which is the US fishery institution with the authority to regulate and allocate the Alaska portion of halibut resources. These meetings were held in Anchorage, AK and Seattle, WA.

I conducted ten semi-structured interviews with biologists, managers, enforcement officials, and non-native commercial fishermen involved in the halibut fishery. I also reviewed numerous publically-available policy and historical documents linked to the halibut fishery. These included NPFMC documents related to halibut policy agenda items and Old Harbor corporation documents related to their work to restore access to halibut resources. In addition, I reviewed numerous IPHC documents including annual reports, reports of assessment and research activities, scientific reports, technical reports, and regulations which date back to the early 1900s. All of these reports are publicly available on the IPHC website.

For the most part interviews were conducted under the expectation of anonymity and I do not include names of individuals when citing the interviews, but only indicate what type of interest they may have in the fishery (e.g. Old Harbor fisherman or state enforcement official). For public figures that I interviewed in the fishery, I only include a title and not a name. Through this I hope to show that most of my critiques of aspects of halibut management do not center around particular people, but deal with processes of knowledge and colonialism that are much larger than any one individual. Three elders with whom I developed oral histories agreed to allow me to use their names, so these names are included when I cite their words or stories.

When I use oral histories in the dissertation I try not to make too much of a distinction as to whether oral histories represent completely accurate accounts of the past or whether they represent a lens to the past that is entirely shaped by the context of the present (although it is my personal belief that they probably fall somewhere between the two). In the introductory history section of Chapter 4, I occasionally use oral history accounts to fill in some aspects of Old Harbor's fishing history; though these are often pieces of history that are quite well known and were recounted to me by several different community members. For the most part, though, I use oral histories in this dissertation to describe peoples' and communities' *ideas* about halibut resources. The stories that individuals choose to tell about the past, regardless of whether or not they are completely accurate, reveal much about their orientation towards fish resources – about their interpretation of the resource and about their beliefs as to how fish should be used.

Theoretical Framework:

This dissertation lies at the heart of tension between two fields of study – American Indian/Indigenous Studies and Conservation Biology. Indigenous Studies is a broad, interdisciplinary field that investigates the ways that historical and political forces impact the lives of indigenous peoples. The field is greatly focused on the ways that indigenous people, through processes of self-determination, have worked to shape their destinies within the continuing context of colonialism. Conservation biology, on the other hand, is concerned with developing biological and social processes that can best conserve natural resources and biological diversity.

Through the lens of indigenous studies, I explore the connections between fisheries management and processes of colonialism. By seizing control and authority over fish resources of Alaska, US and international institutions have acted to dispossess Alaska Native communities of fish resources they have fished for centuries. Subtly, halibut management practices work to dispossess Alaska Natives from meaningful participation in the defining, stewardship, and management of their local halibut resources. Natural resource agencies establish a new kind of technoscience bureaucracy for fisheries management that can alienate resource users who have different historical orientations towards resources.

The fields of conservation biology, fisheries management, and commons studies direct us to pay attention to the material and finite nature of fish resources. Due to increased technology and economic pressure, halibut stocks could easily be fished to depletion without regulation. From a conservation biology perspective, commons institutions such as those within the halibut fishery, were not established with the intention of dispossessing particular resource users. Instead, these institutions serve the purpose of protecting halibut stocks from decimation by a highly efficient commercial fleet.

Indigenous and American Indian Studies:

Currently the field of Indigenous Studies is following two somewhat, but not completely, contradictory threads. On one hand, literature, research, and theory in the field is focused on highlighting indigenous forms of separateness. This scholarship has included work to advocate that indigenous groups have distinct forms of literature (Justice 2006), distinct approaches to history (Nabokov 2002), distinct ideas about law (Borrows 2002), distinct ideas about nature (Cajete 1999), as well as unique worldviews in a number of other topics. This literature aligns with concepts of sovereignty and self-determination that shape the field. Another emerging branch of inquiry within indigenous studies is focused on concepts of indigenous expectations and authenticity (Raibmon 2005; Deloria 2006). This body of literature examines the ways that outsider expectations of what American Indians should be – for examples stuck in the past, rural, and connected to nature – end up doing considerable work on indigenous groups by creating limited paths through which indigenous peoples can engage with society.

Considering these two theoretical trends, one of the greatest challenges for Indigenous Studies moving into the future is to be able to argue for difference without essentializing or contributing to the further development of a set of expectations regarding indigenous people. In my dissertation, I argue that Alaska Native fishermen from the village of Old Harbor tended to have different ideas about fish compared with those of the regulatory agencies that manage the fishery. Examining the difference between Old Harbor and Western agency ideas about fish is essential to understanding the ways that fishermen in Old Harbor have been impacted by fishery management policies and processes. However, while I argue that their ideas differed in many cases, I do not intend to set up a dichotomy between Western (management agency) and indigenous (Old Harbor) ideas about fish resources. In some cases, Old Harbor fishermen have embraced Western approaches to fisheries; they have incorporated new technologies and benefited from capitalist engagement in the economies of the halibut trade. Additionally, Western resource scientists are not limited to cold, sterile assessments of natural resources. Often, management agency approaches to fish resources result from engagement with community and place.

When I describe Old Harbor ideas about fish, I also do not intend to essentialize Old Harbor or present community members and their ideas about fish as a monolith.

Even in a community of 200 people, there was an incredible amount of diversity in approaches to fishing and fisheries. Some large-scale Old Harbor fishermen were actively involved in large scale commercial fishing, generating millions of dollars of income. Others could only afford to subsistence fish and were struggling financially. In order not to essentialize, in each chapter I attempt to highlight the diversity of approaches and responses contained within each community I examine.

This dissertation also benefits from two theoretical frameworks that are receiving considerable attention in the field of geography – political ecology and science studies. Concepts from both of these frameworks guide my approach to researching and writing about the politics of knowing in the Pacific halibut fishery. However, these frameworks are employed in the service of contributing to the field of indigenous studies by understanding an indigenous community's experience of the commons.

Political Ecology – Political ecology is a theoretical framework that draws from a number of disciplines to examine how political, social, and economic forces shape environmental issues. Byrant (1992) writes that political ecology supports three important lines of inquiry into environmental phenomena, "the contextual sources of environmental change, conflict over access, and the political ramifications of environmental change" (Bryant 1992, p.12). It opens up questions of power in environmental management by exploring which individuals or groups have most control over the delineations of landscapes and resources and which groups become marginalized. Political ecology is essential to this dissertation. It provides the lens through which to understand the ways that political and knowledge processes within the fishery impact the community of Old Harbor. These ideas influence the way I approach research and writing in each of my chapters. Researchers in the field of political ecology have also explored the connections between economics and environmental issues; this work plays an important role in my analysis of the privatization of the halibut fishery in Chapter 11.

Science Studies – The field of science studies explores the history, practice, and influence of Western science. Scholars in science studies have opened up the way that science is made and the way that it, as a knowledge, does work on other people and places (Kuhn 1996; Latour 1987; Latour 1999; Stengers 2000; Daston 2000; Haraway 1988; Haraway 1989). The field of science studies plays a great role in structuring this dissertation. It shapes the way that I approach the IPHC and the field of fisheries science. Through science studies, I can explore the way that the work of fisheries scientists influences the activities and worlds of Old Harbor fishermen who must engage with this technical science and live with its products.

Conservation Biology:

The field of conservation biology brings focus to the material and finite nature of fish resources. Scholarship about fish populations and the best way to conserve commonly-held resources influenced and are essential to this dissertation. Finally, this dissertation engages with the sub-field in conservation biology that has directed attention towards traditional ecological knowledge (TEK).

Fish Population Dynamics – Research by fisheries scientists and conservation biologists has revealed that fishing impacts fish population and that the overexploitation of fish stocks can contribute to their decline and collapse (Steele 2004; Steele 1998; Folke et al. 2004; Holling 1973; Walters & Kitchell 2001). Overfishing often leads to the directed harvest of larger fish which also have greater reproductive capacity. When these reproductive fish are removed from the population, the fish stock decreases its ability to reproduce and sustain itself overtime (De Roos & Persson 2002; Walters & Kitchell 2001). Ecological research has also revealed that in some cases when fish populations are reduced to low levels they do not recover – even when fishing pressure is reduced (Walters & Kitchell 2001; De Roos & Persson 2002; Steele 2004). These ecologists believe that fish populations can have multiple equilibriums. This means that when the stocks get to a low population size, they can enter a reduced population equilibrium where they will maintain that small population size and cease to return to their original population size (Holling 1973; Folke et al. 2004). This fisheries conservation research highlights how important it is to prevent the overharvest of fish resources such as halibut. If halibut stocks were to collapse, there is a chance that they would never recover.

Commons Institutions – The field of conservation biology has begun paying increased attention to the social aspects of conservation. The field has recognized that social processes are a necessary and central part of natural recourse conservation. Therefore, conservation biologists have utilized and contributed to research about the best social practices and institutions for resource conservation. Research in the field of the commons has revealed that without some institution (formal or informal) governing resource use, commonly-held resources such as fish are subject to degradation. This collapse of commonly-held resources is called the tragedy of the commons (Hardin 1968). Researchers have, however, uncovered a number of different systems that contribute to successful protection of the commons (Ostrom 1990; Mansfield 2004a; Agrawal 2001). These have included culturally and community-embedded practices of marine tenure as well as top-down Western institutions. The field of commons studies highlights the centrality of systems for resource governance to halibut fishery sustainability. Even if we are to critique aspects of halibut management, we must consider institutional solutions that continue to protect halibut stocks.

Traditional Ecological Knowledge – I would be remiss not to address how my research relates to the field of traditional ecological knowledge (TEK). TEK is a branch of the environmental sciences that has been concerned with gathering information that indigenous communities, through their long history connected to particular places, possess about the natural world (Berkes 1999). Practitioners advocate that indigenous groups can provide important information to guide the conservation of ecological systems (Huntington 2000; Brodnig & Mayer-Schonberger 2000; Reid et al. 2006; Riedlinger & Berkes 2009; Berkes et al. 2000).

The notion of TEK has been critiqued by scholars on a number of fronts. First, the knowledge category has been criticized for being an overly narrow, static, and romanticized conception of indigenous knowledge (Giles-Vernick 2002; Nadasdy 2004). The notion of *traditional* knowledge implies that indigenous ideas about the natural world are passed down from generation to generation intact, whereas many scholars find that indigenous knowledge, like all other forms of knowledge, is dynamic and changing through time. In addition, collectors of TEK are often ecologists, who extract information for its ecological values but fail to consider the wider context and worldview from which it came. Some scholars have written that TEK is a form of knowledge appropriation that will always place indigenous communities in a position of less power (Nadasdy 1999). They argue that practices of collecting TEK remove knowledge from its original context and place it in a Western-scientific context where it is subjected to a set of foreign (and nearly impossible to meet) standards – all in order to answer questions of interest to Western-scientists themselves (Nadasdy 1999).

For these reasons, I do not find TEK to be a particularly appropriate or useful concept for the purposes of my dissertation. However, practitioners of TEK do advocate for increased participation of indigenous peoples in environmental decision-making, something that is quite important to overcome social justices concerns in management. It is just that TEK limits indigenous participation to a narrow kind of information about biology and ecosystem function. Indigenous communities have a wide range of perspectives about natural resources beyond biology that need to be considered in management protocols. In the dissertation, I will show that Old Harbor ways of knowing halibut don't just encompass ideas about the biology of halibut, they also include ideas about the distribution of the fish in space, ideas about how the resource should be used, and ideas about who should have property rights to fish resources.

Both of these perspectives – Indigenous Studies and Conservation Biology – can provide important contributions to a discussion of the position of the Alaska Native community of Old Harbor within the halibut fishery system. Indigenous dispossession or disenfranchisement, even in the name of conservation, is not justified, and throughout the dissertation I show that indigenous disenfranchisement within the halibut fishery has significant material and theoretical consequences for indigenous fishermen. However management institutions, particularly ones in the halibut fishery – one of the few fisheries in the world that is well conserved – play an important role in sustaining fish resources. By combining approaches from these two fields, we can begin to imagine something new for our fisheries and commons systems. We can imagine a form of sustainable natural resource management that accommodates indigenous perspectives and rights.

The Communities:

The organizing structure that I use to describe different interests in the halibut fishery is community. In this dissertation, I view communities as temporal and spatial entities. By this, I mean that the communities on which I focus have not always been communities in the form that they are today. They have emerged or congealed in a particular time and place. Each community's connected history influences the identity of community members and their approaches to natural resources. Communities are also not monolithic – they encompass a diversity of ideas. Their boundaries are diffuse, they are embedded within communities of other scales and they often bleed into one another.

I focus my analysis on four communities that are present within the halibut fishery: (1) the Alaska Native village of Old Harbor, AK; (2) the International Pacific Halibut Commission (IPHC) which is the institution formed by a 1923 treaty between the United States and Canada to conduct research on the Pacific halibut fishery and to generate scientific recommendations for how the fishery should regulated; (3) the North Pacific Fishery Management Council, which is the regional body formed by the federal government to manage the fish resources in Alaska waters (including halibut), and (4) the populations of Pacific halibut themselves (Figure 1). In Pacific halibut management US and Canadian appointed commissioners make decisions about catch limits throughout the entire fishery. Once these catch limits have been established, the NPFMC is charged

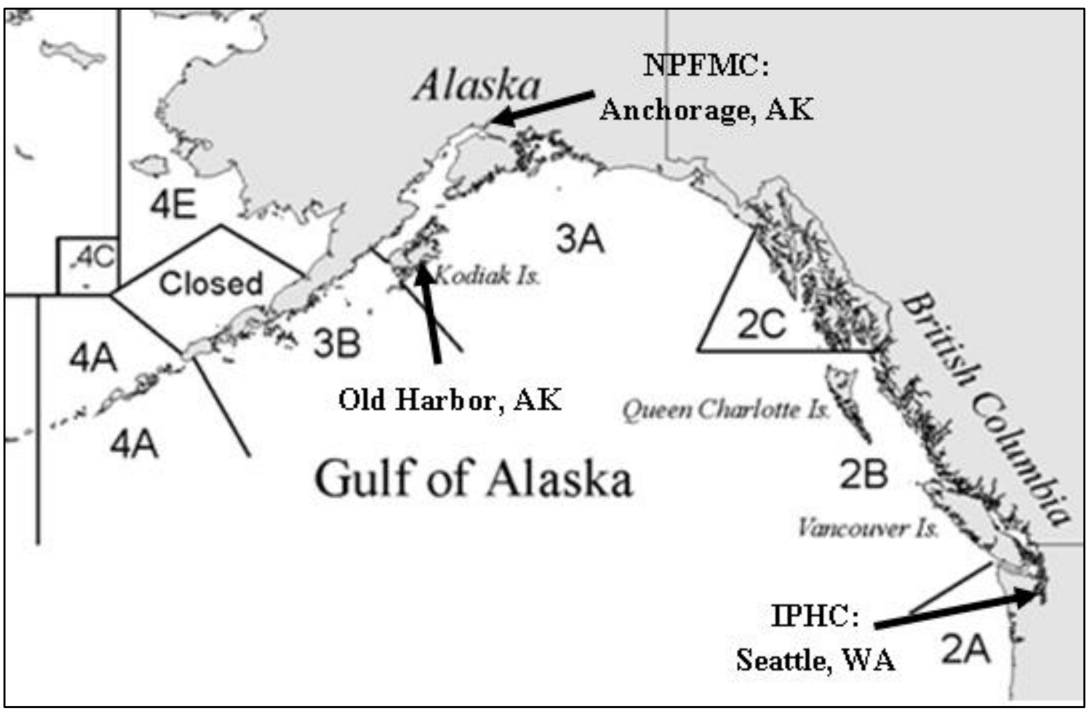

Figure 1. Map of the location of the major communities involved in this study: the Alaska Native village of Old Harbor, the North Pacific Fishery Management Council (NPFMC), and the International Pacific Halibut Commission (IPHC). Numbers and letters represent IPHC regulatory areas within the halibut's range.

with developing policies for how that amount of catch is allocated and fished in the Alaska region.

I provide a detailed history and background of each of these communities in various chapters of the dissertation, so I will not go into much detail about them here. However, I will provide a brief background of the halibut fishery. Pacific halibut is a bottomfish found in the North Pacific Ocean and Bering Sea - ranging from southern California to the Bering Sea and over into Russia and Japan (Figure 2). The US and Canadian fishery is managed from Oregon to the Bering Sea – halibut in Northern California and Russia and Japan are not included in assessments and management decisions. Pacific halibut is a member of the family Pleuronectidae or the right-eye flounders. When halibut hatch they swim upright but as they develop, their right eye migrates so both eyes are on the right side of their body and they can swim flat like a flounder. Halibut tend to remain on the ocean floor and their topsides are brown to blend with the substrate. Their bottoms are white allowing them to elude any predators swimming below.

Figure 2. Pacific halibut range

Halibut can grow to up to 500 pounds in size and they are commercially valuable for producing such a high quantity of quality white fish meat. Pacific halibut are also known to live for up to 55 years. The halibut fishery encompasses a wide range of fishing activities inclduing commerical, guided sport, recreational, subsistence, and research fishing for science investiation. In recent years, fishermen have harvested about 60 million pounds of halibut per year.

Figure 3. Images of Pacific halibut

In 2010, the commercial fishery was valued at $193 million[1] though this number can fluctate with changing harvest levels and changing prices for halibut. Fishermen from the Alaska Native fishing village of Old Harbor on Kodiak Island represent only a small percentage of this effort. Through commerical, sport, and subsistence harvest, Old Harbor fishermen harvest less than 185,000[2] pounds of halibut, which is less than 0.4% of the total halibut harvest.

Despite, this relatively small level of participation, halibut and other forms of fishing are centrally important to residents of the rural village. Old Harbor has a current population of 200. The village is disconnected from the road system and can only be accessed by boat or small bush plane. Fishing of all kinds is a central part of the community's source of income, food, and identity. Historically and in the present,

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[1] Laine Welch. December 11, 2010. *Halibut, sablefish fisheries see increased value*. Anchorage Daily News. *http://www.adn.com/2010/12/11/1599819/halibut-sablefish-fisheries-see.html*

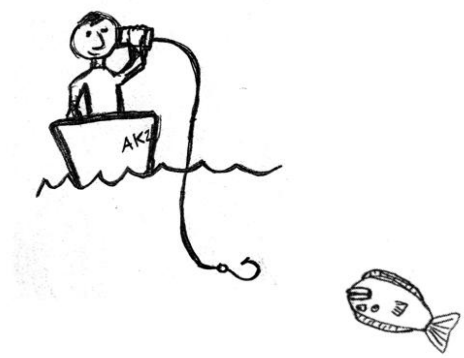
[2] Combined data from NOAA Fisheries IFQ Halibut/Sablefish Reports, NOAA Fisheries IFQ Halibut/Sablefish Reports, Fall, J.A. an d David Koster. 2010. Subsistence Harvest of Pacific Halibut in Alaska, 2008. Alaska Department of Fish and Game. Technical Paper No. 348, [RECREATIONAL STATS] and 2008 IPHC Annual Meeting Handout

residents of Old Harbor have been involved in commercial, sport, and subsistence halibut fishing. In addition, as I will show in more detail in Chapter 11, Old Harbor's relatively small level of participation in the halibut fishery is not due to lack of interest or need, but rather is linked to a colonial history that has dispossessed community members of access to local fish resources. The experiences of halibut fishermen from Old Harbor can provide an important perspective on how a relatively small community can advocate for their interests in a fishery that is international in scale

There is significant debate about what to call the Alaska Native people and related language group from the Kodiak Island, Alaska Peninsula, and parts of the Kenai Peninsula regions. At present, the most commonly used title is Alutiiq or Alutiit. However, these terms derive from the names that Russian settlers gave to the people from the region. Some Alaska Natives from the region have advocated for the use of the terms that the people themselves used to describe their people and language: Sugpiaq to describe the people (meaning 'the real people') and Sugstun to describe the language. For the purposes of this dissertation, I will use the term Sugpiaq to refer to people of indigenous decent from the Kodiak Island.

Although I focus on four communities, I do not mean to suggest that these are the only or the most substantial communities connected to the fishery. The fact that Old Harbor is only responsible for 0.4% of the total halibut catch suggests that there are a number of other groups fishing halibut. In fact, the halibut fishery encompasses large scale commercial fishermen, most of whom are non-native, from cities such as Anchorage, Kodiak, Homer, Sitka, and Seattle. It includes a whole host of Canadian fishermen, it includes treaty-tribes from Washington State. It includes Bering Sea fishermen, and includes an array of recreational, sport, and subsistence fishing interests. This is not to mention the processing plants that purchase halibut from fishermen or the consumers who finally eat the product. The relationships between the four communities I focus on is enmeshed within the activities of these multiple other groups. However, the story of these four communities – two regulatory agencies, one Sugpiaq fishing community, and a species of fish – helps to illuminate the indigenous experience in the face of the commons.

I. COMMUNICATING WITH A MYSTERY



Chapter 1
Notes from the Field

Knowledge Vignettes

During the five years that I spent researching the Pacific halibut fishery, I traveled to many locations. I spent time in laboratories among halibut otoliths, I spent time in smoke houses among drying fish carcasses, I spent time on fishing boats, I spent time in airplanes, I spent time in people's homes, I spent time in large meeting venues, I spent time in remote Alaska Native villages, I spent time in Seattle, Kodiak, and Anchorage. In all these disparate locations and contexts connected by the Pacific halibut commons, I found people engaged in processes of knowing things about the world around them. They sought to better understand their past, their present, and their future. Through my engagement with these different places and people, I ran into a number of surprises. Knowledge and knowing didn't seem to work in any of the ways that I had assumed it would. Knowledge whether it be from a halibut biologist or an indigenous fisherman did not appear to result from a linear or progressive accumulation of information over time. The process could be surprisingly circular, chaotic, and elusive. These are some stories or vignettes from my travels that opened up my vision of what knowledge and knowing could entail.

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International Pacific Halibut Commission Annual Meeting, Portland, OR 2007

At the 2007 annual meeting, the International Pacific Halibut Commission (IPHC) staff made an announcement. They no longer considered the current closed-area approach to modeling the halibut stocks effective and they planned to switch to a coastwide approach to modeling the fishery. This announcement sent ripples throughout the halibut fishing community. The new model would mean higher catches for some areas and lower catches for others.

Prior to the meeting, IPHC biologists began to observe a number of trends that made them question the validity of the closed-area model they had been using to assess the fishery. This closed-area assessment model treats each of six regulatory areas as a separate, closed entity within the fishery. However, multi-million dollar tagging studies began to indicate that halibut stocks move between halibut regulatory areas to an astounding degree. The IPHC staff decided that they could not continue modeling the halibut stock through a closed-area assessment; fish simply appear to move too much between these areas.

The IPHC tends to switch to a new type of fishery assessment model about every five years. In 2007, the IPHC made another in a series of model changes to implement this new coastwide assessment model. At the annual meeting they initiated a three plus year process of explaining and justifying the new approach to the halibut fishing industry and to the government appointed commissioners who ultimately make decisions about harvest levels. What's amazing is that this model was partially a movement back in time for the Commission. It represented a return to a coastwide approach that had been utilized by the commission in the late 70s and early 80s, an approach that had been convincingly abandoned in the mid-80s for a then superior closed-area approach.

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Fisherman's House, Old Harbor, AK 2008

Halibut fishermen from Old Harbor fish in the IPHC statistical areas 3A and 3B. When the IPHC enacted their new "coastwide model", the catch level in area 3B was dramatically increased. I talked to an Old Harbor fisherman about how he felt about the model changes. He had the following to say about the work of the IPHC scientists and the recent changes in catch limits, "It seems like they do their models, they go to the same grounds do their same way of catching fish - tag em and all that sort of stuff - but then someone gets a wild hair up their ass and they say oh well our model's changed and then all of sudden they can add fish here and take away fish over there."[3]

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Nuniaq Culture Camp, Old Harbor, AK 2008

The female director of the Old Harbor summer cultural camp taught a number of young campers and me how to make salmon-skin pouches. To do this, we needed to prepare salmon skins for sewing. She passed around a jar of salmon skins that had been curing in a mixture of water and laundry detergent. We each pulled out a skin. She instructed us to scrape all of the remaining salmon meat from the skins. We used a variety of tools to scrape the skins – butter knifes, razor blades, the edge of a tin box – all to varying degrees of success. In the middle of our efforts, her husband walked in from an expedition to a nearby river. He showed the group an old Sugpiaq artifact – an ulu carved out of stone – that he found near an archeological site at the river. His wife said: 'Hey, hand me that'. Without pause, she grabbed the ulu and began using it to scrape the meat off her salmon skin. It worked perfectly

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IPHC Research Advisory Board, Seattle, WA 2008

Every year, the Halibut Commission director and staff meet with the Research Advisory Board (RAB), which is a group of fishers and processors who offer suggestions and input into the Commission's scientific research agenda. At the 2008 RAB meeting

[3] Interview, Old Harbor fisherman 10/11/08

the question on everyone's mind was the issue of 'catchability' or the relative ease of catching a halibut in different regions of the fishery.

The problem is that designing an experiment to test relative catchability is incredibly difficult. Because a fishery is an open system, there is no way of knowing if a higher catch of halibut is related to the ease of catching halibut or to a higher abundance of halibut in the area. The Halibut Commission has visited and abandoned the idea of testing catchability several times throughout its history. At the RAB meeting, the Commission director presented some of the staff's crazy brainstorms about testing catchability, some of which included complicated sonar and imaging equipment, and none of which were realistic. He then asked the board of fishermen and processors if they had any ideas for how the Commission could design an experiment to test catchability. They offered a few suggestions but in the end remain stumped. After all the discussion, the IPHC director sighed and said: "Sometimes the more time we spend we wonder if we're really learning anything."

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Out in a Skiff, Old Harbor, AK 2007

In the mid-1990s the Pacific halibut fishery was a derby fishery and it was only opened for a short 24-hour period where fishermen tried to catch as much halibut as possible in that time frame. During the derby you didn't want to waste any time setting gear in spots with no fish. A fisherman from Old Harbor told me that to prepare for the derby he would do something called "prospecting". He would subsistence fish in different spots and keep track of the spots where he could catch a lot of halibut. Then during the opener he would fish for halibut in those spots. He says that the problem was that "prospecting" had the opposite effect: "It seemed like when I didn't prospect, I caught more fish, and when I looked around and thought the halibut were where they were gonna be on the opener, they weren't there when I went on the opener. So it worked the opposite way."[4]

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IPHC Director's Office, Seattle, WA 2009

Me: So how would you describe the accumulation of knowledge about halibut in the Commission?
IPHC Director: I think it's really important for everyone to understand that the right answer now is not going to always be the right answer because Mother Nature is always throwing curve balls at you and conditions change so that that, in fact, is not the right answer anymore. The fish might not be behaving that way. They may not be distributed that way because there's been changes in either the pattern of the fishery or the environment influencing that pattern. So if anyone expects this to be a static process, they're really in the wrong business because this is a very dynamic process and it's important that the research that you do is responsive to those sorts of changes, that you're able to detect those sorts of changes. And that's a really important thing. I think there's a

[4] Interview, Old Harbor fisherman 7/29/07

real desire for everybody in this industry to have some stability. That doesn't mean it's going to be delivered. So if you want that kind of stability, you know, you really should be in engineering or something like that. You know, Mother Nature doesn't play that kind of game.

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Fisherman's House, Old Harbor, AK 2008

Me: What is your feeling about the fisheries managers for halibut?
Fisherman: Oh, I never paid much attention to it. I think as far as I'm concerned they're doing a fine job…Or, you know, I mean they, like I said Mother Nature takes its course on everything, so. I don't know, as far as I'm concerned they're doing a fine job…
Me: So, what do you mean by that: Mother Nature takes its course?
Fisherman: Well, like the halibut I mean, you know, they're gonna come, they're gonna go.

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Culture Center, Old Harbor, AK 2007

The community of Old Harbor has a dance troop called the Nuniaq dancers. In fur-lined regalia, they perform a number of song and dances for fishing tourists who visit the village as well as travel to perform and compete with other Alaska Native dancers throughout the state. I asked one of the leaders of the troupe about the origins of the songs and dances. She told me that they didn't have any songs passed down over the generations, so the troupe leaders came up with songs and dances on their own. The leaders write the lyrics to songs in English and have the elders translate them into the Sugstun language. As for the melodies, they borrow from well know tunes such as 'You Are My Sunshine', 'Twinkle, twinkle little star', and her personal favorite: Johnny Cash.

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University of Washington Cafeteria, Seattle, WA 2009

I think looking back, certainly we were, we actually didn't believe in CAGEAN [IPHC halibut population model from 1982-1996] when it was going way wrong. I mean, we had too much trust in our own science. And after, I must say, after we'd been through some pretty, two or three major model changes, I was pretty humble about the science. I wish I had started out that way. You learn humility, you know, in life. I wish I had learned that sooner.

- IPHC Senior Assessment Scientist, retired

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Nuniaq Culture Camp, Old Harbor, AK 2008

As I tilted the digital camera in place, Fisherman an Old Harbor native who is an archeologist for the Alutiiq Museum stood there and struck a stoic pose while holding a nearly 30-foot coil of inflated seal intestine. He then set the processed intestines on the rack to dry, both proud and tired. I had just been witness to a nearly three hour process of experimentation, trial and error, and innovation during which Fisherman and other members of the Old Harbor Cultural Camp worked to devise a method for processing seal intestine – a material they know their Sugpiaq ancestors had used in a number of ways but that no one had ever taught them how to process or utilize.

When a hunter working at the camp brought in three seals to skin and eat, Fisherman asked him to set aside the seal intestines. He hoped to develop a technique to dry the intestines and use them in craft projects. The hunter handed him a stringy mess of intestines and Fisherman unwound them in the stream until they stretched into a single sinewy thread undulating in the current. Fisherman told me that he must turn the intestines inside out in order for them to dry properly. He first attempted to flip the intestines by pulling inside out by hand, but the intestines were slippery and this process was awkward and inefficient. He paused for a moment and said aloud, "I wonder if there is a simpler way to do this." He then grabbed a nearby stick and began to whittle it down to the shape of a large needle with a point at one end. On the fat end of the stick he added a notch. He then threaded the needle into the end of the intestine, pointed side first, such that the notch on the fat end of the stick held the back end of the intestine. He pulled this needle-like tool through the entire intestine and turned it inside out.

Once the intestine was flipped, Fishman told me he needed to inflate the intestine so that it could properly dry. He closed one end of the intestine and attempted to blow air into the other end with his mouth. Despite winded efforts, the intestine barely inflated, lying in the stream, limp. Fisherman then ran to camp shed and brought back a bike tire pump. He then began to use the pump to fill the intestines with air. As he was holding the intestine to the pump nozzle in one hand, and pushing the pump mechanism up and down with the other, he looked up at me. He told me partly with a sense of humor, and partly with a sense of lamentation, that this is how they have to do a lot of things. Because this type of knowledge has not been passed on, he and these other cultural innovators have to experiment and figure out how to do 'traditional' things on their own.

After three hours of work, three long sections of seal intestines were inflated and tied off. We then began to clean up the site. Fisherman grabbed the needle-shaped tool that he had devised to turn the intestine inside out. He held it in his palm, gently feeling the weight. He told me that he plans to take this tool back to compare it with the Alutiiq museum's collection of archeological artifacts. He said that during these processes of experimentation to recreate subsistence or cultural practices he will often jury rig new tools, such as this whittled needle, to complete the process. Sometimes, when he takes one of these tools back to the museum collection he will find an Sugpiaq artifact of nearly the same shape or concept. And, for the first time, he will know what that artifact was used for.

Chapter 2
Old Harbor Stories

One-Trip Charlie

Several fishermen from Old Harbor told me about the story of One-trip Charlie. One-trip Charlie was a halibut fisherman from a community outside of the region, somewhere in Southeast Alaska. He was called One-trip Charlie because he was so good at finding and catching halibut that it only ever took his crew one short trip to get a full load of halibut. There were varying accounts of how he developed such a keen skill at finding halibut. Some fishermen told me that he used to take a black weight ball, cover it with butter, and drop it over the side until it touched the bottom. Once he pulled the weight up he could examine the kind of material stuck to the ball and determine the composition of the ocean bottom. From this information he could then determine if the area was a prime halibut fishing spot. One-trip Charlie was an extremely coveted crew member because his presence on a fishing vessel ensured large halibut catches. Eventually, Charlie got on in age. He retired from fishing and was placed in a nursing home. However, on a semi-regular basis, fishermen from the area would visit him in the nursing home, supply him with alcohol until he completely passed out, and then kidnap him in his wheelchair and place him onto their fishing vessels. By the time he woke up, he would be in the middle of ocean, on a halibut fishing expedition where he could offer his unparalleled fishing knowledge to the crew.[5]

[5] Story told by Old Harbor fisherman at Old Harbor's Nuniaq cultural camp 20 July, 2008

With this story, we get a sense of the Old Harbor idea of a halibut expert. We see a figure who understands halibut biology so well that he is kidnapped by other fishermen for his expertise. While Charlie is perceived as a halibut expert among fishermen throughout the region, the fishery scientists at the International Pacific Halibut Commission (IPHC) would likely be skeptical of his judgment and perception of halibut biology – at least for the purposes of managing the stock. The IPHC has expressed a general wariness about the usefulness and accuracy of fishermen accounts of biological processes within the fishery. They feel that fishermen assessments lack sufficient standardization, are influenced by political factors, and come from too narrow a temporal and geographical scale.

Just as One-trip Charlie has established a reputation for expertise in halibut fishing, the team of fisheries scientists at the IPHC has developed a reputation for excellence in halibut fisheries science. The IPHC is known throughout the fisheries world as one of the premier fisheries science research organizations. Their quantitative scientists have led the way in the development of new fisheries assessment tools.[6] Under nearly 100 years of IPHC guidance, the stock has never collapsed or experienced a dangerous decline. In a world where over 40% of the globe's fisheries have been predicted to collapse, this is a no small feat (Worm et al. 2006; Worm et al. 2009). Yet, despite this reputation of success, I have heard many fishermen comment on just how bad of fishermen IPHC scientists would make. The IPHC scientists often travel on commercial halibut vessels to conduct research expeditions and commercial fishermen

[6] Interview with retired IPHC Quantitative Scientist 4/16/09

have marveled at the scientist's ignorance regarding the small scale movements of halibut and the best 'spots' for catching the fish[7].

So how can we account for this? How can we account for the persistence of a man with such expertise about halibut biology that he is kidnapped by other fishermen yet whose assessments or understanding of trends in the halibut populations would be met with skepticism by fisheries biologists? How can we account for the fact that some of the world's premier halibut biologists do not possess even the most basic understanding of local halibut populations necessary to commercially fish halibut? These puzzling inconsistencies highlight the presence of different circles of learning and different kinds of knowledge within the halibut fishery commons. And, within these different circles, different kinds of experts rise to the top. In this way, the story of One-trip Charlie provides an excellent launching point discuss some of the multiple approaches to halibut biology in the fishery.

I have titled the section *Communicating with a Mystery* because I will explore the considerable efforts that groups have invested in attempting to communicate with and give shape to these elusive underwater fish populations. The next three chapters will explore how IPHC fishery scientists and Old Harbor fishermen approach halibut biology and the results of political negotiations where multiple kinds of halibut knowledge are debated in the process to establish Pacific halibut catch limits.

Even though the pursuit of knowledge about halibut is frustratingly circular and elusive, each year, interests in the fishery must be able to act. Halibut fishermen must ultimately decide in which spots to lay their gear and IPHC scientists must make a set of recommendations about annual catch limits necessary to sustain the fishery. This section

[7] Interview with Homer-based commercial fishing crew 7/12/08

will explore the ways that scientists and fishermen work to develop workable truths about the nature of halibut populations and their surrounding environment. These workable truths enable different interests to act in an inherently uncertain world. Because they remain workable they can be appended or shifted based on new experiences, information, and ideas.

Chapter 3
Analysis

Fishery Scientists Communicate with a Mystery: Utilizing IPHC historical otolith collections to examine halibut growth and environmental change

Counting fish is like counting trees, except that they are invisible and they keep moving.

-John Shepherd as quoted in Hilborn (2002)

Fishery scientists face an enormous challenge. They must attempt to gain defensible information about a population of animals that is invisible because it lives underwater, is extremely mobile, is subject to extreme annual fluctuations, and is under constant pressure from a fishing industry. In the face of these difficulties, fisheries scientists have developed a number of creative and innovative techniques by which to assess or communicate with these elusive stocks. Over an 85 year history, scientists from the International Pacific Halibut Commission (IPHC) have often been at the forefront of the development of tools and theories to describe fish population dynamics (Smith 1994). Starting with the research of William F. Thompson, the first director of the IPHC who began studying halibut populations in 1914, the work of IPHC scientists has defined the field of fisheries science and often been adapted by fisheries scientists the world over (Clark 2003).

This dissertation examines how different communities connected to the halibut fishery related to these shared resources. In this chapter I will examine how fisheries scientists, particularly those from the IPHC, attempt to communicate with halibut resources and develop ideas about the biology of these underwater fish populations. As John Shepard so humorously points out, fisheries scientists face a unique challenge because the organism they attempt to study is invisible underwater and highly mobile. Since fish cannot be seen, a large part of fisheries science involves trying to generate assumptions about the underwater fish populations based on a small sample of fish that have been caught on the surface – either by fishermen themselves or from research activities.

The history of the field of fisheries science has often been about generating techniques to close the information gap between the qualities of these samples of the fish population which are known and qualities of the total population of the fish stock which are and will always remain unknown. This has included the development of more and better sampling techniques and the development of better statistical tools for utilizing information from various samples to make hypotheses about the greater populations of fish. Despite the proliferation of fisheries sampling and data collection techniques as well as mathematical tools and high powered computer systems for data analysis, definitive information about fish stocks remains elusive. It is not uncommon for fisheries population assessments to be off by more than 100% (Hilborn 2002). When describing attempts to know the number of fish in the ocean prominent fishery scientist and manager Ray Hilborn (2002) laments: “I only wish we did”[8].

[8] Hilborn 2002 p.408

In this chapter, I will describe the development and results of a rather unique scientific investigation to gain insights into the dynamics of elusive halibut populations surrounding Kodiak Island in Alaska. I partnered with the research community at the International Pacific Halibut Commission to develop a protocol for assessing Kodiak Island halibut populations through an analysis of the record left behind in the calcified structures of halibut caught in the region over the last sixty years.

For this study, we examine the bone-like structures found in the inner ear of fish called otoliths. Fish otoliths continue to grow over the course of the life of a fish and as a result of the annual cycling of calcium uptake (with increased calcium uptake in summer months), otoliths form annual rings reminiscent of those found in trees (Figure 4). Due to these unique time-keeping properties, fisheries scientists have been using otoliths to determine the age of fish since 1899 (Campana & Thorrold 2001). Recently, fisheries biologists have discovered that in addition to providing an age, fish otoliths can provide other information about the experiences of an individual fish over its lifetime (Ostazeski & Spangler 2001; Coffin et al. 2003; Black et al. 2008). Through a technique called sclerochronology, which is quite similar to dendrochronology in trees, fisheries biologists can measure the extent of otolith growth in a given year and determine how otolith growth in the fish has shifted over time.

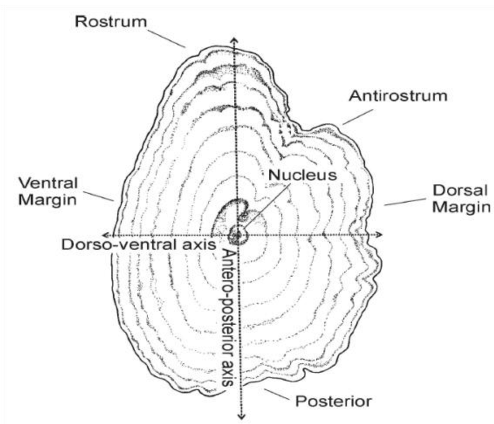

Figure 4. Diagram of a Pacific halibut otolith. Otoliths grow outward overtime from the nucleus or primordium. Note the annual rings radiating outward. Diagram Joan E. Forsberg in IPHC Technical Report 46.

In a way, measuring halibut otoliths can be a means of communicating with fish about the experiences of their lives: which years were good years and which were bad ones.

We use the collective experience recorded in 539 otoliths from halibut caught in a region of Kodiak Island near the village of Old Harbor, Alaska, between the years 1963-2008 to examine historical patterns of otolith growth in the region. Like the work of many other fisheries scientists, we then employ a statistical technique called a mixed-effects model to make generalizations about the growth processes of the larger population of fish from the region based on the experiences of these 539 individual fish. With the model we can examine how halibut growth patterns have shifted over time and explore how different external conditions such as climate, fishery regulations, and species interactions have influenced halibut growth.

This research is particularly important because the halibut fishery faces two important conditions at present: (1) the North Pacific region has experienced unprecedented climatic warming in the past two decades which could influence halibut populations in complicated ways and (2) halibut biologists and fishermen have both observed a troubling decline in halibut growth (fish of the same age are smaller than they used to be) in Kodiak area halibut which could have important economic consequences for the fishery (Clark & Hare 2002; Clark et al. 1999).

This chapter will examine both patterns of biological change within halibut stocks *and* the nature of ideas about halibut generated through IPHC fishery science practices. I choose a chapter structure that is similar to, yet departs in conscious ways from the format of a traditional scientific paper: introduction, hypothesis, methods, results, conclusions. This analysis of historical growth patterns in Kodiak Island halibut would not have been possible without the emergence of the IPHC, a distinct Western scientific community focused on this one species of fish. Prior to describing the methods and results of this research project, I will provide a background of the **history** through which the IPHC has emerged as a halibut-focused scientific community within the broader field of fisheries science. Next I will describe the **purpose** and background of this scientific project to explore halibut growth through assessments of their otoliths. I will discuss the **techniques** or methodology that my colleagues and I employ to assess aspects of the Kodiak halibut fishery. Next, I will present the **ideas** about halibut populations that emerge from the results of this scientific investigation. Finally, I will **reflect** on what this research process and ideas mean for fish, fishermen, and fishery scientists within the halibut fishery.

History: Emergence of a Pacific Halibut Scientific Research Community

Fisheries science is a somewhat curious branch of Western Science. Unlike other basic sciences which may claim to seek knowledge for knowledge's sake, fisheries science has, from its inception, been explicitly connected to a set of economic and social goals. The prevailing goal of the field has been to develop a set of scientific tools to determine the maximum economic benefit that can be obtained from a commercial fish stock while continuing to sustain that fish stock over time. For this reason, the advancement of the field has been fueled by nation-states whose economic and cultural fabric are tied to acts of fishing.

In his history of the field of fisheries science, Tim D. Smith (1994) states that the development of the field has occurred more through a process of "fits and starts depending on the specific problems that gained sufficient political attention."[9] Smith, a fisheries scientist himself, suggests that the crisis response nature of the field, in which scientists are directed to investigate new issues when problems such as the collapse or decline of a particular stock emerges, prevented the practitioners from completing research threads and developing sets of coherent theories about fish populations.

Scientists did not always believe that fishing could have any impact on a species which is able to produce so many eggs. In 1884, at London's International Fishery Exhibition, Thomas Huxley famously stated, "probably all the great sea-fisheries, are inexhaustible."[10] It would be many years before scientists began to conclusively believe that fishing could have an impact on the abundance and structure of fish populations. The problem in detecting the effects of fishing was that fish catches varied so much naturally that it was difficult to discern a fishing effect under the noise of natural variability.

Smith (1994) traces the origins of the field to the Norwegian cod fishery, when in 1864 the Norwegian government asked marine biologist Georg Sars to conduct research to determine why the cod stocks fluctuated so much from year to year. This was prompted by significant economic and food security concerns about the instability of a fishing industry where catches varied so significantly (Handler 2007; Smith 1994). This proved such a difficult question to answer, that it spawned numerous new questions to be pursued by different scientists, the establishment of an international research community called the International Council for the Exploration of the Sea (ICES) (1900-1920), and the development of a new field of study (Smith 1994).

[9] Smith (1994) p. 2
[10] As cited in Smith (1994), p 38

From its very beginnings we can see connections between fisheries science and processes of economic development and colonialism. If governments could predict and control the dynamics of fish populations, they could reliably expand their fishing interests to new regions and new stocks of fish. The economic benefits of fishing often played a role in funding colonial expansion to remote areas in Europe and the Americas (Kurlansky 1998). Max Handler (2005) describes the connections between the development of fisheries science, government led expansion of the cod fishing industry in the early 1800s, and the colonization and attempted assimilation of indigenous Saami populations in northern Norway (Handler 2005).

Severe declines of fish populations throughout Europe prompted the political attention and funding that allowed for the advancement of the field. In the late 1880s biologist C.G.J. Petersen began developing methods for tagging fish (Smith 1994). By tagging, releasing, and catching the same fish at a later date, scientists could begin to gain insights into the ways fish grow, how they move throughout the ocean, and their mortality rates. The development of techniques to age fish from scales, otoliths, and statistical methods became important as around 1914 scientists, such as Johan Hjort from Norway, began to observe a great variation in the number of fish born in different years called year-classes. Around the year 1900, Walter Garstang, began to develop statistical methods to explore the effects of fishing by examining catch statistics or records of the number of fish harvested by fishermen each year. With analyses of ground fish catches in England and Scotland, he began to suggest that the fisheries were not ‘inexhaustible’ and instead were rapidly declining (Smith 1994).

Some of the biggest breakthroughs for ICES European fisheries scientists occurred as a result of World War I and World War II which have been termed 'the Greatest Fishing Experiments' (Smith 1994). As a result of the naval activity that took place, commercial fishing in Europe was nearly non-existent during the course of the two wars. This provided an opportunity for scientists to observe what happened to fish stocks in the absence of fishing. A number of the basic theories of fisheries science emerged as a result of these experiments. Ray Beverton and Sidney Holt, two scientists from the United Kingdom's Lowestoft Labatory (and associated with ICES), used long range data sets that included periods of low fishing from the wars to develop theories about exploited fish populations that are still widely in use today (Beverton & Holt 1957). Most prominently, they, in conjunction with Canadian scientist Bill Ricker, developed what is called *spawner recruit* theory (Smith 1994). This theory describes the relationship between the number of parents (spawners) and the number of offspring they produce that are recruited to the fishery (recruits). Behind this theory is a central notion important for fisheries worldwide: the number of parents or spawners left in a stock matter for the sustainability of the fishery, they are the ones who contribute to the building of the next generation of recruits.

Meanwhile, communities of fisheries researchers began to crop up in the United States. In 1871, the United States established a US Fish Commission to investigate the declining fisheries of the North Atlantic (most famously cod). The Commission focused considerable attention to hatching and releasing larval fish to supplement declining stocks and fell behind in developing the science to assess the fluctuations of actual fish populations. In 1903 the Commission was placed under the Department of Commerce and Labor and renamed the Bureau of Fisheries (Smith 1994, p.176). It isn't until about 1920, that "fishery science" became an actual term used by US scientists and the media to describe fish research (Smith 1994, p.3). It is important to note that the United States fisheries continue to be studied and managed under the department of Commerce. This placement highlights a vision of fisheries science and management as tools for economic expansion and growth.

William F. Thompson, a zoology graduate student from Stanford, began his career working for the California Fish and Game Commission on the declining tuna and sardine fisheries (Dunn 2001). He had studied the work of many of the European fisheries scientists and felt firmly that it was possible to overfish marine fisheries. He developed a practical and applied approach to his fishery science, believing that fisheries scientists should focus research on "that which is necessary to the perpetuation and prosperity of the fishery." [11]

The Western-oriented commercial halibut fishery (indigenous communities had been involved in the catch and trade of halibut for centuries prior) began to take shape in the 1880s beginning with sail vessels and moving towards power schooners in 1900 (Bell 1981). The fishery took off with the development of the transcontinental railway, which allowed fish to be shipped to the east coast of the United States and Canada. Since the Atlantic halibut and other Atlantic Ocean fisheries had nearly depleted, there was a steady demand for Pacific halibut product on the east coast (Smith 1994). Until the 1960s the majority of the halibut product caught in Washington, British Columbia, and Alaskan waters, was landed in major ports of British Columbia and Washington State.

[11] From W.F. Thompson (1919) The scientific investigation of marine fisheries, as related to the work of the Fish and Game Commission in southern California. *Fisheries Bulletin* (California), 2, 3-27. as sited in Smith 1994

Due to intense fishing pressure, by 1910, fishermen were already observing declines in catch rates and the average size of halibut (Smith 1994). Concerned with these trends, the United States and Canadian governments began a series of negotiations with regards to the sharing and management of the resource. In 1914 they hired W.F. Thompson to conduct some initial assessments of the halibut stock (Bell 1981). Then, in 1924, the two countries made a nearly unprecedented move for the fisheries world. With the 1923 Halibut Convention, they established an international forum for regulation and a scientific body for research whose purpose was to focus on *only one species of fish*. Prior to the Convention, and to this day, most US and International Fisheries agencies focus on multiple species of fish at the same time.

The body responsible for regulation and research of the fishery was named the International Fish Commission (IFC); because halibut was so ubiquitous at the time fish could refer to no other species (Clark 2003). The US and Canadian commissioners hired W.F. Thompson to be the director of the IFC which would later come to be called the International Pacific Halibut Commission (IPHC). The emergence of the IPHC allowed for pouring of unprecedented amounts of research funds, staff time, and intellectual power towards understanding the dynamics of one stock of fish. It established a research community devoted entirely to the Pacific halibut species.

Thompson developed an ambitious research and data collection program whose roots are still present in the activities of the IPHC today. He applied nearly all of the ideas and methods developed by disparate fisheries scientists throughout the world. Learning from the legacy of Garstang who worked on assessing fish populations through catch statistics, he developed a standardized log book through which fishermen marked the location, effort, and size of their catches (Bell 1981). He also placed samplers at each of the major halibut ports to collect size, sex, and otoliths (for age) information about a percentage of the commercial catch (The International Pacific Halibut Commission 1998). Following the work of Petersen, he initiated several large scale tagging studies to uncover seasonal and lifetime movements of the stock as well as estimate mortality rates (Commission et al. 1930). In addition, he conducted significant research into the life history of halibut, traveling himself and sending his staff on treacherous schooner trips to the North Pacific in the summer and winter to locate and quantify egg masses and identify other life history characteristics (Figure 5) (Bell 1981; Commission et al. 1930).

Figure 5. W.F. Thompson (left) on a 1914 research schooner trip. He and his staff went on many such trips to develop assessment techniques and learn about life history and dynamics of halibut populations. Source: William F. Thompson papers, Archives, School of Aquatic and Fishery Sciences, University of Washington, Seattle; as cited in (Dunn 2001).

Thompson served as the director of IPHC until 1940. He was succeeded by two of his protégés, who had worked closely with him as IPHC became established: Henry Dunlop in 1940 and F. Heward Bell in 1963. Dunlop and Bell felt that information about the fishery gained from the statistics of commercial fishermen was potentially biased because fishermen can change gear and fish in specific patterns.

Therefore, in 1963 they initiated fishery independent standardized setline survey (Hoag 1980). In the survey, they fish a consistent set of stations in the same way each year. This allows them to track changes in relative abundance of the stock, as well as changes in the age and sex make-up of the stock. The survey has since expanded to 1,369 survey stations throughout the southern Oregon to the Bering Sea range of the fishery. This survey has provided the IPHC with one of the longest running fishery independent datasets of the world.

Since the Halibut Convention, the halibut fishery has never experienced a severe decline or collapse. This is often cited as a triumph of management because the Halibut Convention allowed for imposition of a closed season for fishing and catch limits for each of the regions of the stock, which were enforced by both governments (Clark 2003). Bill Clark, a recently retired halibut commission scientist, stated that the work of W.F. Thompson was also a "triumph of analysis"[12], because during his work with the stock, he developed quantitative tools which are the basis for fisheries population models used today.

Thompson developed *a priori* methods for investigating dynamics of the halibut stock (Smith 1994). He took information he knew about the stock such as mortality rates and then using a set of logical assumptions, he made simulations to determine what would happen to the abundance of the stock under different conditions (such as different harvest rates). He then tested the results of these simulations against known historical catches to determine their accuracy. These simulations, done primarily by hand, were an early form of fish population model. With the advent of new computer technologies and new forms of statistics, the IPHC has continued to develop more complicated stock

[12] (Clark 2003)

assessment models. Clark (2003) describes four significant periods of change and innovation in the IPHC approach to modeling fish stocks. Despite all this development in the field of population modeling, some quantitative scientists question if the IPHC current models and assessments are much more accurate than the early simulations Thompson conducted[13].

From the above history, it might appear that the development of fisheries science has amounted to a progressive and linear development of knowledge over time. But, looking closely, we can see that the very question that plagued the first fisheries scientists in 1864 Norway – why do fish populations fluctuate – has yet to be successfully answered. The development of fisheries science has been frustratingly circular. Entire ideas about fish population dynamics have been whole-heartedly embraced, only to be definitively abandoned decades later (and in some cases picked up again decades after that). The goal of fisheries science has been to develop stability, predictability, and control in our world's fisheries. Yet fisheries scientists continue to come up with uncertainty, instability, and unpredictability.

In the 1950s-1970s, fisheries scientists peaked in their quest to dominate fish populations. Many practitioners believed that they could predict and manage a fishery to an exact point called maximum sustained yield (MSY), where nations could reap the maximum economic benefit from the fishery overtime. Fisheries scientist P.A. Larkin somewhat jokingly described fisheries scientist's commitment to the concept of MSY as something akin to religious devotion with practitioners serving up the following dogma, "any species each year produces a harvestable surplus, and if you take that much, and no

[13] Interview, retired IPHC Quantitative Scientist 4/09

more, you can go on getting it forever and ever (Amen)."[14] Real fish populations did not always respond in the ways mathematical models predicted and MSY left little wiggle room for unexpected events. Sudden shrinking of a particular year class or an environmental event could make MSY predictions inaccurate and lead to a gross overharvesting of the stock. Many fisheries researchers believe that commitment to the concept of MSY contributed to the collapse of several important fisheries (Larkin 1977; Hilborn 2002).

The futility of MSY's attempts at controlling fish populations became so widely accepted that in 1977, P.A. Larkin was writing an "epitaph" to the concept (Larkin 1977). Even after the abandonment of MSY, fisheries scientists enthusiastically embraced other ideas about fish population dynamics. In the 1980s and 1990s, IPHC's belief in the predictability of their own science led them maintain an age-based approach to modeling the fishery that grossly underestimated (by half) the halibut population for more than a decade (Hilborn 2002). This model has since been replaced. Most current fisheries scientists including those at IPHC describe population dynamics and develop catch limits to accommodate a greater sense of uncertainty, utilizing ideas such as a precautionary approach and adaptive management (Hilborn 2002; Koeller 2003).

From the above description we can see that the emergence of fisheries science, and more specifically the International Pacific Halibut Commission, was not an inevitable product of the search for knowledge. Instead it was heavily guided by the economic interests of nation-states looking to stabilize their fishing industries. As researchers and governments became more aware of the limits and exhaustibility of the world's fisheries, the need for work from fisheries scientists to determine the appropriate levels of harvest

[14] Larkin 1977, p.1

began to increase. The field began to take shape through the development of strategic networks, such as ICES, between individuals working on similar fishery issues world-wide.

Figure 6. IPHC historical otolith collection. Hundreds of thousands of halibut otoliths collected, stored, and labeled since in 1914. Photos: author.

Economic concerns of the United States and Canada who faced a declining fishery, led to the 1923 Halibut Convention. This convention established a research body devoted entirely to Pacific halibut. As directors, W.F. Thompson, Henry Dunlop, and F. Heward Bell initiated a standardized system for data collection that with some modifications, still persists today. As a result, the IPHC possesses vast stores of historical data about the stock. Since the IPHC has been collecting and carefully preserving halibut otoliths since 1914, they also have a nearly unprecedented collection of historical otoliths (Figure 6). This makes them an ideal community with whom I can collaborate to develop this otolith-based research project. I scoured the IPHC otolith collection, aggregating a sample of 539 otoliths which I then measured and used to develop a chronology of how halibut growth has varied over time.

Purpose:

Scientists and fishermen have observed many signs that the average size of Pacific halibut in the Gulf of Alaska is shrinking. Fishermen from the region report that the size of halibut in their catches is smaller than it used to be and that they hardly see any big ones anymore[15]. Halibut scientists at the IPHC present graphs called size-at-age models which show that halibut in the region are not attaining the same size that they used to, and in particular older halibut are much smaller than halibut of the same age were a decade ago (Figure 7) (Hare 2010). The figure below shows that the average size of halibut of similar ages has been declining in 1980, particularly among halibut of older ages. The problem is that neither fishermen nor scientists are entirely sure why the average body size of halibut is smaller than it

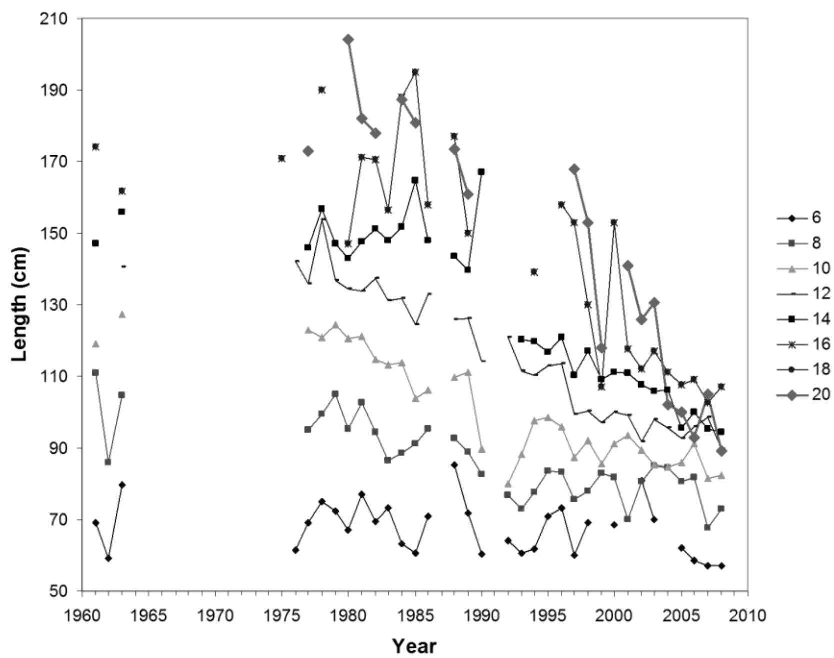

Figure 7. Plot of size-at-age of Pacific halibut caught in the Standardized Setline Survey in statistical area 280. Observe the declining trend in halibut size from 1975 – 2008. The declining pattern is much stronger in halibut of older ages (>10 years).

[15] Interview Old Harbor fisherman 10/13/08

used to be. In fact, the IPHC biologists are so stumped, they refer to the issue in their public lectures as “the incredible shrinking halibut”[16]. For this reason, I have teamed up with the IPHC and other scientists to develop and apply high resolution tools to explore patterns of halibut growth over time and to try to figure out just what is going on in the world of these sea-dwelling creatures.

Since fish is sold by weight, fisheries managers are ultimately concerned about the weight or exploitable biomass that a fishery produces, not just the number of fish that are present (Clark 2002). The biomass of a fishery depends on two important factors: **recruitment** which is the number of offspring that are produced and become large enough to be caught by the gear and **growth** which is how large these individual fish grow (Beverton & Holt 1957). Therefore, fish growth is an important and often studied aspect of fishery science (Beverton & Holt 1957). Also, a declining trend in fish growth like the one observed in the Pacific halibut fishery (particularly when there has not been observed a compensatory increase in recruitment) could potentially have significant economic impacts on participants in the fishery. It could mean less biomass for fishermen to harvest.

Fish growth in any given year consists of both an intrinsic and an extrinsic component. The intrinsic component includes aspects of growth that are internal to the fish such as the age of the fish (younger fish tend to grow more than older ones) and size of the fish (some fish are simply born to be large, others to be small) likely influenced by its genetic disposition. Extrinsic components are aspects of growth related to the external environment of the fish such as climatic conditions, food availability, and species

[16] Hare, Steven and B. Clark. Presentation: The IPHC Harvest Policy: past, present, and future conditions” at 2008 IPHC Biomass apportionment workshop

interactions. In order to understand how body growth of individual fish stock in a population is influenced by environmental factors, we need to be able to separate out the intrinsic and extrinsic components of its growth.

Recently scientists have begun developing growth models based on patterns of growth observed in fish otoliths, scales, and spines as a means to explore the extrinsic and extrinsic components of fish growth (Ostazeski & Spangler 2001; Ogle et al. 1996; Weisberg 1993). Because of their unique time-keeping properties, halibut otoliths contain separate records of otolith growth for each year of the fish's life. We refer to the measurement of each annual ring within an otolith as an increment. When you collect an otolith from a 4-year old fish, you know how long the entire otolith is at age 4, but you can also see how long the otolith was when the fish was 1, 2, and 3 by measuring the width of each increment. The otolith provides information about growth of the fish over its entire life. Measurements from otoliths of many fish can be complied to develop an understanding of otolith growth dynamics in a greater population of fish.

As I mentioned above, fish and otolith growth is comprised of *intrinsic* **age-effects** (growth because of how old it is) and *extrinsic* **year-effects** (growth due to environmental conditions in that year). To examine extrinsic aspects of halibut otoliths growth, we must first separate out the age-effects. Researchers have developed a number of tools for isolating the year-effect component of otolith growth. Black at al. (2008) utilized statistical tools from dendrochronology to remove the age-effect growth in rockfish chronologies. He removed the first few years of maximum growth from each chronology and then detrended the remaining data with negative exponential functions (Black et al. 2008). The problem is that lack of model fit in the younger ages of the detrended data may obscure important relationships between environmental factors and otolith growth. The first years of fish growth, particularly in species that live shorter than the 80+ year old rockfish of Black's study, provide significant information about the life history and growth patterns of fish. In addition, the detrending approach lacks an avenue for examining age and year interactions.

Weisberg (1993) proposed using a fixed-effects linear model to decompose the age and year effects of growth across a population of otoliths. In this model, the length of any given otolith increment is considered a sum of the intrinsic growth of the fish based on its age when the increment was laid down, the environmental effect during the year the increment was laid down, and independent error. This model had several important limitations: it assumed that all increments were independently distributed with a common variance, where in reality, among fish of various ages, increments associated with a particular calendar year are likely to be correlated because they experience common environmental effects. Similarly, increments within the same fish are likely to be correlated due to intrinsic qualities of that fish (e.g. genetic propensity for growth) (Weisberg et al. 2010). The Weisberg model also has limitations in factoring age x year effects. This is the idea that fish of different ages might respond differently to environmental conditions in a given year – perhaps younger fish are more influenced by cold water temperatures than older ones (Weisberg et al. 2010).

To overcome these limitations, Weisberg et al. (2010), proposed a mixed-effects model for examining incremental fish growth. Mixed-effects approaches to linear modeling have been growing in popularity in the past thirty years (McCulloch, Charles and 2008). While the theory behind mixed models is not new, only recently has the software and computing power been available for these models to become widely used in practice. The variation in any given response variable – in this case the measurement of one otolith increment – is considered to be a combination of both fixed and random effects. **Fixed-effects** are those that are attributable to a finite set of levels that occur in the data and are already known. In the increment model the, **age-effects** component of otoliths growth are considered fixed-effects because there are a finite and known set of fish ages within the dataset (age classes 1 – 18 in my data). **Random-effects** are attributable to a potentially infinite (and unknown) set of levels of a factor and the data are assumed to come from a random sample of the possible levels. In the increment model, the **year-effects** are considered random-effects because the fish otoliths could respond in an infinite and unknown number of ways to the environmental conditions of a given year. The error in the model is also considered a random-effect. The mixed-effects model also contains a term for within fish variation. This accounts for the potential correlation between increments laid down throughout the life of the same fish.

Several elements of the mixed-effects model make it a powerful tool for attempting to use the sample of otoliths from 539 individual fish to make generalizations about the larger population from which they came. First, the model is appropriate for scaling up from the experiences of individuals to make population-level generalizations, because it accounts for within fish variation: it allows each fish to exhibit its own unique experience, broadening our perception of individual variation. Second, the mixed-effects approach partitions the model into things that we better understand (fixed-effects) and things that we have less of an idea about (random-effects). This allows us to incorporate information that we already know, such as ages, into the model. We can use known information to improve the model and don't have to presuppose that everything in the system is completely random.

The mixed-effects model allows us to develop estimates of both the age and year components of Pacific halibut growth. We will then use the age and year-effects estimates to explore processes and mechanisms of halibut otolith growth in the Kodiak Island region. We will examine quantitative associations between halibut otolith **year-effect** growth and environmental factors that are thought to influence halibut growth and year-class strength – these factors include an index of Pacific Ocean climate variability (PDO), stock density (CPUE – an indicator of abundance) and species interactions (*Atheresthes stomias:* arrowtooth flounder). Other sclerochronology researchers have been able to detect climatic impacts, species interactions, and fishing effects in the otolith growth records of freshwater and marine species (Ogle et al. 1996; Ostazeski & Spangler 2001; Pereira et al. 1995; Coffin et al. 2003; Weisberg 1993; Black et al. 2008). This project also builds off the work of two IPHC biologists who examined changes in the first five years of halibut otolith growth (Hagen & Quinn 1991). They found strong evidence that halibut otolith growth is influenced by a broad-scale climatic factor.

It is important to note that this technique describes changes in otolith growth and not body or somatic growth which is so important to fishermen and managers. Research in otolith physiology reveals that otolith growth, like body growth is tightly linked to a fish's metabolism and food availability (Clark 1992; Fey 2005). Most research has found that in general as body size increases, otolith size increases, but the relationship is not always linear and is subject to changes or decoupling as a result of differences in environmental conditions, geographic area, species, and sex (Clark 1992; Fey 2006).

This decoupling between otolith and somatic growth is not overly surprising since otoliths can continue to grow even in periods of extreme stress when somatic growth has completely ceased (Campana & Thorrold 2001; Fey 2005). It is likely that otolith and somatic growth are generally parallel since they are both tightly linked to the overall metabolic processes of the fish. However, the mechanisms for otolith growth are distinct from those that regulate overall body growth, so under certain conditions, the two processes will not always be clearly mathematically linked.

However, the record of otolith growth is not at all meaningless. Research by Gauldie (1990) demonstrates that the physiology of otolith growth is tightly linked to the conditions experienced by the fish and in particular to the metabolism of the fish. In fact, otolith growth may be more immediately related to changes in fish metabolism, since the process by which a change in metabolism leads to a change in otolith growth is a fairly simple one (Gauldie 1990). Information about the physiology of otolith growth shows that it can be affected by a number of external factors acting on fish. While sclerochronologies may not reflect the overall growth of the fish, they can be important records of the conditions experienced by the fish. As such, they can provide important insights about factors that influence the growth and vitality of fish populations.

The halibut sclerochronology provides a high resolution way to examine the growth and environmental experiences of fish within the Gulf of Alaska region that surrounds Old Harbor Alaska. We can use these analyses to try to understand why halibut in the region have been showing a shrinking trend over the past decade. In addition, the region has historically experienced dramatic decadal variability in temperature, often described as the Pacific Decadal Oscillation (Mantua & Hare 2002;

Mantua et al. 1997). In recent years, the region has been showing trends of warming well beyond the range of historic variation. Examining linkages between the otolith record and oceanic climate might provide insights into the ways the stock might respond to continued warming trends.

Technique: Getting Otoliths to Speak

For the purposes of this project, we selected and measured a small, but very specific subset of the extensive archive of historical otoliths that the IPHC has been collecting and storing since 1914. We only selected otoliths from halibut that were caught in statistical area 280. This area encompasses waters surrounding the southeastern end of Kodiak Island, and includes most of the current and traditional halibut fishing grounds of the community of Old Harbor (Figure 8). Recent studies have shown that Pacific halibut can be highly mobile so while all fish from the sample were caught in statistical area 280, this does not mean that the fish hatched there or lived all of their lives in that area (Loher & Seitz 2008; Loher 2008; Webster 2009). Since halibut

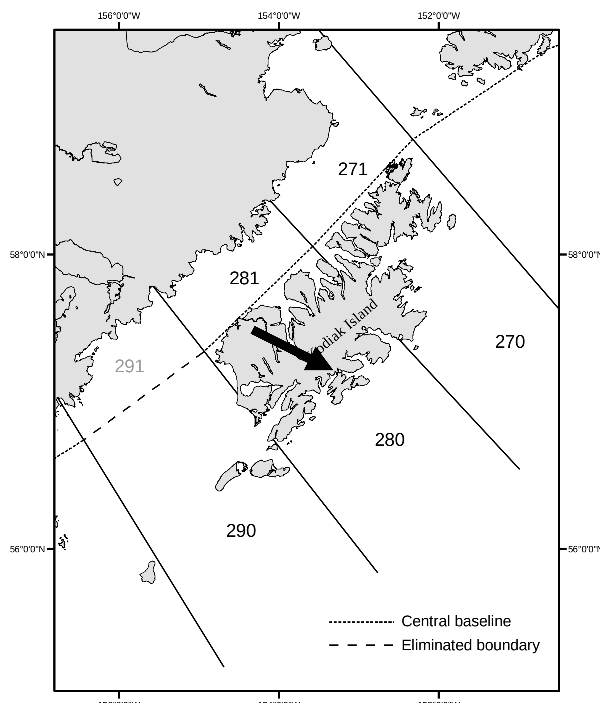

Figure 8. IPHC statistical areas surrounding Kodiak Island. Arrow points to the location of the village of Old Harbor, AK. All samples from statistical area 280.

can be so mobile, when we compared halibut otolith growth with environmental conditions, we selected variables that reflected environmental conditions on a broader scale than statistical area 280 (either regulatory area or regional scale). However, it is possible that halibut from the samples spent part of their lives outside the range of those environmental variables.

We only selected otoliths from fish that were caught as a result of the IPHC standardized setline survey. This allows us to make meaningful comparisons between otoliths of fish caught during different years because the gear type, fishing method, bait, and fishing locations are fairly uniform over time. We selected 539 otoliths for measurement based on clarity of aging and measurement. To measure the width of each otoliths increment and develop a defensible chronology, we needed to be confident in both the age of the otoliths and the boundaries of each of the increments (or annuli) within the otoliths. Figure 9 shows the difference between a clear and unclear otolith.

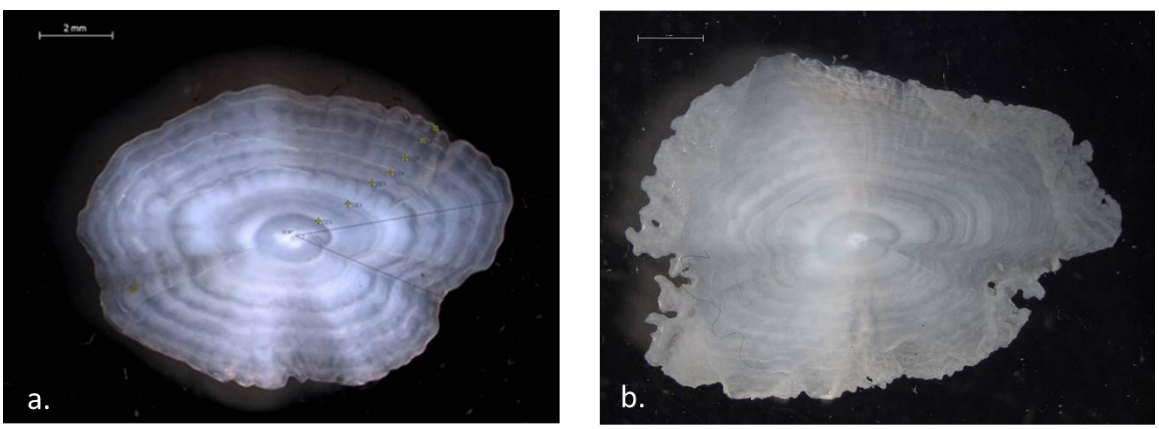

Figure 9. (a) Digital image of a 'clear' otolith which would be included in the sample and measured. You can clearly see each of the seven annuli. (b) Digital image of an 'unclear' otoliths which was rejected from the sample. This otolith has become crystallized at the edges and the outer annuli are not discernable.

We measured annual increment width from the distal surface of each of the otoliths. Thin section measurements from thin transverse slices of the otolith have been successfully used in other schlerochronology projects. We also considered measuring the otolith increments from the transverse edge of otoliths that had been broken in half and toasted to intensify the color of the annuli. The IPHC has been aging halibut from broken and toasted sections exclusively since 2002. However, thin sectioning was too time consuming and destructive to the otoliths collection and break and burn locations and measurements were not consistent enough between otoliths. Using the software Leica Application Suite (LAS) version 4.1, we took a digital photograph of each otolith for measurement and embedded a 2 mm scale bar within the photograph.

We established a transect radiating from the center of the otoliths nucleus to the region of fastest growth (the *longest* edge) towards the rostral edge of the otoliths. Using both LAS 4.1 and Image J[17], we measured the width of each increment along the transect. Figure 10 depicts the transect of measurement, each otolith increment measurement is demarked by alternating colors.

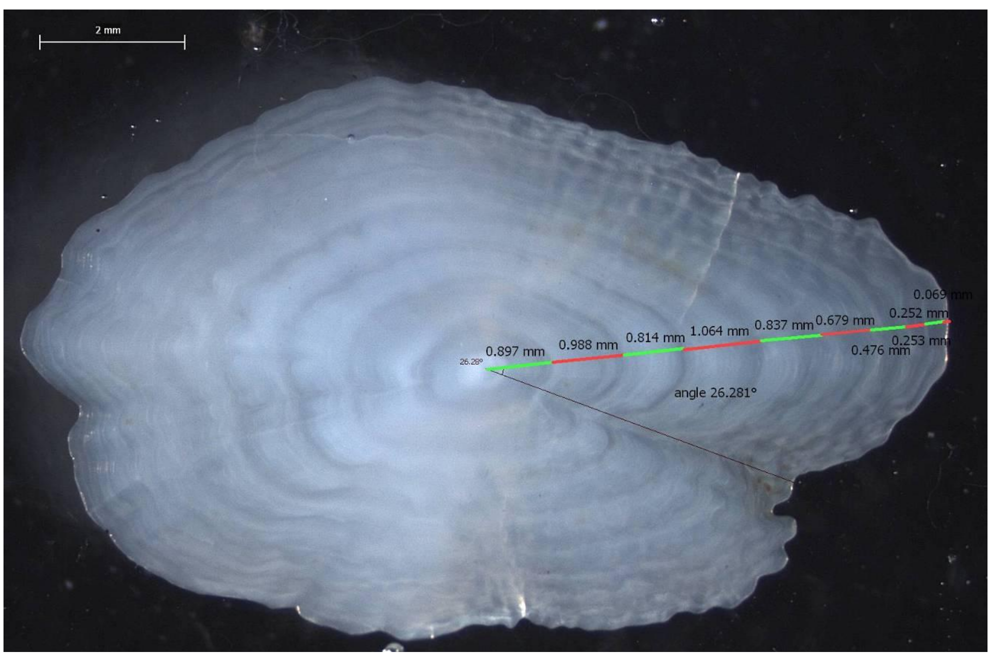

Figure 10. Otolith with transect of measurement across the plane of maximum growth. Measurements are broken down for each annual increment, alternating in color.

[17] Image J, open source Java software, National Institutes of Health

We measured the increments of 539 clear otoliths from fish caught between the years 1963 and 2008. The majority of the otoliths came from female fish, but to characterize sex differences, we added and additional 86 males to the sample. Surface aging is difficult in older fish because individual annual otolith growth becomes quite small as fish age, making the increments difficult to discern. For this reason, we did not include many older fish in our sample. The breakdown of our sample of otoliths, by sex of fish, year fish was caught, and by ages of fish is contained in Figure 11 and Figure 12.

Figure 11. Histogram of the age distribution of halibut otoliths used in analysis

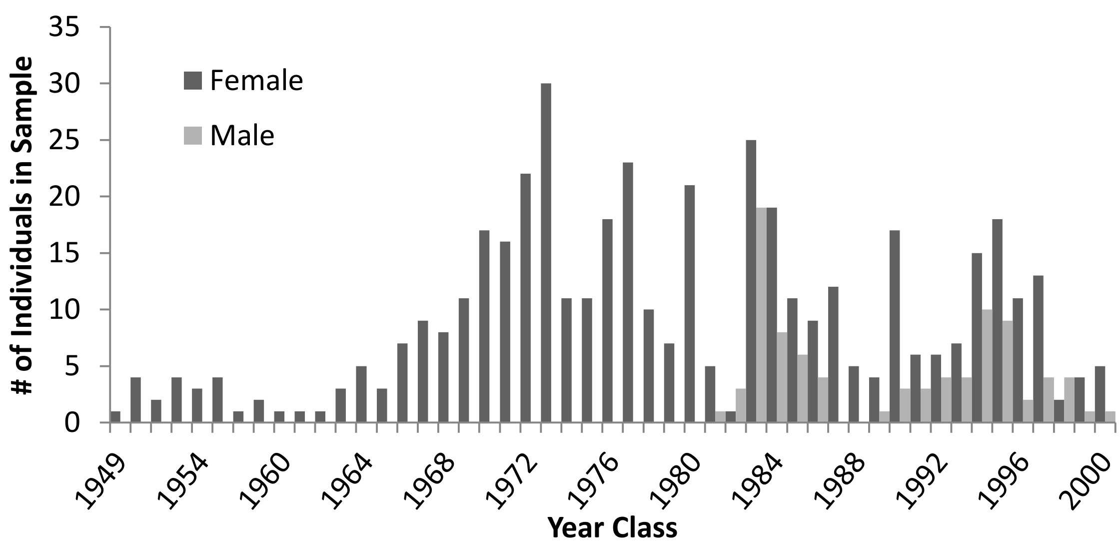

Figure 12. Histogram of the number of male and female individuals from each year class included in the sample of otoliths for this analysis.

Ideas:

The Model

Once we have measurements of all of the increments we input this information into a mixed-effects model to gain insights into how Kodiak halibut otoliths grow in relationship to their age as well as annual environmental conditions. We utilize the equation or model outlined in Weisberg et al 2010 to summarize the process of otolith growth. We define γ_{cka} to be the measured length of the a^{th} increment of growth a^{th} annual increment for the k^{th} fish that was born in year c (year class).

$$\gamma_{cka} = \iota_a + h_{c+a-1} + f_{ck} + e_{cka}$$

This model represents the growth of any given increment measurement as the sum of four components:

(1) ι_a: The *intrinsic or **age effect** growth* or the growth linked a fish age a.

(2) h_{c+a-1}: The *extrinsic, environmental, or **year effect** growth* of the increment linked to the year the increment was laid down: year class plus the age of the fish minus one.

(3) f_{ck}: The within-*fish effects* resulting from the fact that the increment was laid down in a specific fish k.

(4) e_{cka} : the error associated with this particular year, fish, age combination.

Because this is a mixed-effects model, the *environmental/year-effects* (h_{c+a-1}), the *fish effects* (f_{ck}), and the error are all modeled as random draws from unique distributions although all are considered to be normally distributed.

From this model, we can isolate and visualize two key components of otolith growth in the Kodiak Island region: the **age-effects** or the amount that halibut otoliths grow as a result of how old the fish are and the **year-effects** or the amount that fish grow as a result of the environmental effects during a given year. Running the model for the 539 halibut otoliths caught in the Kodiak region, we are able to estimate age-effects of halibut growth for halibut ages 1-18 and the year/environmental effects of halibut growth for the years 1949-2007.

Intrinsic or Age Components of Growth:

Using the mixed-effects model in the statistical software R[18], we are able to separate out the intrinsic or age-effect components of growth. These are different estimates for ι_a for each of the fish ages (a) within the sample. The model also calculates a standard error for each of these estimates.

This plot of the age-effects or intrinsic components of halibut otolith growth gives us a generalized idea of how the otolith in a halibut from the Kodiak Island region grows as the halibut ages (Figure 13). This plot, combined with other biological research about Pacific halibut, can give us a picture of the general life history of an individual halibut within

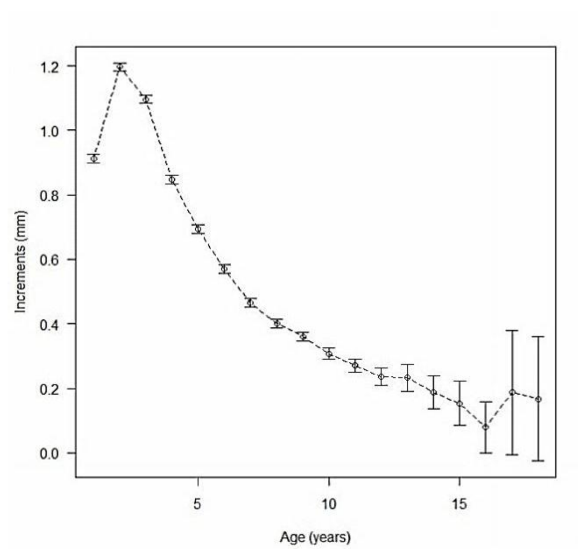

Figure 13. Age-effects or intrinsic components of halibut otolith growth ascertained from the mixed-effects model. Error bars represent standard error.

[18] The R Foundation for Statistical Computing. 2010. R. version 2.11.1. Vienna, Austria

this fishery. The age-effects plot shows that otolith growth is largest in the first few years of the fish's life and then begins to steadily decline towards zero. The plot exhibits a pattern that is typical of body growth of fish – growth in the second and third years is higher than growth in the first, with the second year of growth the highest overall. With life-history research, we can give this growth pattern a bit of a biological context.

Pacific halibut adults are thought to migrate to deep waters (660-1,500 feet) to spawn during the winter months (November – March) (Loher & Seitz 2008; Loher 2008).

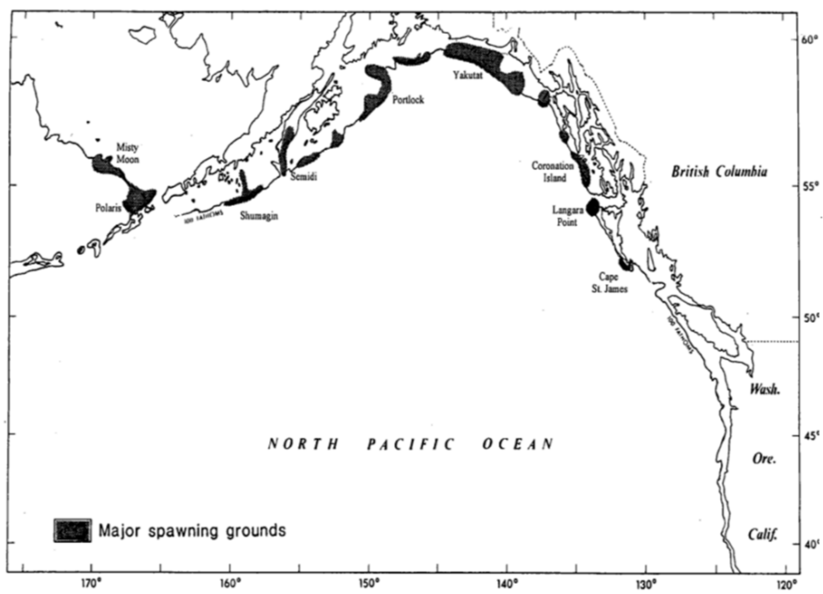

Figure 14. Location of halibut spawning grounds. Source: St-Pierre 1984.

The IPHC research staff has located and mapped the extent of these spawning grounds. After they have hatched, young larvae drift in the currents, so halibut like the ones from our sample caught in statistical area 280, could have originated from any number of the spawning grounds in the Gulf of Alaska (and possibly Bering Sea) region (Figure 14) (St-Pierre 1984). The halibut otoliths begin to grow while the halibut are still in the egg sack. The plot of age-effects of otolith growth shows that halibut otoliths grow considerably, but not at the highest rate, during their first year of life. The first year of life is characterized by the hatching and transformation from the larval to the adult form of the halibut (International Pacific Halibut Commission 1998).

After 15-20 days, halibut eggs hatch. The eggs and larvae are heavier than the surface water, so during the first months of growth, they drift passively in deep water currents. Halibut larvae begin in the upright position with eyes on either side of their head. When the larvae are an inch long, the left eye migrates over the snout of the fish and the pigmentation on the left side of the fish fades. At this point, the fish takes on a horizontal orientation to the water column and takes on the adult form and locomotion of a flounder species. Throughout this transformation, the density of the halibut decreases, and it begins to float upward to shallower waters where it drifts within the counter-clock wise surface currents known as the Alaska Stream (International Pacific Halibut Commission 1998).

During the first year of growth, the larval and post-larval halibut relies on the egg yolk and later small planktonic organisms for food. By the second year, the fish is large enough to begin eating small fish and crustaceans. Perhaps as a result of this shift in diet, the second year is the largest year of halibut otolith growth. Adult Pacific halibut are opportunistic carnivorous feeders and will eat any number of small fish, crustaceans, and cephalopods on the ocean floor, they have been known to completely shift their diet as a result of the changing species composition in the Gulf of Alaska region. Old Harbor fishermen joke that halibut are the vacuum cleaners of the ocean. One fisherman reported that he caught and opened the stomach of a halibut that had eaten an entire unopened can of spam[19].

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[19] Story told by Old Harbor fisherman on 7/10/07

After the second year, halibut growth begins declining in what appears to be an exponential fashion. Pacific halibut are not large enough to be caught by commercial halibut gear until they reach a body length of 60 centimeters. In most halibut this occurs around age 6. At age six, most halibut become *recruited* to the fishery (International Pacific Halibut Commission 1998). The IPHC believes that halibut don't become sexually mature until much later – around age 8 for male halibut and age 12 for females. Sexually mature halibut migrate seasonally to spawn – spending the winter months in deeper waters and the summer months in shallow, coastal waters (International Pacific Halibut Commission 1998).

The age-effect plot shows a steady declining trend in halibut otolith growth after age two. However, near the end of the plot the standard error bars get increasingly large. This occurs because we had many fewer older fish in our sample (Figure 11). Pacific halibut have been documented to live as long as 55 years, so this plot only shows a small portion of the fish's life history of growth. We were limited in the number of older fish we could include in our sample as a result of the surface measuring technique we used for otoliths. Since otolith growth declines each year, the later increments in older fish get increasingly small and increasingly difficult to reliably measure.

Despite the large errors at the end of the plot, we can still see a trend in halibut otolith growth that is similar to patterns and theories that describe fish body growth. Namely, fish are believed to exhibit indeterminate growth. This means that over the course of their lifetime, they never stop growing. Mammals such as ourselves, have a genetically determined height and once that height is reached, we stop growing. This is not the case with fish. Although fish continue to grow over their lifetime, this does not mean that they continue to reach astronomical sizes. Fisheries scientists believe that fish growth is asymptotic: over time individual fish approach but never reach a particular size limit. In terms of growth, after the first few years, the rate of fish growth declines each year, but never quite reaches a rate of zero. A prominent human physiologist, Lugwig von Bertalanffy developed a theory and set of equations to describe this aspect of fish growth, which is still in use today. The post age-2 declining trend in this age-effects plot, suggest that halibut otoliths exhibit a similar indeterminate growth pattern.

We can then look at the pattern of age-effect halibut otolith growth in the context of other research and information about the halibut life history and get a better picture of what these bottom-dwelling fish experience over the course of their lifetimes (Figure 15).

The fact that the age-effects components of halibut otolith growth reflect other scientific findings about Pacific halibut and fish body growth is reassuring. It suggests, amazingly, that the small-scale patterns measured in these hundreds of tiny otoliths can communicate important and biologically substantiated information about these deep water fishes. This gives us greater confidence in the accuracy of the extrinsic or year-effects component of the model, which track changes in otolith growth over time. The concordance between this chart of otolith growth and known information about halibut body growth also suggests that the patterns and mechanisms behind otolith and body growth are similar. The record of otolith growth can provide meaningful insights into halibut body growth which is so essential for understanding patterns in the biomass and economic worth of the fishery.

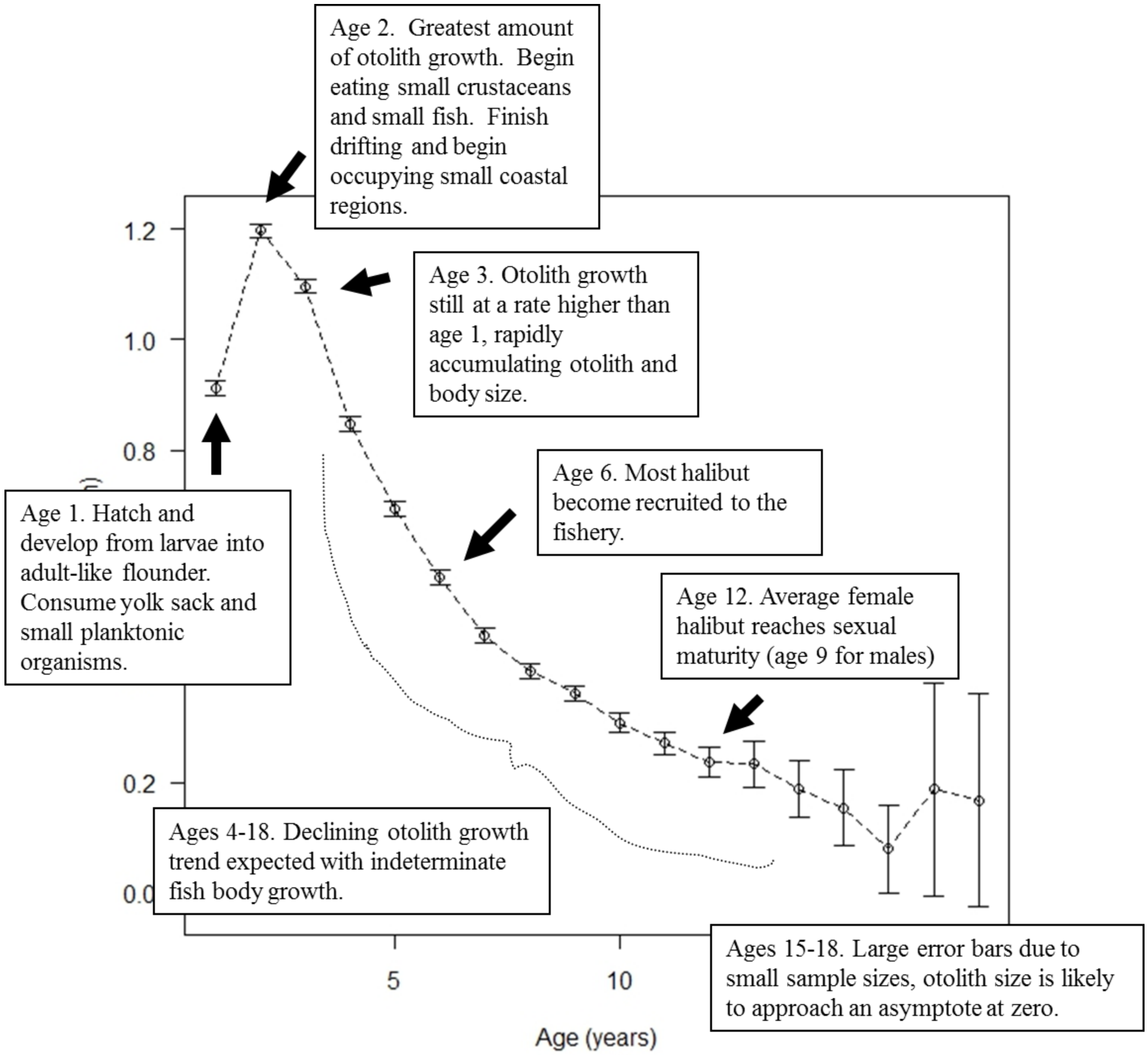

Figure 15. Age-effects with known life history characteristics of halibut.

Extrinsic or Environmental Component of Growth

The intrinsic or age component of halibut growth gave us a picture of how a generalized halibut otolith grows as the fish ages. However, each year that one of these halibut is hatched, it is faced with a different set of environmental conditions all of which can act on halibut growth. With the model we can also separate the extrinsic or environmental components of halibut otolith growth in any given year. In the mixed-model, this is the term: h_{c+a-1} (environmental component of growth in year increment was formed). Once we have extracted the environmental component of otolith growth we can explore correlations between otolith growth and known environmental conditions such as climate, stock density, fishery management conditions, and species interactions.

The extrinsic environmental component of otolith growth extracted from the model is exhibited in Figure 16.

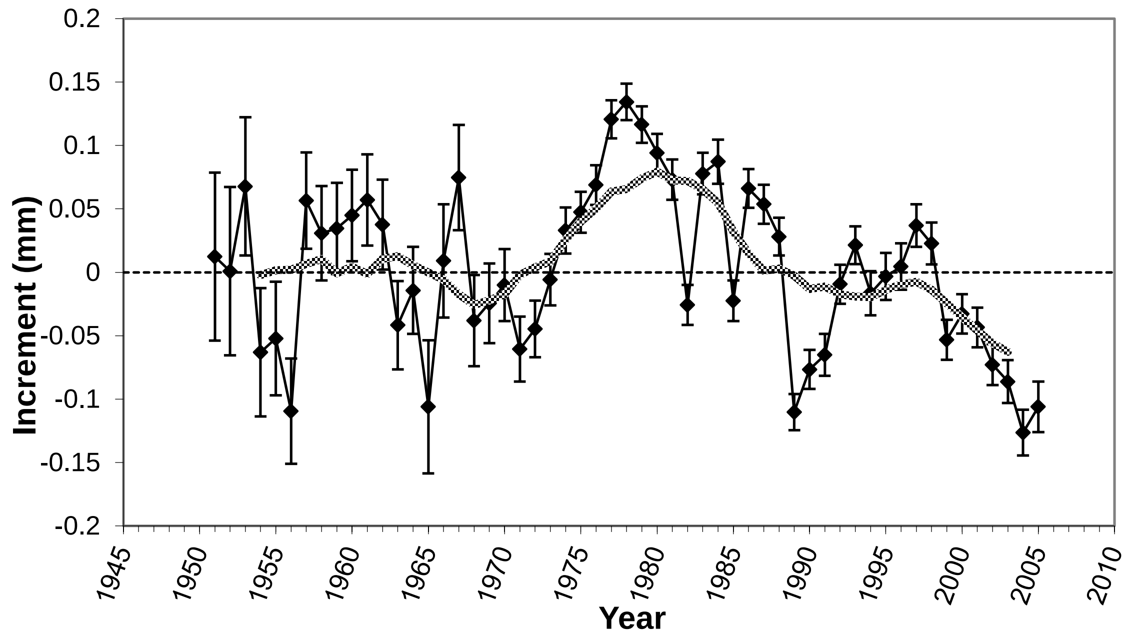

Figure 16. Relative halibut otolith growth with a 10-yr (dotted gray line) running averages.

The figure depicts relative extrinsic halibut otolith growth over the time period 1949-2007. Each point represents the relative otolith growth compared to the annual growth of otoliths over the entire time period. Points with a positive value represent above average otolith growth for the time period and points with a negative value represent below average otolith growth for the time period. The error bars represent standard error. The error bars in the earlier years of the time frame (1949-1965) are larger because the sample sizes for these time periods are smaller – it was more difficult to find historical otoliths that spanned those years and were clear to age and measure. Even with the larger error bars, there appears to be significant fluctuations in otolith growth over time – the relative change in otolith growth is much larger than the size of the error bars in many cases throughout the chronology. This suggests that the annual extrinsic growth rate of otoliths is not flat but has changed over time. This leads us to explore associations with other historical and environmental variables to examine what kinds of external conditions might be influencing this pattern of shifting otolith growth.

First, we will explore the temporal scale over which the fluctuations in relative halibut otolith growth have occurred. In the data, it appears that halibut otolith growth has fluctuated somewhat on a decadal scale (Figure 16). From the early 1970s to the late 1980s, halibut otolith growth appears to have been above average. From the late 1980s to 2007, halibut otolith growth appears to have been below average with a significant declining trend from 2000-2007. Otolith growth from 1949 to the early 1970s appears mostly level under the 10-year smooth, but at the interannual scale, there appears a negative growth trend from 1949-1957, a positive growth trend from 1957-1963, and a negative trend from 1963 to the early 1970s.

Oceanic Climate/PDO:

The fact that halibut otolith growth fluctuates on a decadal scale suggests a possible connection with another environmental factor that is known to oscillate on that temporal scale: the Pacific Decadal Oscillation. Scientists have been hypothesizing the connection between fish population dynamics and climatic conditions as early at 1880

(Smith 1994, p.173). Further scientific research from the 1900s to the present suggests that climatic conditions can have a significant impact on fish recruitment and growth (Glantz 1992). This historical precedent suggests that climate might be an important variable to explore in examining the patterns in halibut otolith growth records.

Mantua et al. (1997) describe the Pacific Decadal Oscillation as a pattern of ocean-atmosphere variability in the North Pacific which has varied at interannual to interdecadal scales. In the Gulf of Alaska region, this has been expressed as ocean temperature shifts between warm and cool periods that last for one or multiple decades. The mechanisms behind the PDO are poorly understood, but it is believed that the oscillations are related to shifts in the strength or position of the Aleutian low pressure center (Mantua et al. 1997; Hare & Mantua 2000; Mantua & Hare 2002). Mantua et al. (1997) established a monthly numerical index to numerically represent the shifts in North Pacific climate. Updated standardized values for the PDO index, derived as the leading PC of monthly SST anomalies in the North Pacific Ocean, poleward of 20N.

The PDO has been shown to act on fish populations in the North Pacific region (Mueter & Norcross 2000). In fact, it was first discovered and described as a result of decadal fluctuations in salmon runs (Mantua et al. 1997). The PDO has been linked to shifts in a number of marine species and environments including plankton, groundfish, and crusteacan (crab and shrimp) species (Hare & Mantua 2000). Researchers believe the PDO is connected to dramatic shifts in the species composition of the Bering Sea and Gulf of Alaska ecosystems – shifts from crustacean based regimes to ground fish based ones (Mueter & Norcross 2000). Many community-members from Old Harbor have observed and are aware of this phenomenon, referring to it as the "cycle"[20]. Scientists from the IPHC have also seen connections between the PDO and trends in Pacific halibut populations. They have found correlations between PDO and processes of recruitment in the fishery – showing that warmer cycles of the PDO have resulted in more young halibut hatching and becoming recruited to the fishery (Clark & Hare 2002). They, however, did not observe a connection between the PDO and body growth in halibut (Clark 1992).

Comparison of the extrinsic halibut otolith growth record with the annual average Pacific Decadal Oscillation index for the same time period highlights a striking similarity in the patterns of the two phenomena (Figure 17). There are, however, a few periods of time during which the two patterns diverge from one another – from 1949-1953, briefly

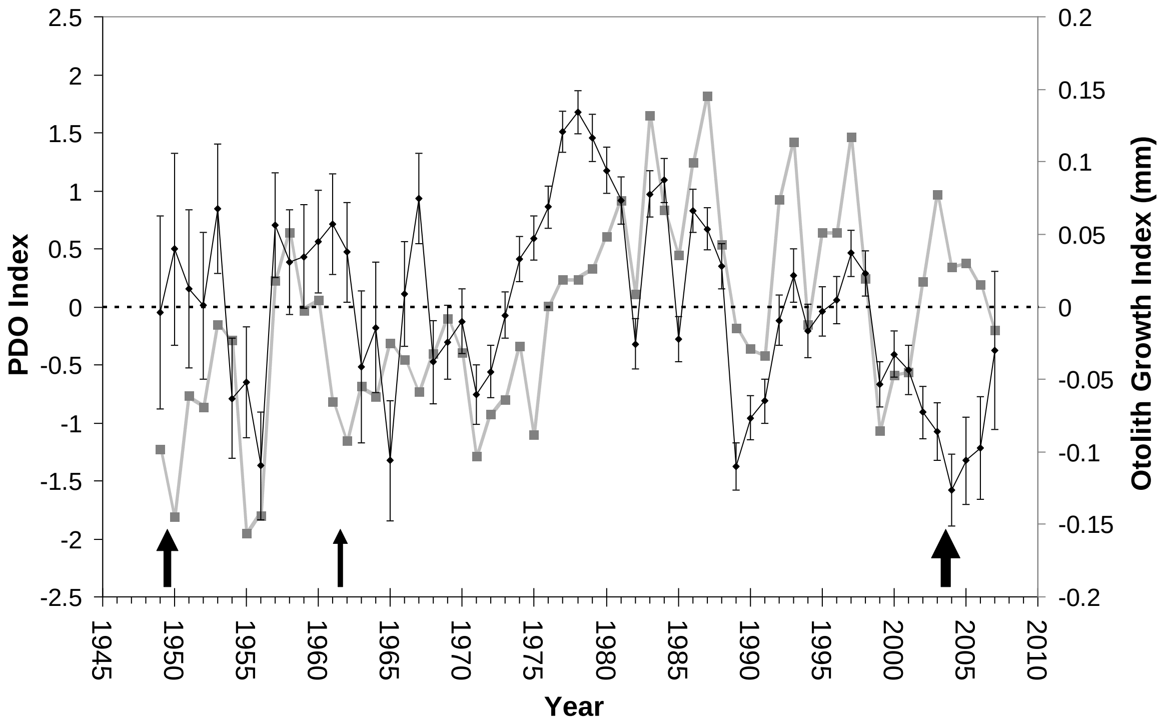

Figure 17. Plot of extrinsic halibut growth (scale of right axis, solid line with diamond markers) with the annual average Pacific Decadal Oscillation index for the years 1949-2007 (scale of left axis, dotted gray line). The arrows represent points in the time series where the two indices diverge from one another to a great degree.

[20] e.g. Interview, Old Harbor fisherman, 6/25/07; Interview Old Harbor fisherman 9/28/08

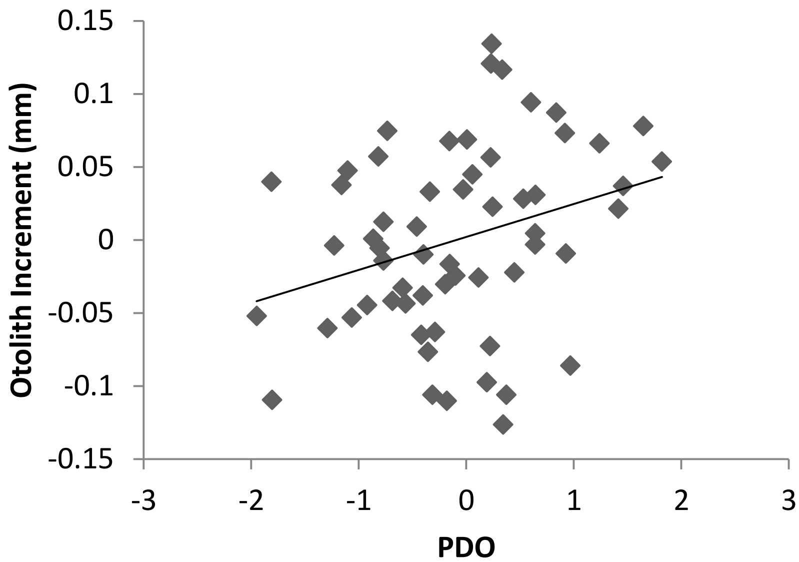

Figure 18. Scatter plot of index of relative otolith increment growth and the annual average Pacific Decadal Oscillation index.

in 1967, and most apparently from 2001-2006. Interestingly, 2001-2006 is also the period over which the IPHC has observed a significant decline in halibut body size (the "mysterious shrinking halibut"). A scatter plot of relative otolith increment growth against the PDO shows the relationship between these two datasets. It reveals that while the patterns trend together, there are points where they diverge.

Statisticians have compiled a PDO index for each month of the year. Therefore, we can also examine correlations between halibut otolith growth and the PDO index from different months to see if the climate during a particular part of the year has more of a relationship with patterns of otolith growth. There is not a large degree of difference between coefficients of different months. However, it does appear that otolith growth has the strongest relationship with winter and early spring months (December through May), culminating with the strongest relationship in April (Figure 19). Conversely, otolith growth appears to have the weakest relationship with PDO values for the summer and early fall months, with the weakest relationship in September. This suggests that warm sea surface temperatures during the winter and spring months could contribute more towards annual otolith growth for that year. This might be linked to the metabolism and

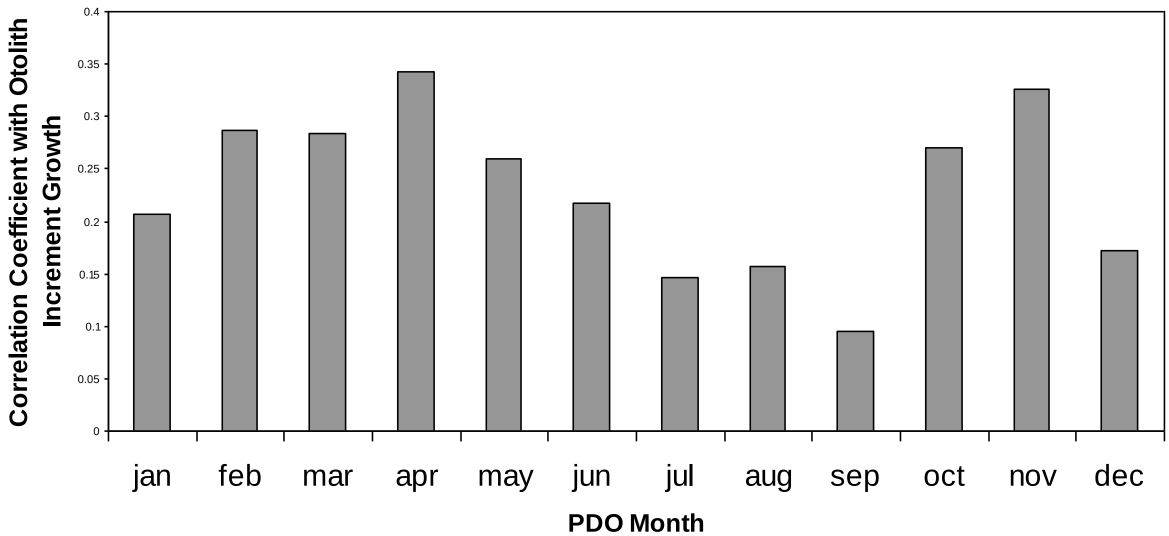

Figure 19. Correlation coefficients for comparisons of annual halibut otolith growth index with the monthly PDO index.

food sources of Pacific halibut. Warm winter and spring temperatures have been linked to increased algae and plankton production (Hare & Mantua 2000; Stabeno et al. 2001), which in turn contributes to increased growth and production of the small fish and crustaceans that halibut eat. With increased food and metabolic activity, halibut otolith growth might increase as well.

There appears to be a fairly strong and convincing relationship between halibut otolith growth and climate, represented by the PDO. In general when the climate is warmer, halibut otoliths appear to grow more and when the climate is cooler, they appear to grow less. The reasons for this correlation could be direct – when the temperature of the sea and body of halibut increases, the metabolic processes for laying down calcium in the fish's ear stone also increases. It could also be indirect – with a warmer climate, halibut may have increased abundance of food which leads to increased growth in body and otolith size. The fact that the correlation with the PDO diverges so distinctly in the years 2000-2006, suggests that climate is not the only environmental factor that contributes to otolith growth. For some reason, during some of the years with the highest PDO index in the 60 year record, halibut otolith growth is at its lowest. This leads us to examine other environmental variables to determine what factors might have contributed to declining otolith growth in recent years.

This analysis uncovers a connection between Gulf of Alaska ocean climate and halibut otolith growth. These findings combined with other halibut research (Clark et al. 1999; Clark & Hare 2002), indicate that increased warming in the Gulf of Alaska as a result of anthropogenic climate change could shape and alter the dynamics of halibut populations. Climate change could impact the growth, recruitment, and range of the species. We find that halibut otolith growth is likely to increase as a result of oceanic warming. Though it is unclear in what ways this increased growth might influence the status of the stock. The decline in otolith growth during the warmest years at the end of the otolith record (2000-2006) is potentially troubling. If some factor independent of climate is acting to diminish otolith growth, then if the PDO shifts to a cooler phase (which is linked to slower otolith growth) the halibut otolith growth could decline even more.

Density Dependent Growth:

Another environmental factor believed to influence fish growth is the density of the fish stock itself (Black et al. 2008; Ostazeski & Spangler 2001; Coffin et al. 2003). Fisheries scientists refer to this as density-dependent growth (Beverton & Holt 1957). This means that when there are a lot of fish within a system, the fish will not grow as much or as fast because they are competing with each other for resources and food. High stock density can lead to stunted growth in fish populations. For this reason, we might expect to see an inverse relationship or negative correlation between otolith growth and the density of the stock. As the size of the stock increases, we would expect the growth rate of halibut otoliths to decrease. Scientists at the IPHC believe that Pacific halibut growth is density dependent (Clark et al. 1999; Clark & Hare 2002). They believe that decadal shifts in halibut growth are density-dependent responses to changes in stock size (Bell 1981; Commission et al. 1930).

A problem in exploring density dependent growth is this: understanding the density of the stock – how many fish are in the ocean – still remains a difficult and nearly unanswerable question in fisheries science. For this reason, fisheries scientists have developed a set of indices that can act as indicators of stock density over time. These statistics are based on the extent of fishermen catches. As I mentioned in the history section, in 1900, the British scientist William Garstang took up the question of exploring trends in fishery abundance with catch statistics (Smith 1994). He immediately discovered that if you look only at catches – how many fish are brought in – you don't know if an increase in the number of fish caught is due to an increase in the fish population or due to an increase in the number and intensity of fishermen trying to catch the stock. Somehow he had to be able to account for fishermen intensity or effort.

His work initiated the development of a fishery statistic that is used by the IPHC today: catch per unit effort (CPUE). This statistic examines how many fish are caught given a standard unit of fishermen effort. Units of fishermen effort can vary from fishery to fishery, but in the Pacific halibut fishery, one unit of effort is a skate or line of 100 hooks that is dropped on the ocean floor to catch halibut. This means that if you take the total pounds of halibut that a fisherman caught and divide by the amount of gear (hooks) that he or she put in the ocean, you can get an indication of the number of fish he or she caught per 100 hooks of fishing. In theory, as the density or abundance of the stocks declines, so too will the amount of fish that any given fishermen catches using a similar amount of effort. By tracking changes in CPUE over time, fisheries scientists can also track changes in stock density over time.

When he became director in 1923, W.F. Thompson initiated one of the most comprehensive log book programs for the commercial fishery. Fishermen needed to indicate the amount of gear they set, where they set the gear down, and the amount of fish that they caught. For this reason, the IPHC has long-running datasets of commercial CPUE for the different regions of the fishery. Commercial catch statistics can have bias because fishermen move around and seek out areas where fish are more plentiful, so in 1963 the IPHC instituted their fishery-independent survey. IPHC began conducting the survey in the Gulf of Alaska region in 1977. For this reason, we have datasets for both commercial and survey CPUE in Regulatory area 3A, which is bigger than but includes statistical area 280. The commercial and survey CPUE data sets are highly correlated ($r = 0.95$, $p < 0.001$, $n = 25$), suggesting that they follow a similar pattern and can both serve as indicators of density changes in the stock (Figure 20). The survey CPUE is lower than the commercial CPUE because the survey is conducted in randomly chosen spots on the ocean floor, whereas commercial fishermen tend to fish in areas where they know they will get more fish. The most apparent features of this plot is the dramatic increase in both survey and commercial CPUE around the year 1983. A part of this

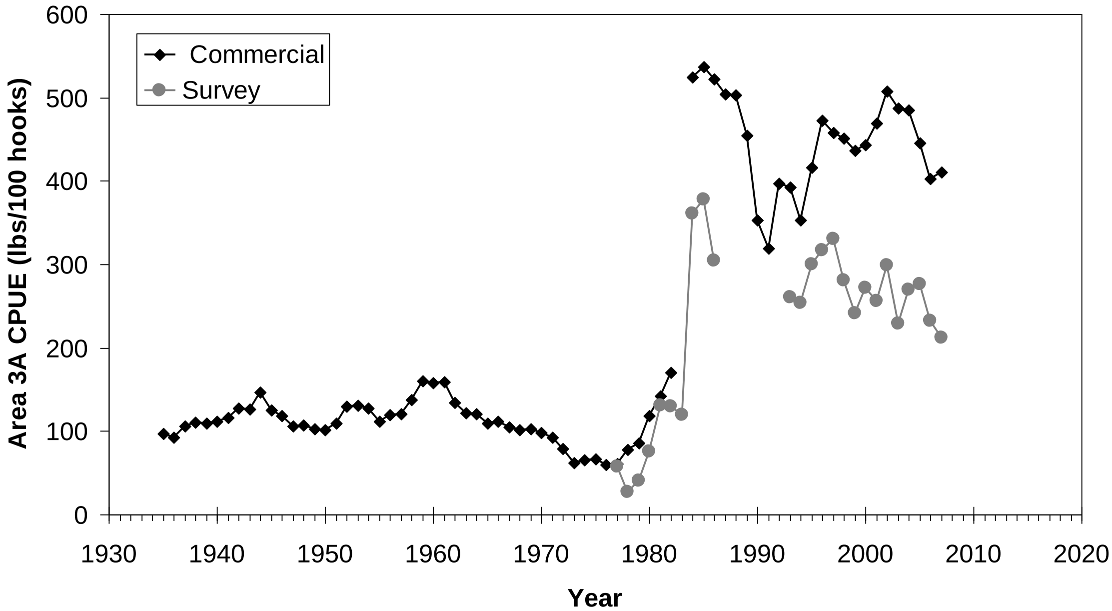

Figure 20. Average commercial (darker line) and survey (lighter line) CPUE for regulatory area 3A. In 1984 both the commercial industry and survey switched from J-hooks to circle hooks which dramatically increased the catch rates of the gear.

increase might be linked to changes in catchability (changes in fishing gear from J to circle hooks made it more effective at catching halibut), but many scientists believe that this is also linked to an increase in stock density or biomass over time related to some strong year-classes recruiting to the fishery (Clark & Hare 2006).

We can compare the CPUE datasets to the annual otolith record of halibut to see if there is any evidence for density dependent influence on halibut otolith growth. Recall that we would expect otolith growth to decline as the stock density increased. There is a statistically strong inverse relationship between survey CPUE and otolith growth ($r = -0.53$, $p = 0.004$, $n=59$, one-tailed). Examining the overlapping plots, we can see that in the period from 1977-1981, when survey CPUE was very low (1/8th of the average for the entire dataset), the halibut otolith growth was above average (Figure 21). The standardized survey was not conducted 1987-1992, so we are missing data points from

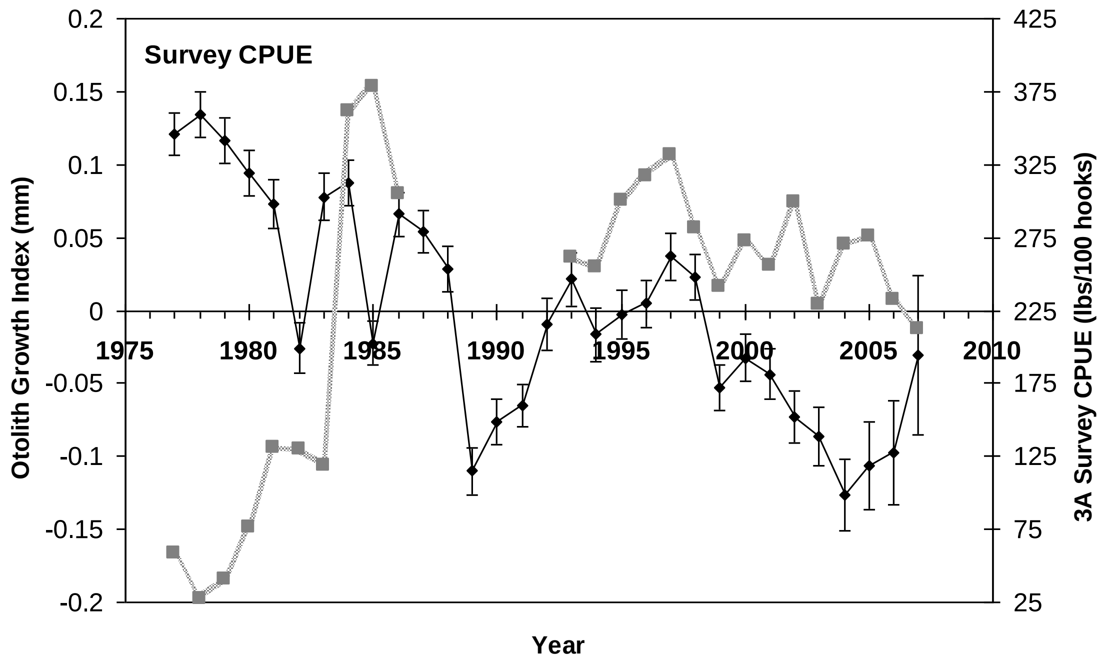

Figure 21. Otolith growth (blue with error bars) and Survey CPUE. Correlation R = -0.53

those years. But, it appears that during that time, the survey CPUE was consistently above average.

The measure of extrinsic otolith growth during that time was below average for most of this period. In addition, this includes the period of unexplained below average growth for the years 2000-2006.

Because of the large jump in commercial CPUE rates between the years 1983 and 1984, we split the analysis of commercial CPUE and otolith growth rates into two time periods (Figure 22). The inverse relationship between otolith growth and commercial CPUE is not significant over either of these time periods, and in the 1984-2007 period, the linear relationship is not even negative (1984-2007: r=0.29; 1943-1983: r=-0.14). However, the period of maximum otolith growth from 1973-1980, appears to follow a substantial decrease in the commercial CPUE of the stock of the region. Similarly, the

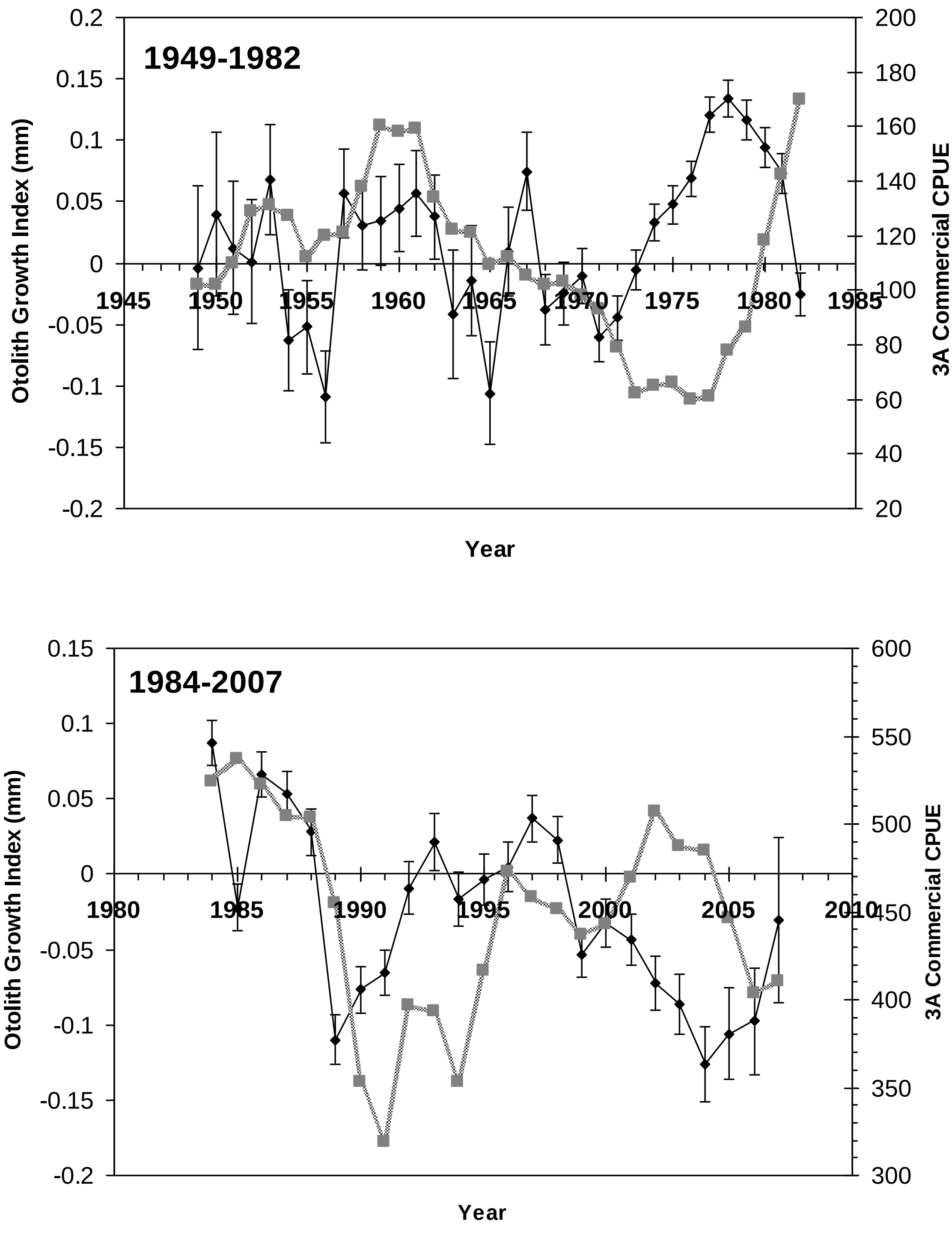

Figure 22. Relative halibut otolith growth (mm) and commercial CPUE (pounds per 100 hook skate) for two time periods (a) 1949-1983 and (b) 1984-2007.

period of slowest otolith growth from 1999-2007 appears to follow an increase in the commercial CPUE. This suggests that these two shifts in otolith growth could at least partially be density-dependent responses to changes in the stock size.

The density of a fish stock depends on both ecological and social factors. In the 1900s, Hjort and other European scientist's uncovered evidence that the population size of fish stocks (year-class size) can dramatically shift from year to year based on environmental conditions (Smith 1994). In this way, stock density is highly dependent on recruitment or the number of fish in a given year that survive to be fished. The density of stock is also highly dependent on a social factor – how many fish fishermen take out of the stock each year. As discussed in the history section, the entire field of fisheries science can be traced to efforts to discern the effects of fishing on fish stocks (Smith 1994). The level of fishing on a stock can depend on a number of factors, economic incentives of fishermen, capitalization of the fishery and perhaps most importantly the regulatory structure of the fishery. As we explore evidence for density-dependent growth, we also examine ways that the bodies of fish have responded to management decisions and practices. Since the goal of management is to keep the fishery at a consistent sustainable biomass, the density of the halibut stock likely has not fluctuated as it would without fishing pressure. IPHC Commissioners have attempted to maintain a steady stock density, and for this reason, it might be difficult to discern the way in which the stock density can impact halibut otolith growth.

Overall, there was not as strong or consistent a relationship between CPUE and halibut otolith growth. However, the two periods of strongest and weakest otolith growth over the 59 year record did correspond with significant decreases or increases in the commercial and survey CPUE of the region. This suggests that density-dependent factors might at least play some role in shaping the record of otolith growth.

Additionally, there are several aspects of the data set that might limit our ability to detect a density-dependent response. First, CPUE is an imperfect indicator of stock density. Changes in the gear or methods of fishing can lead to increases in CPUE, when there has been no increase in the density of the stock itself. Second, CPUE is an indicator of the density of halibut who have recruited to the fishery, mainly fish age six and above. The record of otolith growth contains growth information about fishes age 1-17, but since all otoliths contain records of fish growth from ages one to five (the youngest fish in the sample), the record is skewed towards fish of younger ages. These fish are smaller and might not occupy the same food niche as the older recruited fish. In the discussion of the fish life history, we showed that year one and two halibut persist on planktonic organisms and small fish and crustaceans. Since they are not eating the same foods as the older fish, an increase in the density of older fish might not have any impact on their growth rates.

Species Interactions:

Halibut are not alone in the marine environment. They interact with and come across a number of other species who can impact their lives and growth rates. In the previous section, we showed that halibut can have density-dependence as a result of intra-species competition, or competition for food with other halibut. Fish can also have density-dependent responses as a result of inter-species competition, or competition for food with other species in the same niche.

The arrowtooth flounder is species that occupies a similar niche to Pacific halibut and has been gaining a lot of attention (Turnock et al. 2003). Over the past 50 years, the population of arrowtooth flounder has increased dramatically (by over five times) (Turnock & Wilderbuer 2009). It is currently one of the most abundant groundfishes in the Gulf of Alaska. Arrowtooth is not a viable commercial species and there is no fishing industry directed at the species, which has allowed the population to continue to increase. Arrowtooth flounder occupy the continental shelf and slope in the Gulf of Alaska and Bering Sea regions which are also the home of halibut populations. They both feed on small fish and bottom dwelling organisms.

Given inter-specific competition for similar sources of food, we might have expected that an increase in the population of arrowtooth flounder would lead to a decrease in the growth rate of Pacific halibut. However, young arrowtooth flounders are occasionally the prey of large Pacific halibut (Turnock et al. 2003), so an increased

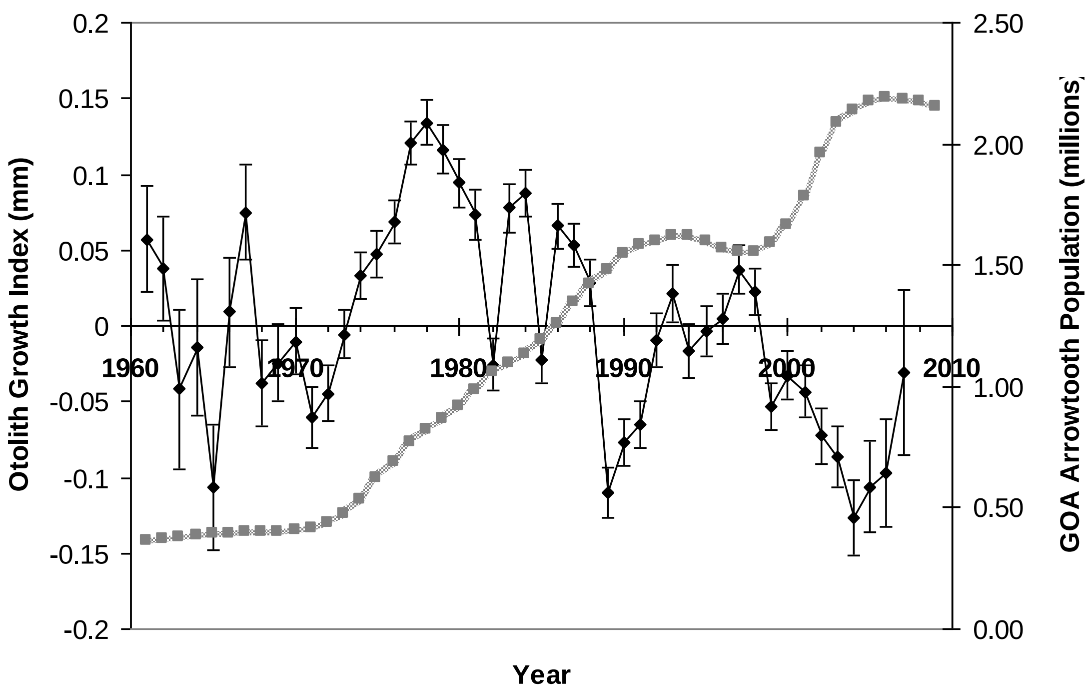

Figure 23. Gulf of Alaska Arrowtooth Flounder population estimate and otolith growth. Arrowtooth estimates from Turncock et al. 2003.

abundance might increase the growth rate of large halibut. When we plotted halibut otolith growth and the estimated biomass of Gulf of Alaska arrowtooth flounder greater than three years old we observed that the arrowtooth population data oscillates at a lower frequency than the halibut otolith growth data (Figure 23).

The estimated arrowtooth population has been steadily increasing since 1961, whereas the otolith growth rate has had several periods of increase and decrease. The arrowtooth population experienced a second surge around 1999 which is also the period that the otolith growth record begins to decline. Perhaps an increase in competition with arrowtooth can help to explain why relative otolith growth began to decline in 1999 even as the climate was warming.

Overall Environmental Components of Growth

There is evidence that temperature, stock density, and interspecies interactions could have contributed to the pattern of otolith growth observed in the otolith record of 539 otoliths from the Kodiak Island region statistical area 280. The otolith growth record often aligned with the record of climate shifts indicated by the Pacific Decadal Oscillation. During warmer phases of the PDO otolith growth appeared higher and during cooler phases, growth appeared lower. However, there was a divergence from this pattern at the end of the record in the years 1999-2006. This suggests that ocean climate is not the only factor acting on halibut otolith growth. Negative correlations with CPUE data suggests that halibut density could contribute to otolith growth rates – increased density leading to decreased growth and vice versa in several cases throughout the record. Since the arrowtooth data is fairly short-lived and has only showed an increasing trend over the course of the dataset, it is difficult to determine how arrowtooth population sizes contribute to growth. However, a 1997 surge in arrowtooth was followed by a decrease in otolith growth from 1999-2006.

The marine environment occupied by Pacific halibut caught in statistical area 280 is incredibly complex. In addition, individual fish have been known to travel long distances well beyond the region in which they were caught. By exploring otolith growth in concert with other data sets we gained some ideas about what factors drive otolith growth (Figure 24). It seems likely that some combination of climate, stock density, and species competition in addition to other environmental conditions have driven the fluctuations in halibut otolith growth.

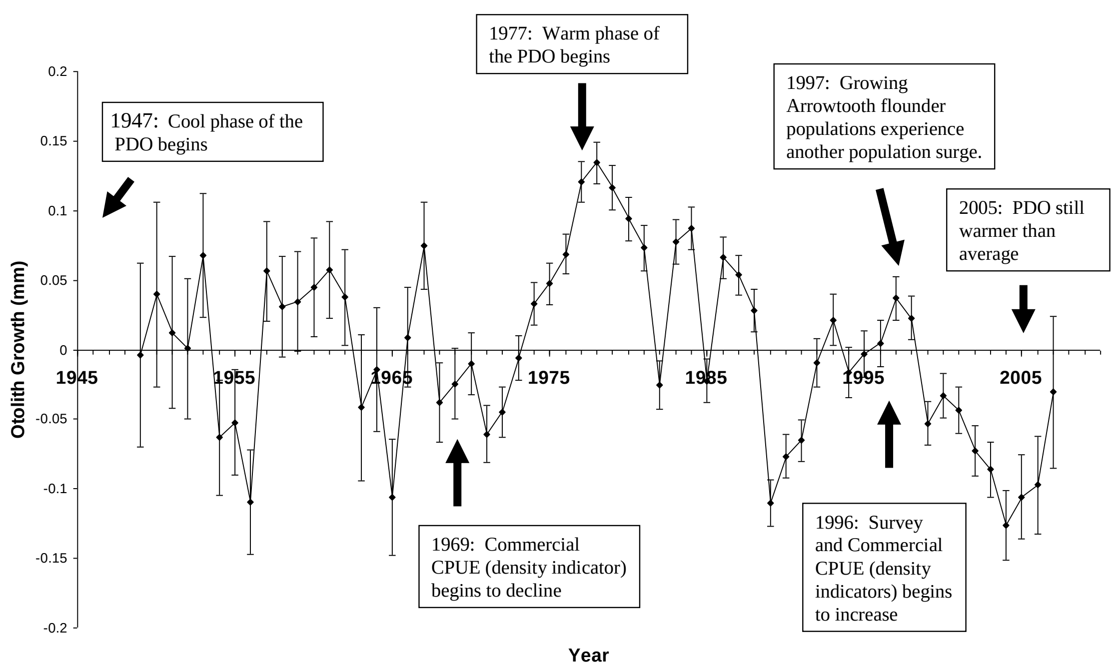

Figure 24. Halibut otolith growth record with key changes in the Gulf of Alaska environment

Reflections:

In this chapter, I traced the trajectory of a fisheries science research project I was involved in to examine growth patterns in the Pacific halibut fishery. Through an analysis of the record of growth in the inner ear stones of 539 halibut caught near Kodiak Island, I worked with other scientists to develop a set of ideas about how halibut otoliths grow as they age and over time. The IPHC's collection of halibut otoliths served as a historical archive into experiences of halibut from the past. Unique properties of otoliths allowed us to examine processes of growth to great temporal precision; we were able to isolate components of halibut growth in each year of its life. Using a mixed-effects model, we separated age or intrinsic and year or extrinsic components of growth. The age components of growth give us a window into the life history trajectory of halibut and how they grow as they age while the year component of growth indicates how halibut growth has changed as a result of environmental conditions across time. That the age components align with life history characteristics of halibut populations and the year effects correlate with significant environmental variables of the region, suggesting that these otolith records can communicate us valid things about the experiences of halibut stocks.

We entered the project hoping to determine what factors contribute to halibut growth and to understand why halibut growth seems to be declining in recent years and how halibut populations are impacted by a changing climate. By examining connections between the record of otolith growth and environmental variables, we got hints and possibilities about what factors might contribute to the growth experience of halibut over time. But, definitive information about mechanisms for growth remains elusive.

Correlations and patterns of association do not always appear to hold up over time and no one environmental variable seems to have a dominating influence over the record of otolith growth. In addition, the marine environment of Pacific halibut is incredibly complex with a number of social and ecological linkages – many variables that act on halibut populations over different frequencies of time and to different effects. Even if fish do speak through their otoliths, it is difficult to figure out what they are trying to say.

Throughout this dissertation, I will examine the historical trajectories of different social groups or communities who become joined together in the halibut commons. These groups include an Alaska Native fishing community, the International Pacific Halibut Commission, and the North Pacific Fishery Management Council. As I examine the ways that these different interests in the fishery converge and shape on another in time, it is important to keep in mind that the fish themselves have a unique historical trajectory. The resource is not static through time but responds to changing environmental and regulatory conditions in sometimes surprising and elusive ways. Scholars in the area of science studies, might refer to these dynamic fluctuates and responses of fish populations as a form of non-human agency because the fish can never be fully ordered or shaped to human will (Latour 2005; Callon 1986). Through this project we can see that the social history of the fishery, whether it be decreasing the density of the stock through fishing pressure, or moving fishermen to different areas of the fishery, leaves its mark on the bodies (and otoliths contained within) of fish.

Finally, this Western-science halibut commission approach to halibut population dynamics is one in a multitude of perspectives on halibut biology. In the next chapter, we will examine some of the ways fishermen from the community of Old Harbor approach and understand halibut biology. This chapter demonstrates the connections between ideas about halibut and the social context in which these ideas are produced. The analysis of historical growth patterns in Kodiak Island halibut would not have been possible without the emergence of a distinct scientific community surrounding this one species of fish. My approach to halibut research was shaped by my connections with this scientific community.

Furthermore, the IPHC and my research are situated within a larger history of fisheries science. The methods and approach we use in our analysis – from examining climatic influences, to utilizing the CPUE catch statistic – have their roots in the history of the discipline. The history section demonstrates that the development of both the field of fisheries science and the IPHC was deeply tied to processes of nation-making and a series of historical, political, and economic entanglements. This technoscience approach provides an important window into the behavior and dynamics of halibut populations. Over the course of the development of the field of fisheries science, scientists have developed a number of creative and innovative techniques through which to communicate with a population of animals remains invisible under the sea.

However, like other approaches to knowing halibut, these ideas about halibut biology are shaped by their context. They are shaped by communities or networks that have formed in both time and place. They are rooted in the history of fisheries development and fisheries science. Also, they are shaped by place – the urban 'centers of calculation'[21] in Europe and the United States and later the Seattle based offices of the IPHC.

[21] Reference to (Latour 1987)

Chapter 4
Analysis

Fishermen Communicate with a Mystery: Old Harbor's Halibut Science

We knew, or actually, the skipper knew exactly where those fish were going to be at what time of the year. We – it got into a real science.

-Retired Old Harbor commercial halibut fisherman

sci·ence (noun)

1. [U] (knowledge from) the systematic study of the structure and behaviour of the physical world, especially by watching, measuring and doing experiments, and the development of theories to describe the results of these activities.

-Cambridge Dictionary

I can still remember the sound of Paul Kahutak's old truck as it sputtered around the corner and stopped in front of the house where I was staying. Upon hearing the sound of the truck, I'd jump out of bed, compose myself and try my best to look like I hadn't just been sleeping. When I opened my front door, he would greet me, eyes peering through his oversized glasses. He would then invite me to come halibut fishing. We'd take the truck a quarter of a mile down the road to the harbor and hop into his small skiff. Though well into his 70s, he went subsistence fishing nearly every calm sunny day of the summer. He would pull the skiff out of the harbor and drive for ten or fifteen minutes. Then without warning, he would cut off the engine and instruct me to drop our handlines over the side of the boat. This was our fishing spot for the day. Since groundfish are not visible from the surface, dropping fishing gear whether it be a mile long commercial skate or a single handline, is an act of faith – faith in the information about halibut that the fisherman has accumulated over time.

In the introductory quote, an Old Harbor-based fisherman describes how he and his crew developed such a sound understanding of the movements of halibut populations that their fishing practices became a "real science". In this chapter, I take his statement seriously. I explore the science through which community members and fishermen from Old Harbor have sought to gain information about Pacific halibut resources. In their efforts to become better halibut fishermen, Old Harbor community members practice all four of the elements outlined in the Cambridge definition of science: they watch, they measure, they conduct experiments, and they develop theories about the halibut populations that surround their community.

It is also significant that the fisherman above uses the word "we" two times in his statement, in one instance he almost conflates "it" – the science, with "we" – the fishermen. This suggests that like the International Pacific Halibut Commission's approach to knowing, fishermen's ideas about halibut are not produced by individuals in isolation, but rather result from communication and embeddedness within a larger community.

This dissertation examines what I call the "politics of knowing" surrounding Pacific halibut resources – this includes the ways that different groups approach the resource and the results of political negotiations about which ideas are incorporated into halibut management. In this chapter, I will examine how fishermen from Old Harbor approach halibut biology. I will explore Old Harbor's ways of knowing halibut from a historical perspective – examining how Old Harbor's history shapes community approaches to and ideas about halibut biology.

Over the course of a long history of seeking these elusive, underwater organisms, community members from Old Harbor have developed a number of ideas about the biology, movements, and change of Kodiak area Pacific halibut. As we will see, working knowledge of halibut populations is both essential to and incidental of acts of trying to catch them. Employing a similar structure to the previous chapter, I argue that Old Harbor fishermen and residents, through acts of accumulating information about the local marine environment, have, like the IPHC, emerged as a scientific community within the Pacific halibut fishery.

History: Emergence of Old Harbor as a Commercial Fishing Community

Representatives from the village of Old Harbor are very active in the fishery politics of the North Pacific Fishery Management Council (NPFMC) which regulates the Pacific halibut fishery in the Alaska region of US waters. At these meetings, both politicians and Old Harbor representatives refer to Old Harbor as a "fishing community"[22]. In the context of these meetings the term fishing community has a fairly specific definition. It refers to small, isolated, rural, and mostly Alaska Native populations that are actively involved in fishing for economic and cultural reasons. Over the course of Kodiak Island's long history, Old Harbor as a "community" or more specifically as a commercial fishing community hasn't always been such a stable or

[22] North Pacific Fishery Management Council Meeting 10/3/2008

defined entity. In this section, I will trace the history of the region to explore how Old Harbor has emerged as a commercial fishing community within the context of the Pacific halibut fishery.

Pre-Contact and the Formation of a Community in Place:

The majority of the information about pre-contact Kodiak Island comes from the Alutiiq museum, which is expressly working to overcome archeology's troubled colonial roots[23]. The museum director is Sven Haakanson Jr, a man of Sugpiaq decent who grew up in Old Harbor and received his PhD in archeology from Harvard University. All of the artifacts and findings are housed at the museum which is in the city of Kodiak, a short bush plane ride from all the Alaska Native villages on the island. In addition, community members are encouraged to examine and engage with these materials through a variety of projects and outreach activities.

Archeological evidence garnered from Alutiiq museum sponsored projects suggests that descendants of the Sugpiaq from Old Harbor have inhabited Kodiak Island for at least 6,600 years (Fitzhugh 2004). Digs from that and succeeding time periods have uncovered an array of fishing tools and fish remains which suggest island inhabitants have subsisted on fish throughout that history (Kopperl 2003). Ancient fish otoliths, like the ones described in Chapter 3, were uncovered and identified at each of the sites. While cod and salmon remains were the most common across time periods, archeologists uncovered evidence of halibut remains at all of the sites, indicating that this species was harvested and consumed far back in Kodiak's history (Kopperl 2003).

[23] http://alutiiqmuseum.org/

Archeologists from the Alutiiq museum tend to divide the pre-contact record into three distinct periods: Ocean Bay (6,660-4,000 B.P.[24]), Kachemak (4,000-800 B.P.), and Koniag (800-200 B.P.)[25]. It is believed that during the Ocean Bay period, inhabitants subsisted primarily on marine mammals, with some fish, but in the early Kachemak period there was a shift towards greater use of marine fish and salmon (Kopperl 2003). Archeologists have found evidence of surplus production of fish resources on Kodiak beginning in the early Kachemak period. Surplus production strategies involved economies of long distance exchange and storage of fish resources to insure inter-seasonal survival (Steffian et al. 2006).

According to the archeological record, by the Koniag period, inhabitants were involved in processes of over-production of fish resources where they caught and utilized excess fish for trading purposes and to develop prestige relationships (Fitzhugh 2003). These findings indicate that aboriginal fishermen from Kodiak Island have been involved in fishing activities not just as a means of subsistence, but also as a source of labor, social status, and integration into a wider economy of trade for over 800 years.

Archeologists suspect that by the 1700s, prior to Russian colonization, there were 65 villages with 8,000 people living on Kodiak Island[26]. The current site of the village of Old Harbor was not a permanent settlement at the time of Russian arrival. The Sugpiaq inhabitants often roamed seasonally at that time. Due to significant fall silver salmon runs up Ituwiq[27] or Big Crick, it was the location of a summer and fall fish camp. Oral

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[24] B.P. means before present

[25] The Alutiiq Museum and Archeological Repository, display materials, October, 2008.

[26] Clark, D.W. 1968. "Koniag Prehistory" [Ph.D.]: University of Wisconsin. 834 p. as cited in (Alaska Department of Fish and Game 2002)

[27] Sven Haakanson, Ph.D., Personal Communication, The Alutiiq Museum and Archeological Repository. Kodiak, AK. 7/1/2010.

history accounts state that sometime after Russian arrival in the mid-1700s, residents of Eagle Harbor, a village about 25 miles northeast of Old Harbor all decided to move to the location of Old Harbor to establish a permanent community. An elder from Old Harbor told me the following about Eagle Harbor: “that’s where Old Harbor come from. Some guy went crazy and scared everybody out of there. That’s what mom said. Some guy went wild there and people just packed up and moved.”[28]

Old Harbor was also located near the first Russian colony in Three Saints Bay. Sugpiaq people from the area were forced to hunt and prepare food for the Russians[29]. In the 1790s when the Russians relocated from nearby Three Saints bay to the current location of the city, the village came to be named Old Harbor – it was near the site of the ‘old’ Russian settlement[30].

At present there are only six Alaska Native villages on Kodiak Island. Up to the 1960s (well after Russian and US contact), there were considerably more Sugpiaq villages in the Kodiak area. People who resided in the villages, particularly when they were younger, would seasonally roam to different communities depending on work (mainly fishing) opportunities[31]. In 1964, the region experienced a major earthquake and tidal wave that wiped out the building structures in many of the villages. Only the larger villages were rebuilt following the event. Old Harbor was rebuilt with the assistance of federal government. The nearby smaller village of Kaguyak was not rebuilt, and most of its residents moved to and continue to reside in Old Harbor[32].

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[28] Carl Christiansen Sr., interview, 7/9/2008
[29] Old Harbor Native Corporation. Old Harbor History and Timeline. Accessed 9/9/10. http://oldharbornativecorp.com/index.php/site/history_timeline/
[30] *ibid*
[31] Paul Kahutak, personal communication, 8/11/2007; George Inga Sr., personal communication 7/23/08; Old Harbor Field Notes 2008
[32] Interview, Old Harbor resident 10/19/08; Old Harbor Field Notes 2008

Double Colonialism: Russia and the United States

The Russian presence in Alaska was almost entirely linked to the extraction of marine resources. In 1728, a Russian explorer named Vitus Bering first sighted Alaska. The first permanent Russian settlement in Alaska was established in 1784 by Grigory Shelikof in Three Saints Bay, a bay less than ten miles West of the present location of Old Harbor on Kodiak Island. In 1799, Czar Paul officially claimed Alaska as a Russian possession. Shelikof formed the Shelikof-Golikov company which exported otter and seal furs from all parts of Alaska (the Bering Sea to Southeast Alaska) to Russia (Harriman & Merriam 1902).

The Russian period was brutal for Sugpiaq inhabitants of the island. Russians engaged in active warfare and forced Alaska Natives throughout the state into slavery in the fur industry. In addition, Russians took control of the local government systems, claiming the right to appoint local chiefs. It is estimated that during the period, the Native population was reduced by 80% (Alaska Native Heritage Center 2009).

The Russian presence also provided the opportunity for cultural exchange and the Sugpiaq people from Kodiak variously incorporated Russian elements into their daily lives. The Russian Orthodox church continues to have a large presence in most Alaska Native villages throughout the state and is the dominant religion in Old Harbor (Alaska Native Heritage Center 2009). In addition, the Sugstun language currently spoken contains many Russian words and references. Old Harbor residents also continue to build and use Russian-style banyas or wet saunas.

In 1867, without any consultation with the Native inhabitants, Russia sold Alaska to the United States for $7.2 million (2 cents an acre). Marine resource extraction – in fur and fisheries – was one of the primary motivations for the purchase (Harriman & Merriam 1902). Many Alaska Native communities did not even know the territory they occupied had been claimed by the United States until years later (Case & Voluck 1984). Because of this unique colonial history, Alaska Natives have a somewhat different political history and status from American Indian communities in the contiguous 48 states. The 1867 Treaty of Cession, where the United States claimed Alaska stated the following, "'uncivilized Native tribes' to be subject to such laws and regulations as the United States may from time to time adopt in regards to aboriginal tribes of that country."[33] The legal framework and status for Alaska Natives continues to be worked out.

Similar to the General Allotment Act of 1887, the United States passed two forms of allotment for Alaska. With the 1906 Alaska Native Allotment, Alaska Natives were allotted 160 acre parcels of non-mineral lands. In Old Harbor, residents were permitted to choose their allotments in lands apart from the village site, in bays, peninsulas, or islands where residents might have established a hunting or fishing cabin[34]. In 1926, Congress passed the townsite act, where Alaska Natives were also allotted smaller plots of land within the village site where they resided. These lands could not be alienated without permission from the Secretary of the Interior (Case & Voluck 1984).

The 1934 Indian Reorganization Act (IRA) was specifically amended in 1936 to address Alaska Native issues. The IRA permitted the Secretary of the Interior to

[33] 1867 Treaty of Cessation as cited in (Case & Voluck 1984)
[34] Paul Kahutak, personal communication 8/11/2007; Old Harbor field notes 2008; Konaig corporation staff, personal communication 2008

establish land reserves in areas occupied by Alaska Native groups, provided money for economic development, and encouraged Alaska Native communities to establish federally recognized tribal governments and constitution (Case & Voluck 1984). Old Harbor ratified a constitution during this time. Under the Act, the US government created a number of executive order reservations intended to benefit Alaska Native groups. Several of these reserves were specifically established to protect Alaska Native access to hunting and fishing resources. One such reserve was established near Karluk, a village on the northwest side of Kodiak Island. The reservation held that Alaska Natives had exclusive access to the land *and* the salmon fishing waters up to 3,000 feet off the shore surrounding the village. Unfortunately, executive order reservations did not have the same standing as American Indian reservations in the lower 48. Many aspects of the reservations, particularly the exclusive fishing access clauses, did not hold up in court (Case & Voluck 1984).

The need to establish a legal framework for Alaska Natives became more apparent when Alaska officially became a state in 1959. In 1971, the Alaska Native Claims Settlement Act (ANSCA) was established to clear up the nearly 100 year old issue of aboriginal land claims in Alaska. The act eliminated all Alaska reservations with the exception of one and extinguished Alaska Native land claims in exchange for granting Alaska Natives title to 48 million acres of land. ANSCA also established a set of 13 regional corporations and over 200 village corporations who split and invested a government payment of 462.5 million dollars and an additional 500 million dollars of revenue generated from Alaska lands (Jones 1981). In Old Harbor, eligible residents are part of the Old Harbor Native Corporation and the Kodiak Island regional corporation called Koniag[35]. The Old Harbor Native Corporation has title to nearly all of the land on Sitkalidik Island, the large island that is just across the bay from the village site. This process in combination with the IRA's encouragement of political formation established Old Harbor as a distinct and located political entity.

The impetus for ANSCA was the discovery of oil in the interior of Alaska and the need to establish land title prior to the construction of a major pipeline. For this reason, provisions of the act were focused on issues relevant to interior Alaska such as land claims and subsurface resources, but it did not address marine resources such as fish that were essential for coastal communities. The act contains a statement that purports to extinguish "any aboriginal hunting or fishing claims that may exist."[36] It is widely believed that Alaska Natives lost aboriginal claims to marine resources through ANSCA, however, this notion is currently being disputed in the courts[37]. ANSCA dealt with land claims but it did not abrogate other aspects of the Alaska Native trust relationship with the United States government. Alaska Natives are still entitled to the services and self-government due to all Native American populations. However, since Alaska Native corporation land is not trust land, it remains unclear over what territory Alaska Native governments can exert their sovereign authority (for example tribal police forces or courts) (Case & Voluck 1984).

Many Kodiak Island Natives feel they have lost a connection with ancestral Sugpiaq practices including subsistence, craft, ceremony, and language as a result of these colonial processes[38]. As a result, many Alaska Natives from Old Harbor and

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[35] For further information, visit the corporation website: www.koniag.com
[36] Section 4(b) of ANCSA as cited by (Case & Voluck 1984)
[37] No. 98-1437 Native Village of Eyak, et al., Petitioners v. William M. Daley, Secretary of Commerce
[38] Old Harbor field notes 2008; Alutiiq Musuem staff, personal communication 2008

throughout Kodiak Island are engaged in a process of cultural revitalization. Much of this effort is spearheaded by the Alutiiq Museum and Archeological Repository[39]. The museum offers outreach courses in Sugpiaq Native arts such as skin sewing, mask carving, and basket weaving. The museum also has a language program that is committed to documenting and revitalizing the Alutiiq (Sugstun) language. In addition, many residents of Old Harbor are working on forms of cultural revitalization on a more informal basis. These processes have included developing and running cultural camps, apprenticing young adults in subsistence activities, establishing a dance troupe, and great efforts to listen to and record oral histories[40]. Many of these revitalization processes are focused on generating a greater understanding and practice of traditions from the pre-contact era of Kodiak Island. This has required great attention to the archeological record housed at the Alutiiq museum. However, these ideas about pre-contact Sugpiaq are often reinvented or innovated for a contemporary setting[41].

Commercial Fishing and the Halibut Fishery:

The fur resources from sea otters in the Kodiak region motivated both Russian settlement and the United States' purchase of the territory. Later commercial fisheries based on Kodiak's abundant fish resources (salmon, herring, crab, and groundfish) would come to dominate the colonial development of the region. Sugpiaq people from Kodiak Island have been involved in commercial salmon fishing since it was established on Kodiak in the late 1880s. In 1882, the first Kodiak Island cannery was established by San

[39] www.alutiiqmusuem.org
[40] Ethnographic Field notes June- November 2008
[41] See stories in Chapter 1 Knowledge Vignettes for examples

Francisco capitalists in the Karluk area to take advantage of the large sockeye salmon runs and by the 1900s salmon canneries were established in bays and river mouths throughout the island (Carothers 2008; Roppel 1986). By the 1890s salmon canning was Alaska's leading industry and in 1924, the governor estimated Alaska's salmon to be worth over $31 million dollars (Bone 1921).

Historical records and oral history accounts show that Old Harbor residents worked in the burgeoning salmon industry both as laborers in the canneries (primarily the women) and as fishermen operating cannery owned boats (primarily men)[42] (Carothers 2008; Roppel 1986). The canneries each owned a fleet of salmon seining boats which they would lease to Old Harbor fishermen for a summer salmon season[43]. The canneries began granting exceptionally good fishermen the right to purchase their cannery vessels for personal use using proceeds from their catches[44]. Through this mechanism, several Old Harbor fishermen were able to purchase their own vessels and operate them independent of the cannery system[45]. This began to create a class division within the community between independent fishermen who were able to keep all the profits from their fishing endeavors and cannery fishermen who remained financially tied as wage laborers for the canneries. The effects of this division still persist in the relative financial standing of Old Harbor fishing families today[46]. It is during this cannery period that Old Harbor began to emerge as a commercial fishing community. The majority of residents

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[42] E.g. Paul Kahutak, personal communication 7/27/07; Discussions, George Inga Sr., Paul Kahutak, Carl Christainsen Sr. 7/9/08, 7/23/08. 7/17/08
[43] E.g. Paul Kahutak, personal communication 8/11/07; Interview Carl Christiansen Sr. 7/27/08
[44] E.g. Paul Kahutak, personal communication 8/11/07; Interview Old Harbor fisherman 7/24/08; Old Harbor field notes 2008
[45] Carl Christiansen Sr., personal communication 7/27/08; Interview Old Harbor fisherman 7/24/08; Interview Old Harbor fisherman 7/30/08
[46] Old Harbor field notes 2006-2010

were involved in the industry, and commercial fishing became central to work and social life[47].

In addition, to commercial fishing, a whaling station was established in Port Hobron a few miles from Old Harbor in 1925. Commercial whaling took place at the station from 1926-1937 when the right whale population was beginning to crash (Brueggeman et al. 1986). Both the whaling and commercial fishing industries brought many Scandinavian fishermen (particularly from Norway) to the region. Several Scandinavians married Sugpiaq women and stayed to raise families on Kodiak Island (Mishler & Mason 1996). One of the largest families in Old Harbor is a result of a Scandinavian man marrying a woman from Old Harbor. Scandinavian fishermen brought with them many techniques, materials, and ideas about commercial fishing.

The 1964 tidal wave destroyed many of the canneries' wooden fishing vessels[48]. At the time, most Old Harbor fishermen worked for the Kadiak Fisheries cannery in Shearwater, a bay less than 20 miles east of Old Harbor. Shearwater and several other canneries chose not to rebuild their fleet and shifted to a model of purchasing fish from independent vessel operators. This was difficult for some of the small scale fishermen who lacked the capital and business experience to operate their fishing activities as an independent business[49]. This was compounded by the 1974 privatization of the salmon fishery through a limited entry program that required non-qualified fishermen to purchase a license to enter the fishery. Freedom from the canneries allowed fishermen to diversify their catch and from the 1960s – 1980s Old Harbor fishermen began to participate in the

[47] Carl Christiansen Sr., personal communication 7/27/08; Paul Kahutak, personal communication 7/27/07; Discussions, George Inga Sr., Paul Kahutak, Carl Christainsen Sr. 7/9/08, 7/23/08. 7/17/08
[48] Paul Kahutak, personal communication 8/11/07; Discussions, George Inga Sr., Paul Kahutak, Carl Christainsen Sr. 7/9/08, 7/23/08. 7/17/08
[49] Interview, Old Harbor fisherman 10/11/08

herring, cod, crab, shrimp, and of course the halibut fisheries[50]. Entering these new fisheries required developing a new set of skills to understanding the life history patterns of different species in order to efficiently harvest them.

The 1989 Exxon Valdez spill signaled a devastating blow to the salmon industry. Consumer fears as a response to the spill combined with increased production of farmed salmon lead to a steep decline in salmon prices. This was devastating to all fishermen from the region. Some Old Harbor fishermen reported fishing for entire seasons only to break even or even to end at a loss[51]. Many of the small-scale, undiversified operators from Old Harbor dropped out of the fishery entirely. The decline in salmon prices also led to an increase of interest in the Pacific halibut fishery. The number of Old Harbor residents who purchased commercial halibut permits increased from 12 before the oil spill to 26 two years following (Figure 25). Note that this figure only encompasses the number of vessels participating in the fishery, if you include crew, the number of Old Harbor participants would be much higher.

In 1995, the Pacific halibut fishery was privatized under an Individual Fishing Quota (IFQ) program, which I will discuss in more detail in the final chapter. When allocating halibut resources to individual fishermen, the North Pacific Fishery Management Council used 1988-1990 as the qualifying years (halibut IFQ was assigned to historical fishermen based on how much halibut vessel operators caught in those years) and thus did not include the years of Old Harbor's greatest participation in the halibut fishery. This means that after 1995, many residents were locked out from the fishery.

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[50] Interview, Old Harbor fisherman 10/11/08 and Alaska Commercial Fisheries Entry Commission (CFEC) Fishery Permit and Permit Holder Statistics for Old Harbor 1974-2009. http://www.cfec.state.ak.us/fishery_statistics/permits.htm

[51] Interview, Old Harbor fisherman 7/31/08; Old Harbor field notes 2008

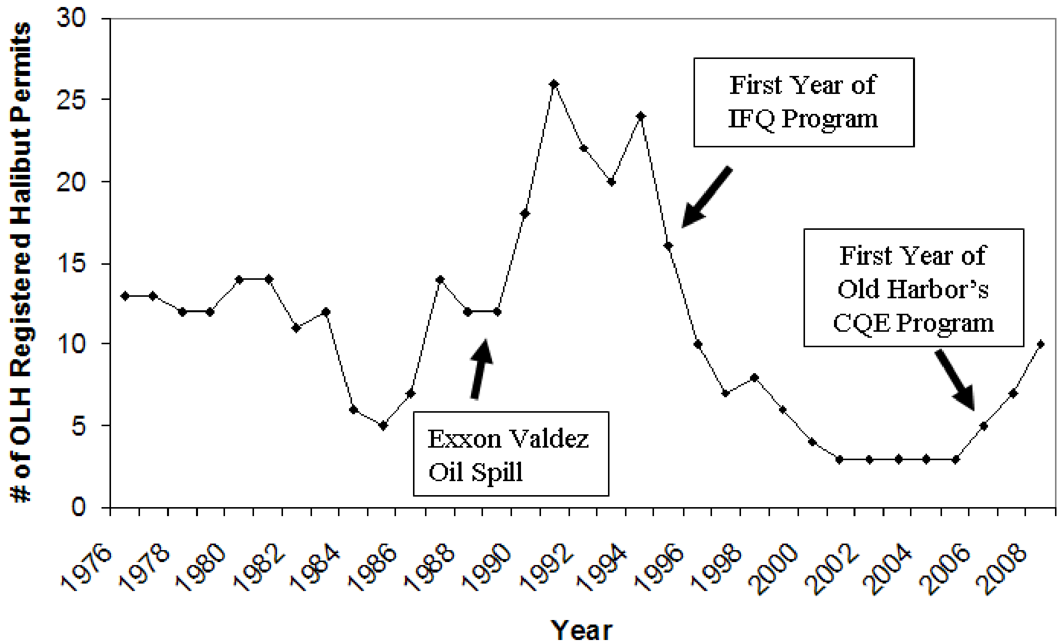

Figure 25. Commercial halibut permits registered to Old Harbor residents from 1976-2009

The uptake in Old Harbor halibut permits at the end of the figure (starting in 2006) is the result of the inception of an Old Harbor Community Quota Entity (CQE) designed to forestall some of the negative impacts from the IFQ program.

The Western commercial halibut fishery in which Old Harbor residents increasingly became involved in the 1960s and 70s, began in the late 1880s at nearly the same time the salmon industry began to develop on Kodiak Island (Bell 1981). Some of the first participants in the fishery were schooner (sail vessels) operators who sailed around Cape Horn from New England (Bell 1981). Hearing about vast fish stocks on the West coast, they traveled from the depleted fisheries of New England in order to colonize a new stock of fish. From 1890-1920, fishermen moved away from schooners and began fishing for halibut in large steam operated ships. Both the schooners and steamers were large ships that required a large crew. Fishermen would lay sets of halibut hooks (skates) from small boats (called dories) that were launched from the steamers. These operations were large and required significant capital investment. In the early years of the commercial fishery, few Native fishermen participated (Bell 1981). However, in the 1920s, the halibut fishery fleet began to shift towards smaller two and four man owner-operated vessels, primarily salmon seining vessels. In the 1940s Native participation began to increase in the *southern* region of the fishery, including indigenous fishermen from Washington State (dominated by the Makah) and from British Columbia and Southeast Alaska. In 1963, 14% of the halibut catch from Southeast Alaska was caught by Native fishermen (Bell 1981).

Sugpiaq fishermen from Old Harbor, however, did not become involved in the halibut fishery until much after their southerly counterparts. Salmon was processed and canned in sites near to the rivers it was caught, canned salmon would not spoil and could then be shipped to any location. Pacific halibut, on the other hand, needed to be iced or salted. It was processed in major industrial ports of Seattle, Tacoma, Vancouver, and Prince Rupert, which were connected to the transcontinental railroad for immediate shipping out east (Bell 1981). According to IPHC statistics, halibut landings in the port of Kodiak were negligible prior to 1961. This is likely linked to freezing and processing limitations. Though, I did hear reports that Old Harbor fishermen sold halibut product to Kodiak canneries and small-scale cold storage facilities on a limited basis prior to that time[52]. Since Old Harbor fishermen were so focused on the salmon fishery and since they tended to practice community-oriented fishery where they fished the waters near Kodiak and remained close to home, they did not become actively involved in a fishery that mainly landed product in the far away ports of Washington state and British

[52]Paul Kahutak, personal communication, 8/11/2007

Columbia. After Kodiak began receiving halibut product, it rapidly grew in size to become the largest receiver of US caught halibut by 1970 (Bell 1981). At present fishermen from Old Harbor sell their commercial halibut in the port of Kodiak or to a remote cannery on the Western most tip of the island in a town called Alitak.

The lack of a port for halibut in Kodiak during the early years of the fishery did not, however, stop Washington State and British Columbia based fishermen from harvesting fish in Kodiak Island waters. Kodiak Island and the surrounding Gulf of Alaska region have long been the center and most productive region of the fishery (Bell 1981). In the earliest period for which IPHC has statistics (1921-1929), 12.3 million pounds of halibut (out of 51.3 million coastwise) were harvested from the Kodiak region of the fishery (Bell 1981). This represented 24% of the total coastwide halibut catch and the second highest catch per area in the entire fishery. From 1921-1959 before Kodiak became a major port, 56.7 million pounds were caught in the Kodiak region (Bell 1981). This means that from the inception of the halibut fishery in the 1880s until the 1960s, outsider fishermen were coming to Kodiak waters, harvesting vast amounts of halibut resources, and taking them to sell in urban areas far from the region. No economic benefit was given to the communities from Kodiak that resided in the areas from which the halibut resources were extracted. In addition, fishing practices by outsider boats spearheaded by the large scale schooner and steamer fleets, contributed to the severe decline of the fishery that led to the establishment of a halibut regulatory structure in 1924. The development of a halibut fishery commons into which the Alaska Native fishing communities have become enmeshed was initiated by the extractive practices of outsider fishermen, the first of whom traveled to Alaska waters from the depleted fisheries of New England.

At present, Old Harbor residents are concerned about the persistence of their status as a commercial fishing community. Fisheries privatization and the Exxon Valdez oil spill have taken their toll on the Old Harbor commercial fishing industry. Old Harbor residents have reported a 75% decline in fishing participation over the course of one generation (Carothers 2008). The Old Harbor commercial fishing fleet, as large as 32 vessels in 1993, is now down to eight working vessels.[53] The decline in fishing participation has also contributed to processes of outmigration. A recent study found that 57% of Old Harbor households reported a sibling or family member moving out of the village because of a lack of fishing opportunities (Carothers 2008). The Old Harbor population has declined from a high of nearly 350 in 1980 to 200 in 2008. Many individuals who grew up in Old Harbor have since migrated to the cities of Kodiak, Anchorage, and Seattle for work or personal reasons. In many instances, these individuals return to Old Harbor for visits or for the fishing season and are still considered community members. The Old Harbor Native Corporation as well as the Old Harbor tribal council are involved in activities to try to bring fishing careers and community members back to the village of Old Harbor. Increasing participation in the halibut fishery has played a large role in this process.

When I describe Old Harbor as a fishing community, I opt to use a form of the word community that is free from its romantic trappings. Although the village is remote it is also quite global. Old Harbor residents have adopted new technologies and have

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[53] Alaska Commercial Fisheries Entry Commission (CFEC) Vessel Statistics for Old Harbor 1978-2008. Vessels over 20 feet registered to Old Harbor residents and registered for commercial fishing in at least one fishery. http://www.cfec.state.ak.us/fishery_statistics/vessels.htm

participated in and benefited from global circuits of capital most significantly in the commercial fishing industries. Over their history Old Harbor residents have been involved in the commercial fishing industry and participated in highly extractive fishing practices such as damming rivers to capture salmon[54]. Old Harbor is also not neatly bound in space. Individuals from Old Harbor and their families, who have moved to other locations, are often still considered part of the community. Similarly, many outsiders such as fishermen and teachers, who have moved and married into Old Harbor families, are considered by many to be part of the community as well[55].

The history of Old Harbor as a community provides an important background on the context from which the community's ideas about fish resources and biology have been generated. Central to this history is the Sugpiaq people's experience of double-colonialism first by the Russians and later by the United States. Processes of colonialism have marked and shaped Sugpiaq people's relationship with the halibut resources in the waters that surround them. Russian and US colonialism were devastating in so many ways. As a result of colonialism, more than half of Sugpiaq people were exterminated due to warfare, disease, and forced slave labor. In addition, colonial agents laid claim to marine resources, leading to a legacy of dispossession of Sugpiaq fish resources that continues to the present. But, colonialism also brought about wider networks of trade and economy, most specifically commercial fishing industries, in which Old Harbor residents have been active participants since the late 1800s. In addition, contact with Russian, American, and other foreign fishermen, brought new forms of fishing technology which Sugpiaq fishermen variously adapted in their own practices. These economic networks

[54] Interview, Paul Kahutak, 8/7/07; Interview, Old Harbor fisherman 7/9/08
[55] Old Harbor field notes 2006-2009

and technologies are central to the way that Old Harbor fishermen communicate with and come to know things about underwater halibut resources.

Purpose:

A lot of ideas that Old Harbor residents possess about halibut biology and the marine environment surrounding the village have been acquired incidentally to living next to and fishing in the same waters over the course of long periods of time. However, there is also evidence that community members have actively sought out improved understanding of the local halibut resources by cataloguing their fishing experiences, conducting their own fishing experiments, talking with other fishermen, and systematically observing the behavior of other fishermen. The purpose for gathering more information about local fish resources is fairly straightforward – fishermen seek to improve their ability to catch them.

The reasons why Old Harbor fishermen desire to catch halibut are diverse and complex. Old Harbor community members catch halibut for a variety of purposes including: for income, for food, for fun, to feed elders, to send to family and friends, to consume at ceremonies and events, and to bring tourist revenue to the community. Legally, all of these diverse and overlapping purposes for halibut fishing have come to be divided into three categories: commercial, subsistence, and sport/charter. The legal definitions of these categories are so strict, that fish caught for one purpose category cannot legally be held on the same vessel (or caught on the same trip) with fish caught from another purpose category.

These static and rigid definitions have proven limiting for Old Harbor, a resource dependent community where flexibility and opportunism play an important role in getting enough food and income to survive. They also introduce inefficiencies into Old Harbor processes of gathering fish resources because fishermen must undertake and finance (gas isn't cheap in rural Alaska) separate trips to gather commercial fish to sell and subsistence fish to eat.

Commercial

Commercial halibut fishing involves fishing for halibut on a larger scale with the purposes of selling through legitimate channels, which in this case are the processing plants. Presently, to catch and sell commercial halibut, the fishing vessel must have on board one crew member who owns Pacific halibut quota (the number of quota shares determines the pounds of halibut they can catch and there are strict penalties for going over the amount). The seller of the halibut must also apply for a state of Alaska commercial halibut license. In 2008, ten Old Harbor residents received State of Alaska commercial halibut permits. This is down from a high of 24 Old Harbor halibut permits in 1994. In a community of 200, this is not an insignificant number especially when you consider that each of these permit holders brings along with them 2-5 crew members to assist.

Pacific halibut is not the primary species of target for most commercial fishermen from Old Harbor. Old Harbor has traditionally been a salmon fishing community and halibut has been a secondary or tertiary fish species of interest. Even in this secondary role, commercial halibut fishing has provided Old Harbor residents with an important revenue stream to support their families and to support their fishing operations. Most fishermen take out sizable loans to purchase their fishing vessels and are on a tight schedule of payments. Prior to the IFQ program, the halibut fishery operated as a derby fishery. The catch of halibut was regulated by a series of short openers (24 to 48 hours) where any fishermen could catch as much halibut as possible. The first of the openers was in the spring, which provided fishermen with important income to help make payments and purchase equipment to get prepared for the summer salmon season.

Another advantage of commercial halibut fishing is that it can be done on any scale and with nearly any size of vessel. Salmon fishing requires large seining vessels which can cost a minimum of $150,000. During the derby days of the halibut fishery, Old Harbor fishermen caught commercial halibut in a variety of vessels including small skiffs and charter size vessels[56]. This was an important mechanism for underprivileged community members to continue to participate in commercial fishing and gain essential revenue to survive in the village where there are few job opportunities. A woman from Old Harbor, said the following about commercial halibut fishing, "It meant a lot to me anyway, because it was extra money in your pocket, because winter everything, fuel's expensive. I think a lot of people miss it because a lot of people, if you had a boat they were able to go out and fish it and make good money and keep supporting their families."[57]

Because halibut can be fished from smaller boats, Old Harbor planners see halibut fishing as a part of the community's future economic growth. One of their primary strategies has been the implementation of a Pacific halibut Community Quota Entity (CQE) program, which allows small scale operators to lease and fish halibut quota.

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[56] Alaska Commercial Fishing Entry Commission, Fishery Statistics – Vessels http://www.cfec.state.ak.us/fishery_statistics/vessels.htm

[57] Interview, Old Harbor fisherwoman 8/3/07

Commercial fishing of halibut requires two important components: access to halibut resources (a topic I will discuss in Chapter 11) and the ability to catch halibut (the subject of this chapter). Old Harbor commercial fishing has driven the accumulation of important information about the biology of Pacific halibut in the Kodiak Island region. During the derby days of the fishery, Old Harbor fishermen had to catch as much halibut as possible in a limited time period. Fishermen sought to gain information about the biology and movements of local halibut in order to most efficiently harvest halibut during the openings. After the fishery became privatized under the IFQ program fishermen had unlimited time to catch their allocated resources. Old Harbor fishermen still sought superior information about the dynamics of halibut resources because running a fishing vessel is expensive in terms of crew time and fuel consumption. The quicker that fishermen can catch their allocated halibut, the more profit they can make from the sale of these resources. For this reason, Old Harbor commercial halibut fishermen continue to work to increase their understanding of local halibut populations.

Subsistence

The term subsistence has become ubiquitous in Alaska Native villages (Langdon 1986). Although state and federal regulations have not acknowledged Alaska Native claims to hunting and fishing resources for commercial purposes, they have maintained policies to protect Alaska Native subsistence use of resources (Case 1989).

Until 2003, there was no formal policy governing the subsistence use of Pacific halibut resources. Residents of Old Harbor simply harvested halibut for personal use and customary trade as they saw fit. In 2003, with public input and significant participation from rural and Alaska Native interests, the Department of Commerce passed a legal definition of subsistence halibut fishing.

In order to participate in subsistence halibut fishing, individuals must obtain a Subsistence Halibut Registration Certificate (SHARC). Many Old Harbor elders expressed outrage at being forced to obtain a card for what they believe is their inherent right to subsistence fish.[58] Even the language of the 2003 Final Rule, "the purpose of this action is to provide regulations that would authorize a subsistence fishery for halibut in Convention waters off Alaska"[59] suggested that regulators did not honor or acknowledge indigenous reserved rights to halibut resources prior to the policy. In the policy-makers minds, an Alaska Native subsistence fishery did not exist until the US government authorized it.

The formal definition of subsistence fishing from the final rule is as follows:

> *Subsistence halibut* means halibut caught by a rural resident or a member of an Alaska Native tribe for direct personal or family consumption as food, sharing for personal or family consumption as food, or customary trade[60].

While this rule limits some flexibility in Alaska's halibut use, it also incorporated progressive elements to encompass the vast majority of Alaska Native uses of halibut that were in place prior to the legislation. Subsistence fishermen can use both 'modern' (rod and reel) and 'traditional' (handline) types of gear to catch halibut. They can harvest halibut for themselves and for other relatives or community members, such as elders, who might be unable to fish. In addition, the definition contains a clause for the

[58] Old Harbor fisherman, interview 7/23/08
[59] FR 68 18145, April 15, 2003.
[60] FR 68 18145, April 15, 2003.

"customary trade" of halibut "through monetary exchange of no more than $400 per year."[61]

The subsistence regulations prohibit fishermen from retaining "on board the harvesting vessel, halibut harvested from subsistence fishing with halibut harvested from commercial fishing or from sport fishing"[62]. They also prohibit the retention of subsistence halibut "harvested using a charter vessel"[63]. This creates a clear separation between commercial, charter, and sport fishing.

Nearly all Old Harbor residents engage in subsistence halibut fishing and consumption[64]. Most community members possess large freezers to store fish and meat to consume over the winter. Because the village is so remote, the cost of bringing food from the outside is exceedingly expensive. Subsistence consumption of halibut is an important way for community members to feed themselves. Nearly everyone from the community who is capable goes subsistence halibut fishing at some time during the summer months[65]. Residents tend to harvest subsistence halibut from small skiffs that they or their friends own. They tend to fish in areas near to the village. Subsistence fishing also requires an understanding of the biology and movements of halibut in the waters surrounding Old Harbor. This understanding is essential for the efficient gathering of halibut for food. Since subsistence halibut fishing is so common in Old Harbor, nearly all the residents have developed ideas about the biology and movements of halibut in the area.

[61] FR 68 18145, April 15, 2003.
[62] FR 68 18145, April 15, 2003.
[63] FR 68 18145, April 15, 2003.
[64] Old Harbor Field Notes 2006-2009
[65] Old Harbor Field Notes 2006-2009

Charter/Sport

Old Harbor also has a burgeoning charter fishing industry that relies on the harvest of Kodiak area halibut resources. The charter industry involves Old Harbor guides taking sport fishing tourists from around the globe on fishing trips. The isolated village of Old Harbor possesses some of the world's premier salmon, halibut, and cod fishing grounds. Outsider sport fishermen are willing to pay high prices to fish in the region. Old Harbor currently has two lodges to put up fishing tourists and between 5-10 registered charter fishing guides[66].

One of Old Harbor's first charter boat operators reports that the industry developed almost organically. Old Harbor has long history of bear guiding – Native guides would take adventurous clients to hunt the epically large Kodiak bears – however year-round guiding for fish, fowl, and deer emerged more recently[67]. He said that in the mid-80s he was one of the few men living in Old Harbor who wasn't involved in commercial fishing. He started to get various requests for fishing and hunting trips:

> The mayor at the time said, you know, I got the telephone guy here, you want to take him out fishing? Cause I'd be the only guy in the village left - everybody's out fishing. And OK, I'll take him out fishing. And then somebody else would come into town: take this guy out fishing - his plane's gonna be here at five, take him out fishing and next thing you know I started to get calls, hey you took my friend out - what do you charge?...And then you know a bunch of things happened like my…great aunt she was working at the post office. She said ah, I got this letter addressed to the post master and they want to go duck hunting…They say: Post-master I want to hunt these ducks. Do you have any? Can you tell me who would take me hunting? I looked at it - I didn't even recognize their names cause they were all names of the ducks we have around here, but we had local names. So, I took him out and he happened to be a writer and he wrote a big article and it got in the paper, so I started getting bookings for fishing and duck hunting, that's how it started.[68]

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[66] Old Harbor field notes 2006-2009
[67] Interview, Old Harbor charter boat fisherman 9/28/08
[68] Interview, Old Harbor charter boat fisherman 9/28/08

With the decline in commercial fishing opportunities following the Exxon Valdez oil spill and later the Pacific halibut fishery privatization, former commercial fishermen began to turn to charter fish guiding as an alternative source of income[69]. In the 1990s the industry began to take a more formal shape with the construction of two overnight lodges[70]. Currently the charter fishing industry plays a significant role in Old Harbor's economy[71]. Old Harbor residents work as guides, cooks, cleaning staff, construction/maintenance staff, and even van drivers to serve the lodges and charter fishing clients. The industry is currently in a state of flux and it is uncertain the extent to which it will grow or change in the coming years. The state and federal government have begun implementing limited entry regulations similar to those in the commercial fisheries which could inhibit future growth in the Old Harbor charter industry. In addition, the recession has led to a decline in sport fishing tourism to the community.

Still, the charter industry contributes to significant catches of Old Harbor area halibut resources[72]. Most charter boat guides seek to become experts at catching local halibut resources. The charter industry thrives on word of mouth recommendations and repeat business. One charter operated said that more than 50% of his business is repeat business[73]. If charter boat operators are able to guide their clients to catch lots of fish, they are likely to increase their future business. Old Harbor fishing guides are also notoriously competitive with each other, looking to outdo each other in catches and

[69] Interview, Old Harbor charter boat fisherman 9/28/08; Interview Old Harbor charter boat fisherman 7/31/08
[70] Interview, Old Harbor fisherman 8/23/08
[71] Interview, Old Harbor charter boat fisherman 9/28/08; Interview Old Harbor charter boat fisherman 7/31/08; Interview, Old Harbor fisherman 8/23/08
[72] Interview, Old Harbor charter boat fisherman 9/28/08; Interview Old Harbor charter boat fisherman 7/31/08; Interview, Old Harbor charter boat fisherman 7/27/08
[73] Interview Old Harbor charter boat fisherman 7/31/08

remaining protective of their best fishing spots[74]. A charter boat operator told me, "Yeah, there's like a lot of spots I fish that I don't even tell my dad about, I mean it's, it's not even about it from boat to boat cause you want to give your guys the best trip they can have and you don't want to go to a spot that's fished out, so."[75]

Halibut is a central part of Old Harbor's life and culture and those residents that particularly love halibut fishing call themselves "halibut heads"[76]. Catching fish for charter clients, in addition to subsistence and commercial fishing, have driven the accumulation of information about Old Harbor area's halibut stocks. Old Harbor residents and Kodiak Island Sugpiaq people have sought halibut resources for a variety of reasons over a 6,000 year history. The purposes behind halibut catches have continually shifted with changing economic, cultural, and political conditions. Through this history of seeking halibut and seeking to become better halibut fishermen, Old Harbor community members have developed an expertise about the biology of local halibut stocks.

Techniques:

In the previous chapter, I described a specific methodology by which fisheries scientists including myself attempted to gain information about the biology of Kodiak area halibut stocks. I also described a number of other techniques that fisheries scientists have developed over time to assess fish stocks including analyzing catch statistics, tagging studies, and surveys. International Pacific Halibut Commission biologists

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[74] Interview Old Harbor charter boat fisherman 9/28/08
[75] Interview Old Harbor charter boat fisherman 7/31/08
[76] Interview Old Harbor fisherman 10/13/08

employ these scientific techniques to gather stock information appropriate for making management and catch limit recommendations. Fishermen face many of the same challenges as fisheries scientists. They must attempt to gain enough information to be able to catch something that they can't see. Like fisheries scientists, Old Harbor fishermen and community members have developed a number of techniques for communicating with and understanding underwater halibut resources.

A common critique of local or indigenous forms of environmental information is that they are too anecdotal and haphazard to be useful in decision-making processes (Ellis 2005). Although, fishermen's techniques are not standardized and replicable in the manner of fisheries science approaches, they are intentional and systematic. Fishermen from Old Harbor actively gather, assess, and test aspects of the fishery to better understand local halibut stocks.

The primary means through which Old Harbor community members communicate with halibut stocks is the materials fishermen use to catch them. In setting and hauling fishing gear, fishermen gain information about halibut stocks when they catch fish and also when they don't. Fishermen can then catalogue these various fishing experiences to develop ideas about the biology of movements of local halibut resources. These are ideas that make them better at catching halibut. Importantly, community members are not isolated in the search for information about halibut stocks. Through communication with and observation of other fishermen in the community and beyond, individual fishermen benefit from the experiences of others. In addition to catching halibut and cataloguing fishing experiences, some fishermen in the halibut fishery conduct their own fishing experiments.

Materials:

Boats

It is pretty difficult to catch Pacific halibut by casting from the shore. Halibut are groundfish that occupy the ocean floor and are rarely found in extremely shallow water. Therefore, successful fishermen need a form of transportation to go out to deeper water and catch fish. Throughout their long history in Kodiak, Sugpiaq fishermen have utilized a number of different kinds of boats to catch halibut. Since Old Harbor fishermen practice so many different kinds of halibut fishing, they also presently operate many different kinds of boats in their pursuit of halibut.

Archeologists believe that during the pre-contact period, Kodiak Island Sugpiaq utilized skin covered qayaq or kayaks for oceanic travel (Figure 26a). Old Harbor oral historical accounts state that Sugpiaq people fished and even hunted whales from these qayaq [77]. Old Harbor elders remember traveling in qayaq when they were younger, suggesting that qayaq were in use long after Russian contact, even into the early and mid 1900s[78]. Qayaq are not in use in Old Harbor at present, though some residents and staff at the Alutiiq museum have built a few traditional style qayaqs and are looking to revitalize traditional qayaq use and building[79].

[77] Interview, George Inga Sr. 6/25/07; Old Harbor field notes 2008
[78] Paul Kahutak, personal communication 7/27/07; Discussions, George Inga Sr., Paul Kahutak, Carl Christainsen Sr. 7/9/08, 7/23/08. 7/17/08
[79] Old Harbor field notes 2007

Figure 26. Smaller boats or skiffs utilized over the course of Old Harbor's history: (a) wooden Qayaq that Sugpiaq people from Kodiak would have used (Photo: Alutiiq museum, courtesy of the National Archive Albatross Collection), wooden skiff with slot for outboard motor (Photo: author), currently-used Old Harbor skiff (Photo: author), currently-used charter boat (Photo: author).

The Russians arrived to Kodiak Island on large sail operated vessels. They did not use their vessels for halibut fishing, but they introduced smaller oar operated row boats. Sugpiaq people utilized row boats for many kinds of hunting and fishing. They used the row boats to set beach seines for catching salmon and they used the row boats to travel to deep water and set halibut and cod fishing gear.[80] When they reflect on the wide use of row boats, elders are amazed at just how hard people from Kodiak used to work – rowing long distances on almost a daily basis.[81]

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[80] Interview, George Inga Sr. 6/25/07; Discussions, George Inga Sr., Paul Kahutak, Carl Christainsen Sr. 7/9/08, 7/23/08, 7/17/08
[81] Interview, Paul Kahutak,7/22/07; George Inga Sr, pers comm 6/25/07

The gasoline operated outboard motor, referred to as a “kicker” by Old Harbor residents, was introduced to the area when many of the elders were younger, likely around the 1930s[82]. A small simple boat with a kicker attached to it is called a “skiff”. The speed and efficiency of the outboard motors has increased over time. In addition, the body of the skiff has shifted from wood to aluminum or fiberglass material. Old Harbor residents still use skiffs for island travel and subsistence halibut fishing. Old Harbor skiffs are simple, often aluminum boats without any kind of cabin and only small planks of wood for seats. They are also small, some shorter than 8 feet long. However, they are rugged and Old Harbor residents are adept at driving them in long distances and in large seas[83]. Because these skiffs are relatively inexpensive, even less fortunate families are able to own and operate them to gather subsistence harvests.

When salmon canneries began to be established on Kodiak Island in the 1880s, the canneries introduced larger wooden salmon-seining vessels to the island (Figure 27). Old Harbor residents first leased the seining boats from the canneries and in later years some residents started to purchase their own[84]. Crew could sleep on the salmon seiners, so fishermen could take these larger boats out for longer periods of time and travel longer distances. The boats were also sturdy and could travel in larger seas. Initially, the seiners were used exclusively for salmon fishing, but as the commercial halibut industry developed in the mid-1900s, Kodiak fishermen used them for halibut fishing as well. In 1967, Carl Christian Sr. a prominent Old Harbor fishermen bought the community’s first

[82] Interview, George Inga Sr, 6/25/07
[83] Old Harbor field notes 2006-2009
[84] Discussions, George Inga Sr., Paul Kahutak, Carl Christainsen Sr. 7/9/08, 7/23/08, 7/17/08

fiberglass seining boat[85]. Presently, there are eight commercial salmon-seining vessels, these are all fiberglass (Figure 27). Old Harbor commercial fishermen use these seiners to catch salmon, halibut, herring, cod, and crab. There are two non-Native fishermen from Old Harbor who married into Old Harbor families and commercial halibut fished during the schooner period in the mid-1900s.[86] They fished throughout Washington, British Columbia, and Alaska on large halibut fishing schooners that were based out of British Columbia and Washington State. Many of their ideas about halibut stem from time

Figure 27. Commercial fishing vessels from Old Harbor. (a) Wooden vessels leased to Old Harbor residents from the canneries, many used until the 1980s (Source: photo hanging in Old Harbor senior center, 2009), (b) one of Old Harbor's last working wooden commercial vessels, used until it sank in 1984, (c) current fiberglass salmon seining (and halibut fishing) vessels (Photo: author), (d) Old Harbor's harbor in 2009 with commercial vessels, charterboats, and skiffs (Photo: author).

[85] Carl Christian Sr., pers comm, 7/27/08
[86] Interview, non-Native Old Harbor fisherman 9/13/08

fishing on those vessels.

Some Old Harbor fishermen also possess a vessel that is a size between the large salmon seiners and the small skiffs. These vessels are larger than skiffs and often possess small cabins where passengers could sleep. In Old Harbor they are often called “charter boats” because they are the style of boat used to take clients out charter fishing (). Old Harbor residents also use these style vessels for small scale commercial fishing for halibut and cod. In 2008, three Old Harbor residents used these sized vessels to fish community owned commercial halibut quota.

Navigation and Charts

In order to become a better fisherman, it is important to know the exact locations that you have fished before. This way you can return to spots that had lots of halibut and avoid spots where you came up empty. In addition, you can communicate these locations to other fishermen. The techniques by which to find and mark the location of halibut spots have evolved over time. During the cannery period and the years before, vessels did not possess navigation systems[87]. In times of fog and poor visibility, fishermen would travel very close to the shore and keep a lookout to make sure they didn’t hit land. Fishermen also report that “old timers” could navigate by “the wind or something and they could tell well it’s the way the clouds moving”[88]. They also utilized marine charts and a compass to assist with navigation, though some did not bring a compass[89]. They would mark fishing spots in their minds by picking and remembering two or three

[87] Discussions, George Inga Sr., Paul Kahutak, Carl Christainsen Sr. 7/9/08, 7/23/08, 7/17/08
[88] Interview, Paul Kahutak 7/22/07
[89] Interview, Paul Kahutak 7/22/07

reference points on the shoreline. Old Harbor fishermen still use this mental reference points technique to mark halibut fishing spots for subsistence fishing – much of which is done in skiff without any navigation technology[90].

Commercial and charter fishermen, however, have adapted various navigation technologies to help them mark and communicate fishing spots. Over the course of the second half of the 20th century, Old Harbor fishermen began to incorporate radio communication, radar, satellite-based GPS navigation, and most recently down sounders (depth meters) and fish finders that indicate the ocean depth and can illuminate schools of fish. The fish-finders don't tend to work with halibut which are groundfish, but down sounders can tell fishermen both about the depth and characteristic of the bottom. One fisherman told me, "the professional guys they drive around a lot and look the bottom over with a meter…Your down sounder - those colored graphs – it tells you if it's hard or soft."[91] With GPS navigation, fishermen can mark and save the exact location where they catch halibut so they can easily return to that spot. In fact, commercial fishermen are required to mark the exact location of their catches in log books that are returned to the IPHC for management purposes.

Fishermen have also incorporated marine charts into their fishing practices[92]. Navigation charts show the various depths and underwater geographical features of particular stretch of ocean, often referred to as bathymetry. Fishermen use these charts to seek out spots with features that they believe are conducive to halibut presence. One fisherman told me, "After charter fishing for so long you get a feel for in what - what they're gonna be in you know what you're looking for in the bottom and what, even

[90] Old Harbor field notes 2006-2009
[91] Interview, Old Harbor fisherman 10/11/08
[92] Old Harbor field notes 2006-2009

looking at a chart you can kind of guess by the way a chart looks you know it there's gonna be fish laying there."[93]

Fishing Gear

Considering the technological advancements that have accompanied many kinds of fishing, the present gear for commercial and subsistence halibut fishing is surprisingly similar to the gear developed and utilized by aboriginal halibut fishermen prior to Russian contact. Since halibut are groundfish, they are typically caught using gear that allows fishermen to place a hook on or near the ocean floor. The Alutiiq museum possesses artifacts that they believe Sugpiaq fishermen utilized for catching cod and halibut resources. These include carved stones that act as sinkers to weight the line and hook to the bottom as well as wooden hooks that when attached to fishing lines near the sinkers would float just above the ocean floor[94].

Much more is known about the halibut fishing gear used by indigenous groups from more Southern regions of the fishery including the Makah, Nu-cha-nuuth, and Tlingit. Early halibut commission staff reported that fishermen from these communities utilized processed kelp for fishing lines and would sometimes string more than one hook together in a line to be able to catch multiple halibut on one trip[95]. The Alutiiq Museum also possess a halibut hook utilized by Sugpiaq fishermen (Figure 28). The wooden hook has a carved design that is indicative of patterns used by Tlingit fishermen. This suggests

[93] Old Harbor charter fisherman 7/31/08
[94] Patrick Saltonstall, Alutiiq Museum Curator, personal communication, 2008
[95] Halibut Commission Report No. 5 (1930), as cited in (Bell 1981)

Figure 28. Bottom fishing gear used over the course of Old Harbor's history: (a) Sugpiaq weights or sinkers for cod and halibut fishing (Photo: courtesy Alutiiq Museum, Patrick Saltonstall, artifacts from Alutiiq museum archeological collection), (b) Sugpiaq hooks for capturing groundfish such as halibut and cod (Photo: courtesy Alutiiq Museum, Patrick Saltonstall, artifacts from Alutiiq museum archeological collection), (c) an old-style Tlingit hook adapted for use among Kodiak Sugpiaq (Photo: courtesy Alutiiq Museum, Patrick Saltonstall, artifacts from Alutiiq museum archeological collection), (d) hooks used over the past 60 years in the commercial halibut fishery from left to right the J-shaped ganged hook, the off-set J-hook, and the circle hook introduced in 1982 and currently in use today (Photo: IPHC Technical report 40 Pacific halibut: Biology, Fishery, and Management)

that Sugpiaq fishermen developed this hook for halibut fishing by adapting techniques from Tlingits[96], who often ventured to Kodiak Island for warfare and trade (Black 2004).

Commercial halibut fishing is conducted by a technique known as long lining (Figure 29). This involves dropping a long line of baited halibut hooks on the ocean floor, letting it soak for a period, and then coming back and pulling the line up, hoping to capture multiple halibut who have become attached to some of the many hooks on the

[96] Patrick Saltonstall, Alutiiq Museum Curator, personal communication, 2008

line. Many of the early commercial halibut fishermen migrated from the east coast, and likely adapted gear that they had utilized in the Atlantic halibut fishery. Longlining involves one long stretch of rope called the groundline. Fishermen attach an anchor or of weight to one end of the groundline and then drive the vessel in one direction and drop the rest of the groundline over the side. When the reach the end of the line, typically 1,800 feet in length, they attach a weight and buoy. They also attached buoys to either end and at various points in the middle of the ground line so they can easily retrieve the gear. They then drive the boat in one direction and drop a line of hooks off the side. Attached to this groundline are a series smaller ropes called gangions, that have hooks on the end of them. Typically, halibut fishermen attached hooks every 3-25 feet along the ground line.

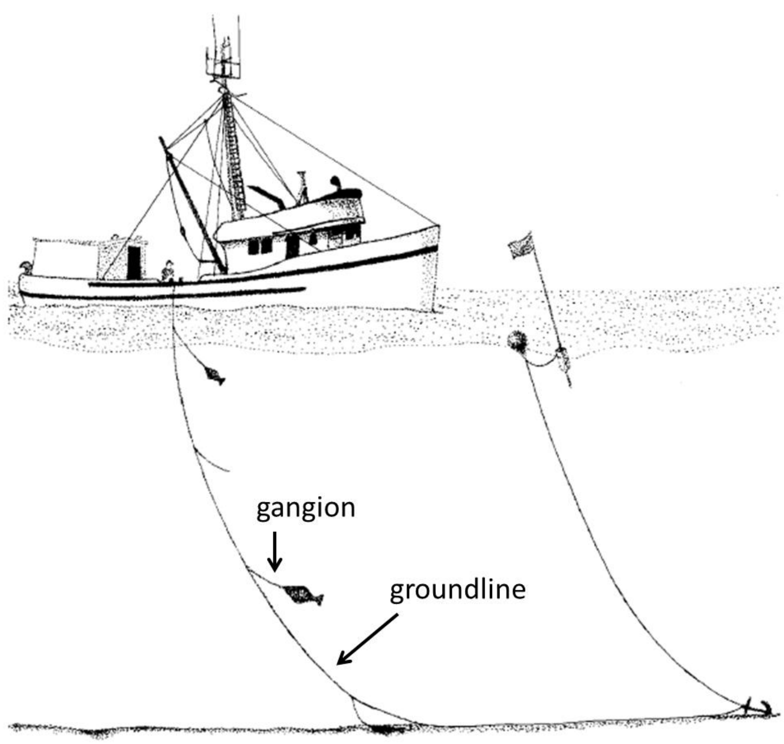

Figure 29. Halibut longlining technique

According to Old Harbor accounts, the spacing of the hooks, the type of hooks, and the means by which the hooks are attached have all changed over time[97]. Old Harbor fishermen have adapted gear used from the commercial fishery into their own fishing practices. An Old Harbor elder, Paul Kahutak reported that he and his father used to have to build their own halibut gear, attaching gangions to the groundline by hand, "with my dad. I was oh 19 - see ah we had to make our own skate. You know like you splice it on the rope. Not like now they got them snaps. You snap em on the line. But my dad - we had to make em ourselves. You know like ah, you know all those, splice the rope. You splice em on the rope so far apart."[98] He references a more current form of halibut gear, which is snap on gear. With snap on gear, gangions are snapped onto the groundline as it is being set overboard. This helps to decrease tangling and increase efficiency. Some Old Harbor commercial fishermen still use snap gear.

The most recent iteration of halibut fishing gear is what is called "tub gear" with this gear the gangions are again spliced into the larger rope[99]. But the gear is all perfectly coiled into a tub and the hooks are hung on the outside of the tub to prevent them from tangling. Most current halibut fishermen from Old Harbor and fishery wide utilize "tub gear"[100]. Old Harbor fishermen have adapted many halibut fishing technologies as they have been introduced into the commercial fishery often by other outsider fishermen. This has included new ways of attaching hooks, new hook spacing converting to gear where

[97] Interview, Paul Kahutak 7/22/07; Interview, Old Harbor fisherman 9/13/08
[98] Interview, Paul Kahutak 7/22/07
[99] Old Harbor fisherman 10/30/08
[100] Old Harbor and Kodiak Field Notes 2008

hooks are closer together[101], and new kinds of hooks converting from flattened to circle hooks.

Communication and Observation:

The above fishing materials have provided important techniques through which individual fishermen can, through acts of fishing, learn about halibut biology. But in the beginning of this chapter, I argued that Old Harbor fishermen encompassed a scientific *community*. By this, I mean that community member's ideas about halibut are not based on singular individual experiences, but rather result from being a part of a larger fishing community that persists in space and over time. When I asked community members how they learned how to fish halibut, an overwhelming majority of them reported that they learned by talking to and observing other experienced fishermen[102]. One fishermen summed it up pretty succinctly saying that he figured out the best spots for fishing halibut by, "Just you know, hear from somebody that catches halibut. And then you go there."[103] These kinds of communication are therefore an important technique by which fishermen accumulation and develop ideas about halibut biology.

In interviews, many Old Harbor elders would use the term "old timers" to describe people who were elders when they were young. Many elders were impressed by how "smart" the "old timers" were despite the fact that "they never went to school, none of em."[104] The old timers knew not to mess with killer whales who have incredible memories and are capable of revenge, they knew how to navigate without compasses or

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[101] An Old Harbor halibut fishermen I interviewed on 10/30/08 stated that when he was younger hook spacing, "seemed like it was about 22 feet or 21 feet, whereas these days they're sticking the gear every three feet."
[102] E.g. Interviews Old Harbor fishermen 11/6/08; 10/11/08; 7/31/08; 7/23/08
[103] Interview, Old Harbor fisherman 7/24/08
[104] Interview, Paul Kahutak 7/27/08

technologies, they could predict the upcoming season's weather based on present conditions, they could successfully predict long-term weather patterns, and they could successfully predict cultural changes that would take place in Old Harbor.[105] Many Old Harbor fishermen also reported that the bulk of their understanding of fishing and local fish populations came from these "old timers"[106].

> *Interviewer:* Um, how did you learn about some of the best spots for halibut?
> *Fisherman:* It was from the old people.
> *Interviewer:* Yeah?
> *Fisherman:* Mm-hmm, like all the ones that died in the '50s, '60s… yeah. [Sighs]
> *Interviewer:* So did they tell you or did you go out with them?
> *Fisherman:* Oh, yeah, they'd go. They'd help each other and tell them where they'd catch all their fish and they were pretty open about it.[107]

This quote from a retired Old Harbor fishermen indicates that the "old people" were quite open about talking to each other and sharing their information with a younger generation of Old Harbor fishermen. Community members reported that old timers taught them about the best places to catch fish, the seasonal movements of fish, and interannual shifts in fish populations based on external environmental conditions[108]. Communication with elders meant that Old Harbor fishermen ideas about halibut were based on the accumulation of experiences by many individuals in a particular place over time. Fishermen did not need to relearn aspects of fish biology each generation but could instead benefit from the experiences of generations before them.

In the final section of this dissertation which deals with concepts of fish as possessions, I will describe the way that Old Harbor fishermen worked together to establish fishing territories. Throughout my discussions with community members it

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[105] Interview, Old Harbor elder 7/26/07; Interview, Paul Kahutak 7/27/08; Field Notes 2008
[106] E.g. Interviews, Old Harbor fishermen 8/8/08; 7/29/07; 11/6/08
[107] Interview, Old Harbor fisherman 11/6/08
[108] Paul Kahutak, pers comm 8/7/07

seemed that Old Harbor fishermen exhibited a community-oriented attitude toward fishing – they would fish in groups, defend territories in groups, in some cases combine catches and profits in the form of a co-op, and they would incorporate young community members as crew members on their fishing trips[109]. This often translated to communicating ideas about local fish populations. Fishermen tend to be secretive about and protective of their best fishing spots. They are very particular about who they communicate this information to. Despite that fact that fishermen from Old Harbor are very protective about their fishing spots, this kind of community sharing of information took place on a regular basis[110]. On fisherman described it this way:

> *Interviewer:* So you know good spots here?
> *Fisherman:* Yeah
> *Interviewer:* And in Alitak?
> *Fisherman:* Yeah, yeah. Spots. Everybody kind of work together, like [another Old Harbor fisherman], I'll tell him where they're at and he'll tell me where the best spots were, we kind of work together.
> *Interviewer:* And that's just working together with people in the community?
> *Fisherman:* Yeah, let them know where there's fish.[111]

Fishermen have also learned about halibut resources by observing the behaviors and fishing practices of other fishermen – sometimes to the chagrin of these experienced fishermen. Many fishermen reported learning about fishing and halibut resources by first being crew members on experienced fishermen's boats[112]. By working as crew members they could observe the spots where the skippers laid their gear and how skippers selected the best spots for catching halibut. Subsistence and charter fishermen could also watch the movements and fishing patterns of other boats that fished for halibut in the waters near to the community. One of the first charter boat operators discussed how angry he

[109] Old Harbor field notes 2006-2009
[110] Old Harbor field notes 2006-2009
[111] Interview, Old Harbor fisherman 10/30/08
[112] E.g. Interviews Old Harbor fishermen 9/28/08; 10/30/08; 7/31/08

used to get at up and coming charter boat operators who would watch him fish and then take clients to the fishing spots he has spent years locating.[113]

Fishermen from Old Harbor also reported gaining ideas about halibut by communicating with outsider fishermen who were not from Old Harbor. Due to a number of reasons, community member from Old Harbor have not been extensively involved in the commercial halibut fishery in recent years. Groups of outsider fishermen from Seattle, Homer, and Kodiak have been extensively involved in the commercial halibut fishing in the Kodiak region, some for even longer than many Old Harbor fishermen. For this reason, Old Harbor fishermen reported to talking to outsider fishermen who were often good friends, to learn more about the best commercial halibut spots, particular in area 3B which is on the south side of the island and less familiar to Old Harbor halibut fishermen.[114]

Experience and Experiments:

In interviews, I would often ask people who within the community they felt were the experts about halibut. In most cases they would list the names of "the guys who have fished it for years."[115] Often their idea of expertise was equated with experience. One of the most prominent commercial halibut fishermen in Old Harbor said that when he started commercial halibut fishing he didn't hear about the best spots or practices from anyone, he simply just "went and set everywhere"[116]. Through the practice of setting

[113] Interview, Old Harbor charterboat fisherman 9/28/08
[114] Interview, Old Harbor fisherman 10/11/08
[115] Interview, Old Harbor fisherwoman 8/3/07; e.g. Interviews Old Harbor fishermen 7/29/07, 7/24/08, 8/23/08
[116] Interview, Old Harbor fisherman 10/30/08

gear throughout the seascape, he began to develop a picture of halibut biology and movements within the region.

This practice of setting gear in different locations over time represents a kind of long-term halibut fishing experiment. Since the fish are invisible underwater, fishermen can't learn about them until they set underwater gear and pull it up, observing if fish come up or if they don't. They also make a mental note of the conditions surrounding the location where the caught the fish – the type of bottom, the time of year, the type of bait used, the number of other food sources available, the direction and size of the tide, and the bottom depth. By cross listing these catch experiences with the conditions of the fishing spots, fishermen can begin to develop a set of conditions and locations that are most conducive to catching halibut.

In addition to this day-to-day practice of experimentation through the experience of fishing, some halibut fishermen have also developed more specific and directed kinds of halibut fishing experiments. Some Old Harbor commercial fishermen will conduct "tests"[117] before they set their commercial gear in a location. For these tests they will drop one or two baited hooks in a location and see if halibut come to it, if they do, they will proceed setting their gear there.

One Old Harbor fishermen described to me a practice that he called "prospecting" which he used to conduct a few days prior to halibut openers that took place during the derby days of the fishery. He said, "prospecting is when you go looking, you know you go out hooking, and checking it out, and you pretty much get a pretty good idea where the fish are hanging. Halibut hook. Check the deep, check the shallows."[118] Then during

[117] Interview, Old Harbor fisherman 7/31/08
[118] Interview, Old Harbor fisherman 7/29/07

the openers, he would fish in those spots where he found the most halibut. He said that halibut can move pretty quickly, so prospecting didn't always lead to higher catches during the derby, "It seemed like when I didn't prospect, I caught more fish, and when I looked around and thought the halibut were where they were gonna be on the opener, they weren't there when I went on the opener. So it worked the opposite way."[119] This highlights the fact that even with accumulated experience and carefully calculated experiments, complete understanding of the halibut resources can remain elusive.

I met one non-native commercial halibut fishermen who was based out of Homer, Alaska who conducted fishing experiences that were a unique hybrid of technoscience and fishermen approaches to halibut research. He contracted with the IPHC to help them conduct their annual halibut surveys. This meant that he and his crew traveled to and set gear in the IPHC standardized survey locations. In his cabin, he kept a marked up map of the different survey stations that indicated the level of catch he experienced in those spots. He told me that one of the "benis" – his short term for benefits – of contracting to assist with the survey was being able to develop a mental map of the fishing grounds surrounding Kodiak Island and discover spots that have higher pockets of fish[120].

Ideas:

Perhaps the greatest manifestation of a fisherman's understanding of halibut biology and ecology lies in the decisions he or she makes about where to fish at what time. When I asked Old Harbor fishermen what they knew about halibut biology, they

[119] Interview, Old Harbor fisherman 7/29/07
[120] Interview IPHC survey vessel skipper 7/12/08

would often have little to say. But, when I asked them what constituted the best halibut fishing spots, they would respond with a variety of details that reflected a vivid set of ideas about halibut behavior, habitat, diet, and movement. Old Harbor community members also had theories about long term changes in fish populations and the surrounding marine environment. With the dynamic history, purposes, and techniques behind Old Harbor's relationship with halibut, community members have developed a set of veracious ideas about halibut biology.

Embodiedness:

Much of the recent academic work focusing on local and indigenous forms of knowledge has examined the extent to which these kinds of knowledge are embodied (Knudsen 2008; Csordas 1990; Csordas 1994; Lorimer 2006). The central idea behind much of this scholarship is that local and indigenous kinds of knowledge are contained within the bodies of those who possess it. The knowledge manifests itself within the practices, mannerisms, movements, of human bodies (Knudsen 2008). Due to this embodied component, local, indigenous, and experiential kinds of knowledge are not easily transported or communicated outside of their bodied context (Knudsen 2008; Csordas 1994).

Western Science in contrast, has mechanisms to render knowledge about a given resource or place transportable and comparable. Social theorist Latour refers to recorded scientific objects such as graphs, tables, and reports as "immutable combinable mobiles" (Latour 1987). Graphs, figures, tables, and reports are mobile; they are a means for scientists to circulate knowledge outside of places about which they speak. By establishing a common set of rubrics to classify a resource, Western scientists are also able to combine and compare information from different places. Rendering information about the natural world transportable and combinable gives Western Science a kind of power advantage over other kinds of knowledge which remain trapped in the bodily and geographic context in which they were developed (Latour 1987). Latour writes that through this process, Western Science is able, "to act at a distance, that is to do things in the centres that sometimes make it possible to dominate spatially as well as chronologically the periphery." (Latour 1987, p.232).

Through these processes, we can observe the connections between Western Science and colonialism. Scientists are able to dominate new and distant places, because they are able to convert information about those places into a format that easily circulates outside its context. This format has more power and relevancy in Western global networks than the embodied and contextual information of, for example, indigenous fishermen. It is possible to see this kind of power advantage in the halibut fishery when IPHC scientists dismiss fishermen accounts of halibut resources as anecdotal or subjective[121]. We can see how ideas about halibut developed by a team of fishery scientists from a research center in Seattle can come to have more power than the ideas about halibut developed by indigenous fishermen who have been living next to and fishing the resource for generations.

In my interviews and ethnographic analyses, I found that Old Harbor community ideas about halibut did have a strong embodied component. However, I also discovered that fishermen had means to communicate their ideas about fish both outside their bodies and outside their communities. Perhaps the strongest example of the embodiedness of

[121] Interview, IPHC scientists 4/09

fisherman knowledge is the story of One-trip Charlie that precedes this section. In the story, crews of young fishermen kidnap a retired halibut fisherman in order to use his fisheries knowledge to help them catch halibut. These young fishermen do not visit Charlie in the nursing home and interview him about the best methods and spots for catching halibut. They kidnap him. The only way they can apply his knowledge to their fishing trip to actually take his body with them. Ideas about halibut are present in bodily expressions like instinct. Fishermen just know how and where to fish, but they don't always know how to explain it.

Ideas or knowledge about halibut are also embedded in the materials fishermen use to catch fish. For example the design of pre-contact Tlingit and Sugpiaq halibut fishing gear contains within it distinct ideas about halibut biology. For example, the stone sinkers used by Sugpiaq fishermen show an understanding that halibut are a ground fish species to be caught on the ocean floor. The wooden hooks that float just above the bottom reflect and understanding that these groundfish hover just above and not directly on the ocean floor. These hooks also show an understanding of the halibut's ecological community – that there persist other ocean floor creatures who would eat halibut bait if hooks were allowed to rest on the bottom. The design of the hook reflects a belief that halibut are suction feeders; that they will suck in the hook and become stuck on it. When a new fisherman is given this fishing gear, he is also passed information about halibut biology. He does not need to learn where halibut swim or how they feed because this information is already contained within the gear he has inherited. Through processes of trade, colonialism, and encounter, fishing gear becomes modified to incorporate multiple ideas about halibut biology.

The space where fisherman's bodies and fishing materials come together is practice. Fishermen's ideas about halibut are present in their day-to-day fishing practices that show where and how they use fishing materials to connect with halibut resources. This expression of fish knowledge is contextual and adaptive. Good fishermen make new decisions about what to do and where to fish based on the conditions they are confronted with at sea. Fishermen ideas about halibut reveal themselves in practice, in the many micro-decisions they make while fishing. It is difficult to transport these ideas outside of the bodied and fishing context.

Old Harbor ideas about halibut biology were not solely embedded in people and in gear, they were also communicated to others. In the preceding section, we saw that fishermen's communication within and outside of the Old Harbor community was an important technique for gaining information about halibut. Fishermen would share information at ports, in their houses, on the street, in bars, and over their vessel's radio[122]. The most common form of communicating ideas about halibut is through discussion of fishing "spots". They share with each other ideas about which spots in the ocean have lots of halibut at what times of year, under what conditions. These spots are easily understood by community members and fishermen who regularly inhabit the waters in the region. The language of spots relies on a micro-scale understanding of the geography and people of the area (for example, spots are described as being near a set or rocks or a near to a place where a particular person fishes) that is not transportable or understandable outside of the region.

Still, fishermen from Old Harbor do also step back to assess and discuss the fishery in a set of terms that is transportable and understandable in contexts outside of the

[122] Field Notes Old Harbor and Kodiak 2006-2009

region. They reflect on changes they have seen and trends that worry them. And as we will see in the next chapter, they take these ideas to meetings and scientific centers where they hope to influence and contribute to management processes.

Mystery:

Even the best fishermen get skunked. After applying years' worth of communication and experience, great fishermen can still pull up a skate of gear with no halibut on it. When Old Harbor fishermen talked about aspects of halibut biology, they often suggested that these ideas are best guesses and that the fish continue to beguile their ideas and expectations. Despite centuries of fishing halibut, incorporation of new technologies, systems of communication, years of experience, and intentional fishing experiments, complete understanding of the halibut resources is eluded. Ideas about halibut whether from scientific analysis or fishing experience, are quite imprecise things.

While fisheries scientists refer to a lack of complete understanding as uncertainty, fishermen from Old Harbor classified it in different terms. In the title and opening of this quote this dissertation, a fisherman used the term "mystery"[123] to classify the fact that fish populations and the natural world fluctuate on their own terms. Old Harbor community members also often conjured up the image of "Mother Nature"[124]. When I asked a fisherman if he felt halibut managers were doing a good job of keeping up the fish populations he replied:

> *Fisherman:* Yeah, I think so. Or, you know, I mean they, like I said mother nature takes its course on everything, so. I don't know, as far as I'm concerned they're doing a fine job.
> *Interviewer:* So, what do you mean by that mother nature takes its course?

[123] Interview, Old Harbor fisherman 10/12/08
[124] E.g. Interview Old Harbor fisherman 10/13/08, Old Harbor field notes 2008

> *Fisherman:* Well, like the halibut I mean, you know, they're gonna come, they're gonna go.[125]

Old Harbor community members would invoke this image of "Mother Nature" taking her course at other times as well, for example when I was waiting for the weather to clear to catch a plane into town, or when we were waiting for the tide to rise so we could make it into a shallow lagoon. I believe that this concept of "Mother Nature" represents a kind of expression of non-human agency. With the term, elements of the natural world are personified. They are presented as actors or agents with their own set of responses, behaviors, and activities that are independent of human will or expectations. "Mother Nature" operates on her own. The image of "Mother Nature" also suggests a deference to rather than a frustration towards the uncertainties and whims of natural phenomena. Many Old Harbor fishermen seemed comfortable with the unpredictability of the resource they sought. This sense of mystery or incomplete understanding is present in many of the ideas and theories fishermen developed about halibut biology.

Habitat, Diet, and Movement:

Most Old Harbor fishermen described the large scale movements and patterns of halibut biology[126]. They explained how local halibut populations came in shore during the summer months and moved to deeper water to spawn during the winter months. Subsistence fishermen from Old Harbor knew where to find halibut at any time of year if they needed to. However, most caught halibut in the summer and stored excess halibut

[125] Interview, Old Harbor fisherman 10/13/08
[126] E.g. interviews Old Harbor fishermen 10/13/08, 7/31/08, 10/26/08

for consumption in the winter[127]. Old Harbor-based fishermen also described in great detail their ideas about micro-habitat preferences and micro-scale movements of Kodiak area halibut populations. Many of these ideas about halibut biology came out during conversations about the best spots and conditions for catching the fish.

Commercial, charter, and subsistence halibut fishermen each had ideas about the best type of "bottom" or ocean floor conditions for catching halibut. In the One-Trip Charlie story, Charlie determined the make-up of the ocean floor by dropping a weight covered in butter and pulling it up. As I mentioned earlier, fishermen from Old Harbor often used down sounders to determine the bottom characteristics[128]. They can also tell by examining the state of the gear and halibut once it is pulled up from the ocean floor and through experience and communication. Commercial fishermen from Old Harbor seemed decisively in agreement that the best spots to catch commercial halibut were ones where the ocean bottom was hard and rocky[129]. Two fishermen immediately responded with the distinct answer "rocky bottom"[130]. Another fisherman gave a slightly more qualified answer, "Ah, well you know like I say they move around and stuff. But, the hard, the harder bottom seems to be from what I'm told better."[131]

Old Harbor charter boat fishermen stated that they found halibut in a number of different bottom types. However, like commercial fishermen, most believed that halibut were more common on a rocky bottom. One charter fisherman told me, "Well, some people swear on ah the muddy bottom or flat bottom. I've gotten more halibut on rock

[127] Old Harbor field notes 2006-2008
[128] Interivew Old Harbor fisherman 10/11/08
[129] E.g. Interviews, Old Harbor fishermen 10/30/08, 9/13/08, 7/31/08
[130] Interview, Old Harbor fisherman 10/13/08; Interview, Old Harbor fisherman 10/11/08
[131] Interview, Old Harbor fisherman 10/11/08

piles then I have on a muddy bottom or a flat bottom."[132] Another charter operator gave the following summary of different ideas about halibut bottom preferences:

> It seems like people from California think they're in the sand and people from up here think they're in the rocks…You find em anywhere. I think they're, everybody thinks they're bottom fish, they're traveling just like any other fish, you can catch em in one spot one day and go out there…the next day nothing there and they're just traveling, you can see the birds move in feeding in one area and then the birds are gone, that's just the way - the way it is. Tide current brings in feed everything follows the feed.[133]

This quote demonstrates how ideas about fish can be shaped by community in place. He can summarize the ideas about halibut habitat preference attributed to "people from up here". These ideas are different from those held by fishermen from California (which does not have halibut, so these are likely visiting sport fishing tourists). His quote also reflects an understanding of the "mystery" of fish populations. He suggests that halibut move and no strict idea about the kind of bottom that you will catch them in will hold up over time.

The charter boat operator above also highlights the importance of the movements of "feed" for halibut. Most believed that halibut had an extremely good sense of smell or a "sensitive nose"[134], so that if any were halibut nearby when they dropped bait, the halibut would come to the hook almost immediately[135]. Charter and subsistence fishermen did not tend to wait in one spot for long periods of time if halibut didn't start biting – if halibut were in the area they would have smelled the bait and come over[136]. This nose allows the fish to seek out food and Old Harbor community members had

[132] Interview, Old Harbor charter operator 10/7/08
[133] Interview, Old Harbor charter operator 9/28/08
[134] Interview, Old Harbor fisherman 10/30/08
[135] E.g. interview Old Harbor fishermen 10/30/08, 7/31/08, 7/29/07
[136] Interview, Old Harbor charter operator 7/31/08

specific ideas about the diet of halibut. When cleaning halibut, fishermen often pulled out and cut their stomachs to view their contents[137]. At science and culture camps, kids from Old Harbor dissected halibut and examined their stomachs[138]. Old Harbor community members believe that halibut will eat just about anything. They have found small fish, octopus, crustaceans, and even a discarded can of spam in their stomachs[139]. One fisherman said that when he was salmon fishing in shallow waters: "there would be big halibut in there and you would actually see 'em come out - jumping out of the water, eating salmon – other things as well, big eaters."[140]

Fishermen from Old Harbor tended to emphasize the importance of salmon to their diets and movements. One told me, "when you get lots of salmon coming in the summertime, you get a lot of halibut because that's what they're feeding on. And, uh, when the salmon go away, then basically, the halibut go away."[141] Through the experience of literally observing large halibut eat salmon as well as their own catch experiences, fishermen fished (often successfully) with a belief that halibut and salmon movements are connected. It seemed that for most fishermen the presence and movements of "feed" was an even more important factor for halibut then the type of ocean bottom.

Some Old Harbor fishermen had ideas about the topography of the bottom that was best for catching halibut. With this information, they could look at charts of the ocean floor in any place and pick out spots that they thought would be conducive to catching halibut. The most commonly-held idea was that halibut like a kind of "plateau"

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[137] Old Harbor Field Notes 2006-2008
[138] Old Harbor Field Notes 2007
[139] Interview, Old Harbor fisherman 7/29/07
[140] Interview, Old Harbor charter operator 7/31/08
[141] Interview, Old Harbor fisherman 10/30/08

on the ocean floor. One fisherman gives this specific description of these microhabitat preferences:

> A lot of times you'll look for like a you'll see like a deep spot but then you'll see something sticking out in the middle of it like a - like a high plateau in the middle of - surrounded by deep and then depending on the tides…the cod and the halibut will do the same thing they'll lay on one side of the hump, feeding on stuff.[142]

Old Harbor fishermen's ideas about the micro-movements of halibut were multifaceted and they incorporated a great deal of complexity into the decisions they made about where to fish. The following is a charter boat operator describing how he fishes halibut:

> Like you can go to a spot with the expectation that you're gonna pull fish out of there and like there's a spot I fish off of Two Headed Island that the halibut have been there for five years and they're 20 -25 pounds and you can expect to drop a hook down there and have a bite in less than a minute, it's just, they're there every year, always in the, they never move, it's basically a nursery spot. And ah, and then there's other spots we fish where you know, we go there and you say you know you got 'em here before just drop down and wait and see what happens and you can tell when you pull the halibut up if they, you know those ones out there you catch 'em and they all have these dirty bellies you know, they're laying down there and those other spots when all the fish you pull out have the pink bellies and you know they've been swimming around and they're traveling, so you kind of look, you can look and see and think you know fish going this way if we fish here there's a good chance they're gonna come up.[143]

This quote demonstrates how Old Harbor fishermen hold complex ideas about halibut ecology in their efforts to catch the resource. He describes two kinds of halibut "nursery" halibut which don't travel much and come up with "dirty bellies" and "traveling" halibut that come up with "pink bellies" from moving on and scraping up against the ocean floor. Incidentally, the IPHC has only just begun to recognize that

[142] Interview, Old Harbor charter operator 7/31/08
[143] Interview, Old Harbor charter operator 7/31/08

there are both migratory and stay-at-home halibut, through some of their tagging studies (Loher & Seitz 2008; Loher 2008; Webster & Clark 2007). The fisherman's statement also demonstrates just how hard it is to separate fishermen's knowledge or ideas about halibut biology outside of fishers' bodies and the fishing processes. The ideas are contained within the micro-decisions that they make throughout the fishing processes depending on the dynamic conditions with which they are faced. If this fisherman pulls up a halibut with a dirty belly, he knows that there will be more halibut in that spot for some time. But, if he pulls up halibut with pink bellies, he can guess that is where a number of halibut are moving through and if he keeps the bait down, more travelers will smell it and come up.

Fishermen's ideas about halibut biology are quite nuanced. They dynamically hold together ideas about bottom preferences, diet, movements with tide, topographic preferences, and different behavior patterns. This kind of dynamic and holistic perspective on halibut biology is unique and important. Western scientific approaches to understanding fisheries rely on tools such as regression which chart the relationship between one variable and another are quite rigid. They are not great at exploring how a number of different factors work together or at shifting analyses based on new conditions. If a scientist explores the relationship between one variable and another and removes it from the rest of the context, the answer can come out misleading. Fishermen provide an important antidote and potentially an important check for the fisheries science perspective. They know that fish like a rocky bottom lot of the time, but sometimes they don't. They know that halibut can follow good salmon runs, but many times they don't. They drop their gear, see what they pull up, and make new decisions accordingly.

Perhaps no one knows just how much information about halibut biology successful fishermen possess better than those who are not good at fishing them. I talked to some salmon fishermen who tried to start fishing halibut, but gave up because they simply couldn't do it. One elder told me the following about halibut fishing:

> I never did really good anyway - halibut. No kidding - I didn't make no money…I just didn't know how to fish them you know. You got to know how. One guy told me, if you fish a halibut you got to set it across where the tide is strong you know, not follow the tides, the tide runs. You've got to set it like this, so the tides could… there was always some guy who used to follow it. Real halibut fishermen used to tell me.[144]

Long Term Changes:

In the previous section, I described Old Harbor fishermen ideas about the micro-scale movements and habitat preferences of halibut in their region. These are the kinds of information that get incorporated into their everyday acts of fishing. When I talked to fishermen, they were also able to step back a bit spatially and chronologically, to think about some of the larger-scale changes and processes taking place within their fishery. Fishermen had many ideas about how halibut populations in their region were changing over time and some of the factors that might be influencing those changes.

Abundance:

In terms of overall abundance of halibut in the Old Harbor region of Kodiak, Old Harbor community members expressed in some form or another that "the halibut have always been here"[145]. Elders and younger fishermen told me that they have never really seen a significant decline in the local halibut population – it has just been something that

[144] Interview, George Inga Sr. 6/25/07
[145] Interview, Old Harbor fisherman 7/29/07

they could always count on[146]. One fisherman did report that if anything he thinks that the current abundance "seems like it's on the high end"[147] and that there were presently more halibut than usual. This perception that there is a healthy halibut abundance exasperates some community members, because they feel like they are surrounded by a thriving population of halibut that for political reasons they cannot fish. The decline in community commercial halibut fishing is not linked to a decline in halibut populations.

When I asked fishermen if they had observed a change in the size or growth of halibut, their responses were different. Everyone expressed that they felt halibut were smaller than usual and that catching big ones was more difficult and less frequent. One fisherman told me: "you don't catch the bigger fish any more, the ones we call barn doors."[148] Another said "the big fish are kind of disappearing"[149] and yet another fishermen said, "they used to be bigger in the old days"[150]. Although fishermen do not age the fish and thus do not have the same size-at-age assessments as IPHC scientists, it is possible that their observations of few larger halibut result from the same biological processes that IPHC scientists have named the "incredible shrinking halibut".

When I asked community members why they believed halibut were smaller, they most often attributed the shrinking pattern to commercial fishing activities rather than climatic or marine conditions. One fishermen said that they were shrinking, "probably because of overfishing or um people like to think in Ahkiok [a village south of Old Harbor] that, that the draggers are, are um catching too much by-catch of halibut."[151]

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[146] E.g. interviews, Old Harbor fishermen 10/30/08, 10/12/08, 9/21/08
[147] Interview, Old Harbor fisherman 9/13/08
[148] Interview, Old Harbor fisherman 9/21/08
[149] Interview, Old Harbor fisherman 10/30/08
[150] Interview, Old Harbor fisherman 10/13/08
[151] Interview, Old Harbor fisherman 9/21/08

Many community members in Old Harbor and Ahkiok another village were concerned about what the activities of the "draggers" which are large catcher-processor vessels that fish by dragging large nets on the ocean floor.   Another fisherman told me that he believed that high-grading of commercial fish is responsible for the prevalence of smaller fish. He said, "oh I guess everybody targets for the bigger fish, you know, and they let the little fish go."[152] Since larger halibut get a higher price per pound, he believes that some fishermen will keep the large fish and let the little ones go, leaving only small halibut in the ocean.

When I arrived to Old Harbor, I was very interested in hearing community accounts of climate change or global warming. Many Alaska Native communities in the Arctic region have experienced dramatic changes in their surrounding environments as a result of climate change (Peterson & Johnson 1995; Duerden 2004; Lynch & Brunner 2007). Old Harbor elders reported that they had seen some subtle changes in the climate – in things like wind patterns[153] and the amount of snow.[154] However most had not observed large-scale warming in their climate. This is not surprising if you look at Western Scientific data from the region. Over the past 40 years, the Kodiak region of Alaska has not experienced nearly the same level of warming as other parts of the state, and one season, spring, has even shown a cooling trend.

Community members did, however, describe what they referred to as "cycle" in both the climate and structure of fish populations[155]. One fishermen told me that any changes in climate, "I think it's, everybody, if you're old enough you'll just say it's a

[152] Interview, Old Harbor fisherman 10/30/08
[153] Paul Kahutak, personal communication 8/7/07
[154] Interview, George Inga Sr. 6/25/07
[155] Interviews, Old Harbor residents 9/28/08, 9/11/08, 6/25/07

cycle."[156] He said that the cycle also influenced the abundance of fish populations, "when the halibut and cod are plentiful, the crab are gone and when the crab come back, the halibut and cod will you know be gone."[157] He learned about the "cycle" from "one of the older guys that he passed away several years ago". This fisherman's description of the cycle might be similar to the North Pacific climatic pattern described by Western as the Pacific Decadal Oscillation (PDO). In the previous chapter, we used the PDO index to examine changes in halibut. It is interesting to note that observations by fishermen and fish landings are what prompted investigation and eventual description of this climatic pattern (Mantua et al. 1997).

Old Harbor is located on the coast of waters in IPHC statistical area 3A. This area includes most of Kodiak Island and the Gulf of Alaska. Many commercial fishermen own halibut quota in statistical area 3B which begins several miles west of Old Harbor and extends for part of the Aleutian chain. They must travel down the south western part of the island to harvest their commercial catch. These commercial fishermen had accounts about the abundance of halibut in that region. Most reported that they "had a hard time finding halibut there"[158]. Another commercial fishermen told me that "in area 3B that seems like it's pretty depleted you know I mean from what I hear guys are really struggling to find their fish in 3B."[159] He said that given his experiences and these accounts, he was really surprised that the IPHC had decided to "miraculously" *increase* the allowable halibut catch for that region. While no Old Harbor fishermen attended the IPHC annual meeting where they establish these catch limits, many other

[156] Interview, Old Harbor charter operator 9/28/08
[157] Interview, Old Harbor charter operator 9/28/08
[158] Interview, Old Harbor fisherman 7/31/08
[159] Interview, Old Harbor fisherman 11/10/08

commercial fishermen attend the meeting and bring large scale observations to bear on the regulatory processes. In the next chapter, I will describe the ways that both scientists and fishermen contribute to decisions about halibut catch limits.

Reflections:

In this chapter, I described the context, form, and processes behind Old Harbor fishermen's ideas about halibut biology. By examining Old Harbor approaches to halibut biology from a historical perspective, we can see connections between community and knowing. The history of Kodiak Island and commercial fishing reveals how Old Harbor has emerged as a commercial fishing community within the Pacific halibut fishery. Driving purposes to catch halibut for subsistence, income, pleasure, and culture, make Old Harbor a community of knowing – a community interested in gaining insights about the biology of halibut resources. Finally, we see that through the use of a wide array of techniques, including forms of observation and experimentation, and through the development of theories about halibut biology Old Harbor is a scientific community.

Old Harbor fishermen science produces a lot of important ideas and information about the biology of underwater halibut stocks. Fishermen have intricate ideas about the micro-scale movements, behaviors, and preferences of halibut stocks. They also have ideas about long term trends in halibut dynamics. Fishermen are able to think about the fishery experientially and holistically, holding together a number of different ideas about the resources and adapting to new conditions. They also intimately understand the relationship between fishermen, fishermen's gear, and halibut.   These ideas serve them well as fishermen. Certain halibut experts have risen to become efficient and prolific fishers of halibut – experts like the mythological One-trip Charlie. Community members who have not been able to master the ecology of local halibut have dropped out of halibut fishing.

Fishermen's ideas also have much to contribute to broad discussions and decisions about halibut management. They offer a place-based, lived, and dynamic understanding of halibut biology that is lacking in most fisheries science. There have been several cases where halibut fishermen have discovered trends or patterns in halibut populations long before fisheries scientists – such as the case with migratory movements in halibut populations. As we will see in the following chapter, fishermen also noticed and responded to a decline in halibut populations in a particular area before IPHC scientists noticed a trend. Fishers also know much more about movements of halibut on a smaller scale – types of habitat preferences, or fishing spots. IPHC scientists assess halibut stocks on a population or regulatory area scale and so have little understanding of these types of movements and behaviors.

This chapter reveals the connection between ideas or knowledge about halibut and the purpose for which that knowledge was collected. Though this may seem quite practical and obvious, it is often overlooked in discussions about environmental knowledge and integrating different knowledge types in management. Knowledge that fishermen have about halibut are linked the purpose for gaining it – to better catch halibut for food and income. Understandings of the micro-scale movements and pockets of halibut all can contribute to increased catches. Even the type of halibut fishing that community members conduct changes the shape of their ideas about halibut. Subsistence fishermen know much more about movements of halibut close to Old Harbor and places to quickly catch one or two fish. Commercial halibut fishermen, on the other hand, fish in deeper water and travel longer distances. They understand dynamics of halibut on a broader-scale and have ideas about places to find large pockets of halibut. The purpose driving the knower also dictates the types of questions he or she asks about the fishery and the techniques he or she uses to assess those questions. Fishers conduct halibut experiments to gain information about better spots to catch halibut. Fishers ask elders and community members questions about fishing designed to accumulate information to better catch halibut.

Purveyors of traditional and local knowledge often present these forms of environmental knowledge as a panacea, claiming that including these forms of knowledge in environmental management will increase both ecological sustainability and social justice (Berkes 1999). The problem is that when fishermen are asked to bring their knowledge to a management context, they are asked to answer questions about the fishery (such as large scale changes recruitment, age structure, reproduction) that their approach and techniques were never designed to test. IPHC, on the other hand, collects information about the halibut fishery for the purpose of managing the stock on a large scale. They design experiments, collect data, and analyze trends for the purpose of contributing to management discussions.

This doesn't mean that fishermen perspectives and ideas don't have important ideas to contribute to the management process. They clearly do. It also doesn't mean that fisheries scientists have more valid or superior ideas about halibut than fishers. All seem equally in the dark when it comes to these underwater fish populations. It does, however, mean that movements towards increased collection and use of traditional ecological and local knowledge can create a set of unrealistic and unfair expectations for indigenous resource users. Indigenous groups or fishermen are asked to harness their ideas for a different purpose and in a different context from which they were generated.

In this chapter, I described how many of fishermen's ideas about halibut are embodied in both materials and practice. Their ideas about halibut are also embedded in place – they describe halibut movements in a local language of fishing spots and fishermen that is not easily transportable outside the region. This places Old Harbor fishermen at an inherent disadvantage when they attempt to bring their ideas to an international policy realm.

By examining Old Harbor ideas about halibut biology alongside a history of the community and the fishery, I hoped to reveal the intimate connections between environmental knowledge and history. Dynamic changes in the community – interactions and exchanges with colonial agents and other outsiders, increasing connections within global networks of fishery trade, shifts in purpose and types of halibut fishing – have all shaped the content of Old Harbor fishermen's knowledge about halibut biology. In the previous chapter, I showed that fishery science ideas and approaches to halibut biology are similarly shaped by history.

Scholars of indigenous knowledge have tended to focus on the spiritual and place-based nature of indigenous approaches to the natural world (Watson & Huntington 2008; Berkes 1999; Huntington 2000). When contemplating the historical nature of indigenous knowledge, scholars have tended to highlight a history of continually residing in one particular place or to focus on connections to an ancestral, pre-contact past. But just as central a component of indigenous knowledge is something that affects all indigenous groups – otherwise we would not call them indigenous at all – that is the experience of colonialism. Processes of both exchange and disenfranchisement that accompanied colonialism shape indigenous approaches to natural resources and their ideas about the biology and ecology of their surrounding environments. As we will see in the next chapters, this experience of colonialism also shapes the relative power position that indigenous groups find themselves in when they seek to participate in the management processes that govern the use of local resources to which they have such a strong historical and cultural connection.

Chapter 5
Analysis

Negotiating a Halibut Biology: Ideas and power in the formulation of Pacific halibut catch limits

Confronted by laboratories we are simply and literally impressed. We are left without power, that is, without resource to contest, to reopen the black boxes, to generate new objects, to dispute the spokesmen's authority.

-Bruno Latour *Science in Action* p. 93

I'd just like to say one other thing. The graphs have been wonderful and brilliant and colorful. I really should have brought sunglasses today.

- Halibut fisherman addressing the IPHC director during a workshop about fishery science approaches the IPHC uses in halibut management.[160]

On Friday January 16th 2009, in a Vancouver, B.C. hotel, a crowd of individuals interested in the halibut fishery – commercial fishermen, charter boat operators, seafood processors, state and federal agency officials, fishery biologists, lobbyists, environmental advocates, and representatives of indigenous fishing communities – all gathered in a ballroom to stare at a computer image on the screen. The participants of the meeting were primarily non-native, but 14 of the 66 fishermen interests groups represented indigenous fishing interests and two major decision-makers were of indigenous descent. Old Harbor and other villages in the Gulf of Alaska did not send representatives. Sitting

[160] Recorded during IPHC public Biomass Apportionment Workshop 9/5/2008

next to the computer screen was a panel of six halibut Commissioners appointed by the governments of the United States and Canada. The chair of the Commission began to read off the catch limits that she and the other commissioners had decided upon for the coming fishing season. As she announced an annual catch limit for each of regulatory areas of the fishery, the number was ceremoniously typed into a giant spreadsheet on the screen. The announcement of these numbers culminated the International Pacific Halibut Commission Annual Meeting and marked the end of a four day process of complex negotiations regarding the status and future of the fishery in the face of high levels of uncertainty.

These numbers expressed the commissioners' understanding of the biological reality of the halibut stocks. Commissioners reflected on all kinds of knowledge and ideas about halibut presented to them both within and outside of the annual meeting. With the announcement of these numbers, the Commissioners made a statement about two essential questions of halibut biology: how are halibut populations in each of the regions of the fishery doing compared to other years and how many of those fish can reasonably be harvested in the coming year while still sustaining the population. Once announced, the numbers define the current understanding of the biology of the resource in a way that applies to all users of the fishery regardless of whether they agree with the Commissioners' assessments.

The final catch limits mark the economic lives of those who participate in the fishery. They finalize how much fish can be caught in each of the regions of the fishery, which impacts all users of the resource. After the announcement of catch limits, seafood processors rush outside to inform business partners about the amount of halibut they might be expected to process that year. Fishermen from regions that have experienced cutbacks call home to inform their families that things might be financially tight in the coming year as the size of their quota shares will decrease. Leaders from community-based fisheries inform their tribal governments about the potential for economic involvement in the halibut fishery for the upcoming fishing season.

This chapter examines the politics of knowing within the halibut fishery by focusing on the process by which the 2009 Pacific halibut catch limits were established. In the preceding two chapters I described how two communities – the International Pacific Halibut Commission (IPHC) and the Alaska Native village of Old Harbor – produce ideas about halibut biology. In this chapter, I will explore what happens when these two along with a number of other perspectives on halibut biology are brought together and negotiated within a political setting. How are different ideas about halibut biology communicated, perceived, structured, and utilized within catch limit negotiations? Which communities and ideas have more power within decision-making processes and which become marginalized? Why? What are the implications of this political structuring of ideas both for the halibut resource *and* the many communities connected to it? Finally, how are indigenous fishermen operating within and impacted by these negotiations? The notion of fish as 'mystery' is central to this discussion. The high level of uncertainty in all kinds of assessments of halibut biology and status creates a broad space for politics and negotiation over which ideas about halibut biology to incorporate into management decisions.

If ever there were a scientific "spokesman" for the halibut resource in the sense that Bruno Latour highlights in the quote at the beginning of this chapter, it is the staff of the International Pacific Halibut Commission (IPHC). The IPHC is an institution established through a treaty between the US and Canada for the sole purpose of conducting biological research and offering decision-makers scientific advice with regards to halibut populations. The IPHC develops assessments of halibut populations utilizing an annual operating budget of nearly four million dollars and enrolling the labor of 25 year-round and 35 seasonal staff members. Though the IPHC staff have a certain technical authority when it comes to halibut populations, they are not the only people who generate ideas about halibut biology and who attend the annual meeting to speak on behalf of the halibut resources. Fishermen and processors throughout the fishery come to the annual meeting to offer their own assessments of the halibut resources they are so intimately connected to.

In this discussion, I will focus on two broad approaches to halibut biology: (1) technoscience[161]– not just Western science in general, but the specific kinds of technical ideas generated by the impressive knowledge apparatus called the International Pacific Halibut Commission and (2) the often experiential and place-based kinds of fishery assessments developed by all kinds of fishermen (indigenous and non-indigenous) throughout the range of the halibut fishery.

In this chapter, I will argue that in the politics surrounding the establishment of the biological reality of halibut stocks, the somewhat narrow form of knowledge generated by the International Pacific Halibut Commission ends up dominating discussions and decisions surrounding the resource. The presence of a halibut commons

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[161] Throughout the chapter I utilize the term "technoscience" to describe Western scientific research conducted utilizing the scientific method and within the confines of Western scientific intuitions. I make this distinction from "science" because several scholars, including Gregory Cajete (2009) and myself in the preceding chapter, have argued that non-Western entities or in this case fishermen, can have their own forms of "science" to gain information about the world.

creates a situation where this narrow understanding of halibut biology applies to and orders the lives of all the different users connected to the fishery system. This has placed fishermen in the difficult position of needing to engage with, understand, and attempt to contest an extremely esoteric and technocratic kind of information; a kind of information that they do not have the resources (access to capital, networks, personnel, training) to replicate or reproduce in their own fashion. As a result, fishermen can find themselves excluded from a dialogue about the biology of fish resources they know well.

Latour refers to technical ideas established by scientific authorities such as the IPHC as "black boxes" because they are largely impenetrable and inaccessible to those without specific resources and training[162]. He states that the black boxes leave the general public "powerless" in the face of the technoscience authority. Because the lay audience can never fully access or contest technoscience ideas, they must accept and be controlled by them[163]. In the second quote at the beginning of the chapter, a halibut fisherman exemplifies this awe in the face of the technoscience authority by commenting about how he needed to wear "sunglasses" to sit through the overwhelming and "wonderful" graphs and figures presented by IPHC scientists at a technical workshop.

But, there is also something else going on in this fisherman's quote: sarcasm. The fisherman is literally standing up and taunting the director of the IPHC technoscience institution in the middle of a public meeting. He is making fun of the onslaught of graphs and figures that the IPHC staff has presented to try to explain concepts in the fishery. In addition, this comment came after he makes a fairly nuanced and scientifically-reasoned argument for why he did not agree with the IPHC's current approach to halibut

[162] Latour, 1987 p. 93
[163] Latour, 1987 p. 93

assessment. In short, he does not present a stance of someone who is or who has accepted that he is "powerless" in the face of fisheries technoscience.

In the knowledge processes of the Pacific halibut fishery, Latour's characterization of the lay audience as "powerless" in the face of technoscience authority is not entirely accurate. Through both an impressive effort of fishermen to understand and shape the dialogue surrounding halibut biology and an effort of the IPHC technical staff to educate fishermen and other interest groups about fisheries science and their research findings, participants without technoscience training are able to have some semblance of power and influence over the biological decisions that shape their fishery. Though they are most often in a position of diminished power when faced with the resources and technical expertise involved in the IPHC assessments, these fishermen are not in fact "powerless". The "black boxes" are never complete and fishermen continue to make tiny cracks in their brittle surfaces.

The fishermen and interest groups involved in the 2009 IPHC Annual Meeting were primarily non-native. However, several indigenous fishing interests from Alaska, Washington, and Canada had a significant presence at the meeting and throughout the negotiations. This analysis will focus great attention on the experience and actions of these indigenous fishing interests. Through this analysis of the indigenous experience in the face of technoscience, we can see the connections between a state's establishment of technoscience institutions for natural resource management and processes of colonialism. Over time indigenous resource users become enrolled into something called a commons that is under control of the state. Through the work of technoscience institutions embedded in this commons system, a natural resource to which indigenous groups have a specific cultural and historical orientation comes to be exclusively defined in a technoscientific and bureaucratic way. This creates a subtle but insidious kind of alienation from resources to which they have aboriginal claim. It places indigenous resource users in a position of catch-up where they must learn and engage with a new kind of technocratic natural resource language – a language in which they might consistently find themselves a step behind, yet in which some have proven quite adept.

While American Indian Studies scholars would engage with the connections between natural resource management and colonialism, researchers in Conservation Biology would see an entirely different purpose behind the establishment of these technoscience resource institutions. To conservation biologists, Western-oriented biologists are working on behalf of the voiceless halibut stocks themselves. Or in the words of the IPHC director, "we'll argue as hard as we can on behalf of resource management to make that heard."[164] The development of sound science institutions and the establishment of 'science-based' catch limits act to protect fish stocks from decimation by a highly efficient commercial fleet. From this perspective, the use of scientific information to the exclusion of other forms of halibut knowledge works to protect catch limits from erosion by political and economic interests who are looking to increase catch levels in any manner possible. This science-based form of management acts to protect fish resources for the benefit of all resource users, including indigenous communities.

To accommodate the conservation viewpoint, I also consider the perspective and motivations of halibut scientists and resource managers who prioritize technoscience in decision-making processes. I describe two kinds of politics that are at work in the

[164] Interview, IPHC director, 4/09

negotiations to establish annual catch limits for the halibut fishery. First is the politics surrounding the biological reality of the halibut stocks – this deals with how disagreements among scientists, fishermen, and other users about what is actually happening to fish populations are worked out. For example, while halibut biologists might observe a declining trend in fish stocks, experienced fishermen might observe phenomena that suggest the fish stock is doing fine. The second kind of politics is the politics of economic and political gain. In this kind of politics fishermen, politicians, state and national representatives, all look to influence decision-making processes in order to increase catch limits in their region of the fishery, regardless of the biological status of the stocks. The inability to separate these two kinds of politics marks the negotiations about the biological realities of the halibut fishery and the decisions that scientists and resource managers make about the kinds of knowledge they include in their fishery assessments.

The Players:

The international management of the Pacific halibut fishery and the catch limit negotiations proceed through an established hierarchy and protocol. The final catch limits are established by a panel of six Pacific halibut **Commissioners**. The Commissioners are political appointees from their respective governments (3 from the United States and 3 from Canada). The Commissioners have the final say with regards to catch limits and all international management decisions in the fishery. There is a high level of indigenous representation among the Commissioners. One US Commissioner is Alaska Native Aleut from St. Paul Island and one Canadian Commissioner is a First

Nations representative. However, neither of these indigenous commissioners have been appointed Chair or Vice Chair of the annual meeting, so their perspectives tend to be more in the margins compared to those of more powerful Commissioners. The Commissioners listen to advice from biologists, fishermen, and processors before making their final decisions.

The International Pacific Halibut Commission (IPHC) is a research institution that is separate from but works under the directive of the six appointed Commissioners. In order not to confuse the International Pacific Halibut Commission with the Commissioners themselves, I will refer to it as **the IPHC**. The IPHC was established in 1923 by a convention between the US and Canadian governments with a mandate to conduct "research on and management of the stocks of Pacific halibut within the Convention waters of both nations."[165] They provide a set of science-based catch limit recommendations to the public and the Commissioners a few weeks prior to the Annual Meeting.

There are also institutionalized processes for fishermen and processors to contribute their ideas and advice to the Commissioners. The **Processor Advisory Group (PAG)** consists of representatives who work on the processing end of the fishery. These are individuals who purchase whole halibut from fishermen, fillet it, process it, and sell it to the fish market. The PAG meets at the annual meeting and develops their own set of catch limit recommendations that they submit to the Commissioners.

Fishermen can contribute their knowledge and ideas about the fishery through the form of **Conference Board (CB)** recommendations. The Conference Board contains voting representatives from 66 fishing interests groups throughout the US and Canadian

[165] International Pacific Halibut Commission website: http://www.iphc.washington.edu/halcom/about.htm

fishery. As I mentioned above, the majority of the actors in the annual meeting are non-native, however there is still a significant indigenous presence, particularly those from communities with strong economic connections to the fishery. Of the 66 interests groups, 11 US and 3 Canadian groups (20% total) represent some form of indigenous fishing interest. In particular, treaty tribes from Washington State who receive an allocation of 36% of the state's halibut resources, and Alaska Native groups in the Bering Sea who have large allocations of halibut resources from Community Development Quota programs play important roles in the annual meeting.[166] Through processes of political savvy, some of these indigenous groups have overcome technocratic barriers to occupy positions of strategic power within negotiations surrounding catch limits and the biology of halibut stocks.

It is important to note at the outset that representatives from the Alaska Native village of Old Harbor were not, nor have they ever been present, at the Halibut Commission Annual Meeting negotiations surrounding catch limits and fishery regulations. This leads to the question: why would I focus a chapter of my dissertation on a set of negotiations at which my major community of study was not even present? The fact of Old Harbor's absence from these negotiations is, in fact, central to an argument about the politics of knowledge in the halibut fishery and the connections between technoscience natural resource institutions and processes of colonialism.

Since the community of Old Harbor has limited resources, they are very strategic about choosing to which fishery meetings they should send community representatives. Due to political processes that I will describe in the last chapter of this dissertation, Old Harbor residents own relatively few shares of halibut quota. They have therefore placed

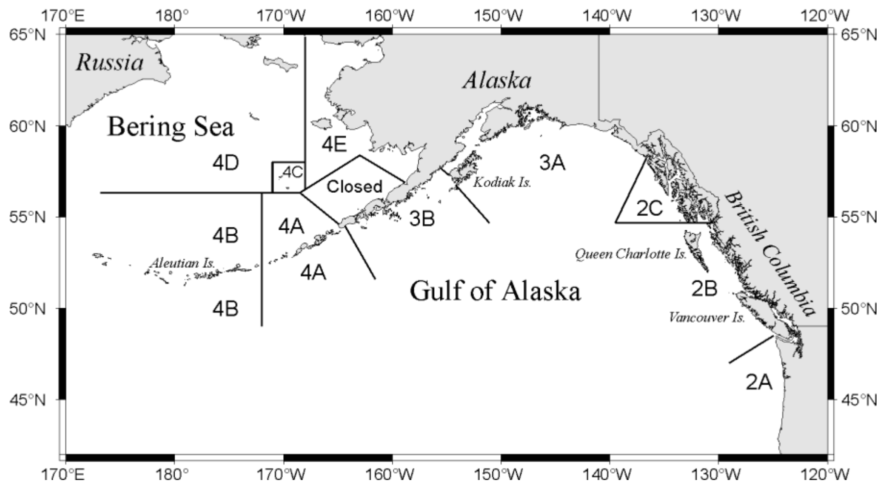
[166] Old Harbor fisherman, personal communication, 8/23/08

all of their political energy into political processes at the federal level – with the North Pacific Fishery Management Council – to try to get increased allocation of halibut resources for community members.[167] Involvement in IPHC meetings, such as the annual meeting to establish catch limits, requires the learning of a new technical language and political terrain that at this point they do not feel is worth their limited resources. This means that even though catch limit negotiations impact the livelihoods of the Old Harbor fishermen who participate in the fishery and even though community fishermen possess important kinds of information and knowledge about local halibut populations, they play almost no role in influencing the establishment of these limits. The fact of Old Harbor's absence from these assessment meetings remains an important presence throughout this analysis.

I will explore the processes (resources and techniques) through which the IPHC and the fisherman's conference board generate catch limit recommendations which they then present to the commissioners. Finally, I will explore the way these two sets of recommendations and the kinds of ideas they encompass become expressed in the final catch limits established by the six Commissioners. These analyses are based upon ethnographic observations of the meeting itself, analysis of IPHC and annual meeting supporting documents, nearly one year of working with the extremely accommodating IPHC staff on a scientific research project, two years following fishermen and politics related to the halibut fishery, and interviews with halibut fishermen and IPHC staff members.

[167] Old Harbor fisherman, personal communication, 8/23/08

a. International Pacific Halibut Commission Recommendations:



Area:	2008 Limits:	**2009 IPHC Recommendations:**	% Change*:
4CDE	3.89	**2.93**	-24.68
4B	1.86	**1.94**	+4.30
4A	3.10	**2.65**	-14.52
3B	10.90	**11.67**	+7.06
3A	24.22	**22.53**	-6.98
2C	6.21	**4.54**	-26.89
2B	9.00	**6.96**	-22.67
2A	1.22	**0.86**	-29.51
TOTAL:	60.40	**54.08**	-10.46

Table 1. 2009 IPHC recommendations for catch limits (in millions of pounds) in each of the eight regulatory areas of the fishery. Above figure shows the location of IPHC regulatory areas. Source: 2009 IPHC Annual Meeting Handout. *Notice that the 2009 recommendations represent significant cuts in the amount of halibut that can be harvested in most regions when compared to the 2008 limits (up to 30% cuts).

The Pacific halibut catch limit negotiations begin each year with the announcement of the International Pacific Halibut Commission's catch limit recommendations for the eight different regulatory areas of the fishery. The IPHC recommendations set the tone for the entire annual meeting. The recommendations from the fishermen's and processor's group and the final catch limits are all conscious responses to these eight numbers. Most annual meeting dialogue works closely within the parameters set by these IPHC technoscience recommendations. When fishermen or commissioners advocate to stray from a particular IPHC catch limit recommendation, they often justify it with the terms and language established by the IPHC – for example they cite flaws with the IPHC apportionment methods or choose to disagree with the IPHC's "hook correction factor"[168].

When I asked a now retired IPHC stock-assessment scientist about the role he believed IPHC played in the fishery management process, he simply responded "scientific advice"[169]. He said this because ultimately, IPHC is not charged with setting the final catch limits, the set of six government appointed Commissioners are. The IPHC catch limits are recommendations that the Commissioners can choose to accept or revise, sometimes incorporating economic or political factors. However, I feel that the term "scientific advice" significantly underplays the central role that IPHC and their scientific recommendations play in shaping the negotiations at the annual meeting and the structure of the fishery as a whole.

In 2009, the IPHC posted and distributed these recommendations to the fishery community weeks before the annual meeting to give fishermen, processors, and politicians the opportunity to consider and potentially refute them. A tremendous amount of resources went into the generation of the recommendations. In 2008, the IPHC received \$3.64 million[170] in appropriations from the US and Canadian governments to cover staff and operating expenses. IPHC employs a permanent staff of 29 with an

[168] Conference Board report 85th Annual Meeting, January 12th-16th 2009. Vancouver, B.C.
[169] Interview, retired IPHC senior assessment scientist 4/09
[170] Appendix 1. IPHC Research program: Review of 2008 projects and preliminary proposals for 2009. In: (International Pacific Halibut Commission 2009, p.143)

additional 35 seasonal employees, who are all involved in various research, analysis, and outreach projects related to the fishery. Almost all of these resources are in some way enrolled in the process of assessing the stock and developing this set of catch limit recommendations. In a way, generation of this set of eight numbers is the central purpose of the IPHC.

Despite the relative amount of power that IPHC staff has in dictating the terms of the annual meeting, the tone of the staff in the weeks preparing and during the meeting itself was one of defensiveness and at times insecurity. The staff carefully practiced their research presentations, came to agreements about how they would communicate scientific ideas, and scoured the literature for evidence to back up their recommendations. When I asked one staff member how he was feeling about the annual meeting he said that he was getting ready and "putting his armor on". The battlefield imagery comes from the staff's realization that their recommendations are going to come under an intense amount of scrutiny at the annual meeting. If you look at the table, the 2009 IPHC recommendations call for significant cuts in nearly every region of the fishery. They know these recommended cuts are not going to be well received and will cause economic hardship for fishermen from those regions. While they are sympathetic to these fishermen, they believe that these cuts are necessary for the health of the halibut stocks.

In a touchingly vulnerable moment prior to the annual meeting, one of the staff members, knowing that I was examining history and politics within the fishery, looked at me and said, "are you going to be on our side?" I responded to him immediately and truthfully, "of course I am." And I was. At times throughout the negotiation, it was difficult to watch as political and economic interests worked to erode the recommendations that the IPHC staff had so carefully and painstakingly developed over the past year. It was downright frustrating when the commissioners finally announced a set of catch limits that deviated from the IPHC recommendations and did not seem to possess a clear logic rooted in ideas about the biology of the fish stocks. The entity that in one instance seems to have the most power in dictating the terms of the meeting in another instance seems completely powerless against the onslaught of criticism and the pull of economic and political forces within the fishery. This apparent contradiction highlights the complexity surrounding the politics of knowledge within the halibut fishery and the inability of simple narrative tropes to encompass the intricacies of these negotiations.

IPHC Stock Assessment Process:

By compiling information from IPHC public reports and ethonographic observation, I developed a flow chart of the various processes, staff, equipment, and activities that contribute to the stock assessment and the development of the IPHC catch limit recommendations each year (Figure 30). It is clear that the staff calls upon a number of resources to develop these recommendations. At the heart of the fishery assessment process is the IPHC halibut population model. This model simulates processes in the fish population in order to develop an estimate of the **exploitable biomass** (this is the cumulative weight of all the fish that could possibly be caught with the gear used by the fishery).

The model requires inputs of data from commercial fishery as well as an expensive and expansive fishery independent survey (called the Standardized Stock

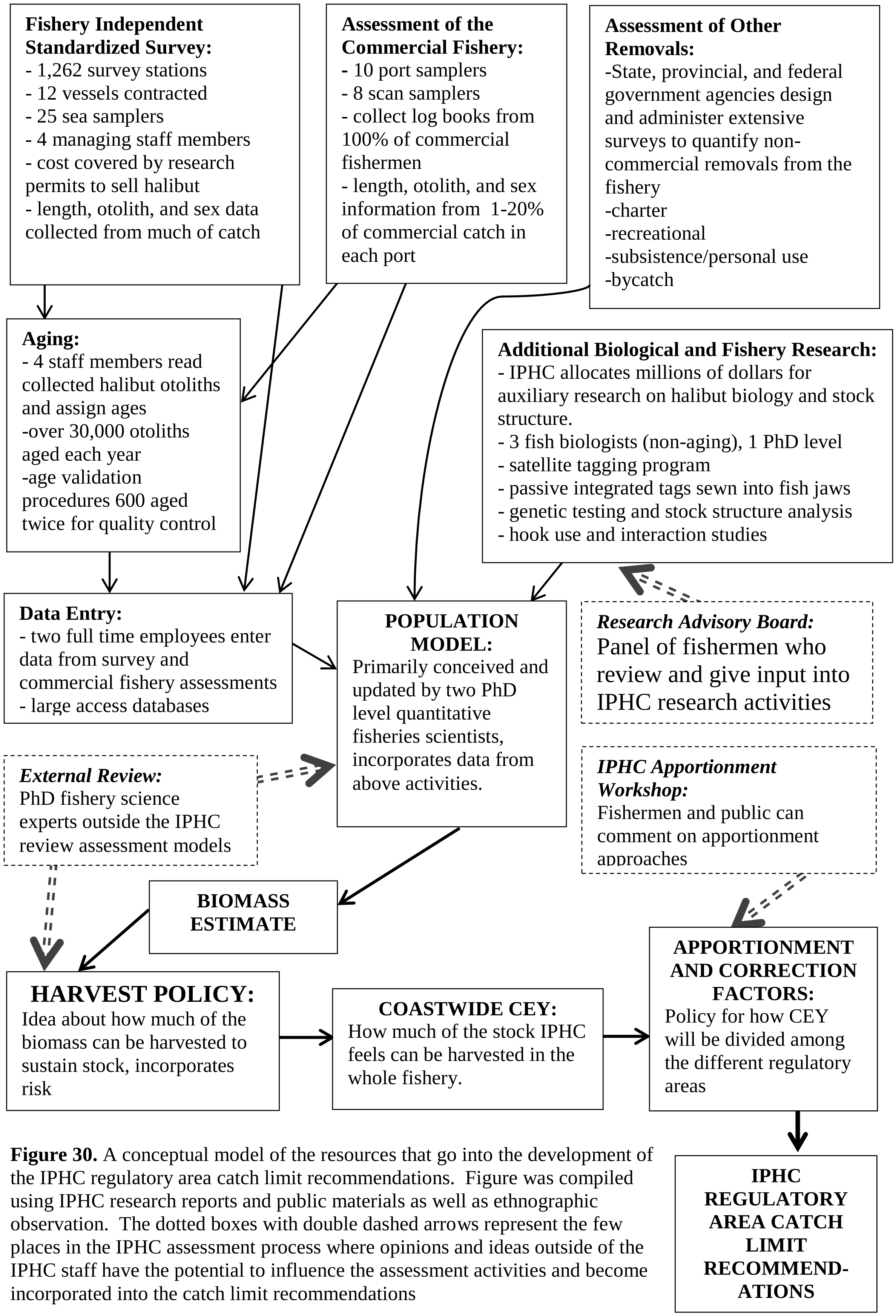


Figure 30. A conceptual model of the resources that go into the development of the IPHC regulatory area catch limit recommendations. Figure was compiled using IPHC research reports and public materials as well as ethnographic observation. The dotted boxes with double dashed arrows represent the few places in the IPHC assessment process where opinions and ideas outside of the IPHC staff have the potential to influence the assessment activities and become incorporated into the catch limit recommendations

Assessment Survey) that the halibut commission conducts each year.[171] The cost of the survey is funded through sale of the halibut caught during the survey trips – the IPHC has a special permit to capture and sell research fish. The collection of all of this commercial and survey data requires an array of port samplers, sea samplers, contracted commercial vessel operators, project managers, agers who determine the age of fish from their collected otoliths, and data entry personnel.

Quantitative scientists[172] utilize data about size and age structure of the fishery, removals of fish from the previous year, and changes in the relative abundance of particular year classes of fish to generate "a numerically fitted model of the fishery and the population"[173]. This requires entering the information into powerful computational programs that run a number of mathematical simulations. According to an IPHC quantitative scientist, "it's a lot of heavy lifting for the computer"[174]. When I asked an IPHC modeler if he had any success explaining the IPHC population model to fishermen, politicians, and the general public, he told me that he had tried a few times, but with limited success. He then described his strategy for explaining the rationale behind model estimates to the public:

> I try, whenever possible, I'll talk about things outside the model - not talk about model fits, so, you know, in trying to explain where the model comes from. I'll actually show survey data and actually the raw data, survey CPUE, this is the apparent mortality, this is what we think natural mortality is, fishing mortality has to be - so high. It's sort of ways of making the estimates credible without talking about the mathematical model because I think that's always going to be a black box to people. Even though it's fundamentally a pretty simple, pretty simple sort of thing, I think it's just inaccessible to people.[175]

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[171] Hare, S.R. and W.G. Clark. 2009. *Assessment of the Pacific halibut stock at the end of 2008* in (International Pacific Halibut Commission 2009)
[172] This is an official IPHC job title
[173] Interview, retired IPHC Quantitative Scientist 4/09
[174] Interview, retired IPHC Quantitative Scientist 4/09
[175] Interview, retired IPHC Quantitative Scientist 4/09

In this quote, the quantitative scientist evokes the very term that Latour uses to describe the way technoscience generates authority – the concept of the "black box". Despite their best efforts, IPHC has rarely been able to successfully explain the inner workings of their population model to the fishing community. The fishery model writes the reality of a fish population that many fishermen know intimately in a language that they cannot access or argue against. This makes it difficult for fishermen to question the outcomes of the model, even though it may be based upon assumptions about the fishery with which fishermen do not agree. As a result, the assumptions and inner workings of the fishery model become something the fishermen and policy-makers must simply accept and defer to the IPHC's expertise. They are forced to trust the judgment of the IPHC staff with sets of analyses that can have a tremendous impact on their fishing livelihoods.

In 2006, the halibut population model switched from a regulatory area to a coastwide approach to modeling halibut stocks throughout the fishery[176]. Under a regulatory area approach, the IPHC modeled each regulatory area as a separate entity and came up with a biomass estimate for each area individually. After tagging studies and data analysis that showed the halibut migrated more extensively between regulatory areas then they thought, the IPHC staff moved toward a coastwide approach. This means that they fit the model to data from the entire fishery – all the way from the Northern Oregon

[176] International Pacific Halibut Commission News Release January 22, 2007. *Halibut Commission Completes 2007 Annual Meeting.*

to the Bering Sea – and used that to come up with an exploitable biomass estimate for the entire fishery[177].

Once the IPHC has determined the total exploitable biomass, they then make a determination about how much of that biomass can be harvested while still sustaining the fish population. The protocol for determining how much of the exploitable biomass can be harvested is called the "**harvest policy**". This harvest policy incorporates information about halibut population dynamics and political determinations about the amount of risk IPHC staff are willing to take with the sustainability of halibut stocks. As far as risk goes, the IPHC operates with a harvest policy that reflects a "Precautionary Approach"[178] designed to minimize risk. Since the 1980s the IPHC has utilized a constant harvest rate policy whereby the commission sets catch limits based on a percentage of the total exploitable biomass.[179] The current harvest policy is to allow the harvest 20% of the coastwide exploitable biomass unless the population reaches a critical level in terms of its capacity to reproduce. This means that 80% of the biomass is left to reproduce and sustain the population.

To further diminish risk, the IPHC harvest policy also incorporates what they call a "Slow Up, Fast Down Approach" when it comes to determining catch limits. If the statistical models demonstrate a decline in halibut stocks, the commission will act quickly to reduce the catch limits. However, if the models indicate an increase in the halibut stocks, the commission will raise the catch limits at a slower rate. The IPHC precautionary approach and slow up, fast down approach are quite prudent and some of

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[177] International Pacific Halibut Commission 2006. *International Pacific Halibut Commission Annual Report 2006*. Seattle, WA, p. 42-114.
[178] Clark and Hare 2009 *Assesment of the Pacific halibut stock at the end of 2008*. In (International Pacific Halibut Commission 2009)
[179] *Ibid*

the most conservative in the fishing world. They have likely contributed to the continued sustainability of the halibut fishery, when so many of the other world's fisheries have collapsed.

Each year the IPHC harvest policy is applied to the estimate of the coastwide exploitable biomass generated from their halibut population models. This creates a coastwide catch limit known as the constant exploitable yield or **CEY**. This is the number seen at the bottom of the table of IPHC catch limit negotiations. The IPHC director is honest about the origins of the harvest policy and says: "I think anybody who doesn't say this is not being completely truthful - harvest policy analysis is risk management. The staff does the risk assessment and then you present this to whoever the body is that's making the decision."[180] Although the harvest rate policy reflects distinctly political decisions about risk tolerance, it tends to be negotiated and determined almost exclusively among IPHC staff. The IPHC catch limit recommendations that set the tone for the negotiations of the annual meeting and end up impacting the lives of fishermen throughout the fishery, contain within them decisions about risk determined by a small number of fishery scientists.

When the coastwide catch limit (Fishery CEY) has been established, the IPHC must take an additional, and perhaps the most controversial, step. They must divide the coastwide limit among the eight regulatory areas of the fishery in a process called **apportionment**. This is an essential step because the fishery is managed on a regulatory area basis – halibut quota shares are distributed by regulatory area, regulatory areas separate the US and Canadian fisheries, and different management and allocation strategies apply to different areas. A map of the geography of the regulatory areas is

[180] Interview, IPHC director, 4/09

contained above the catch limit table. Apportionment is incredibly controversial because it amounts to a battle between different regions of the fishery for a share of the total harvestable fish stocks. After several workshops[181] and internal negotiations, the IPHC has determined that the most equitable and biologically sound way to divide up the fish resources is through a process of survey-based apportionment.[182]

The math behind survey based apportionment is relatively simple. The IPHC multiples the average survey catch per unit effort (CPUE – a measure of the number of fish that are caught on the same amount of gear – this determines the relative abundance of the fish stocks from year to year) for the regulatory area by the total fishing bottom area in each of the regulatory areas[183]. Essentially, the IPHC multiplies a measure of the density of halibut fish in the regulatory area by the size of the bottom area. They then compare these numbers to each other to determine the relative percentage of the coastwide harvest that should go to each regulatory area.

One of the most glaring assumptions of this form of survey based apportionment, and one that is constantly called into question by fishermen, is the notion that the IPHC survey is consistent between the different regions of the fishery[184]. There can be several reasons for inconsistency in the survey between regions. Due to logistical difficulties, the survey is not conducted at exactly the same time of year in each region, there can be

[181] Steven R. Hare, Ray A. Webster, Juan A. Valero, and Bruce M. Leaman. 2009. *IPHC Biomass Apportionment Workshop summary and responses to significant questions arising from the workshop.* In (International Pacific Halibut Commission 2009)
[182] Clark and Hare. 2009. *Assessment of the Pacific halibut stock at the end of 2008*. In (International Pacific Halibut Commission 2009)
[183] Steven R. Hare, Ray A. Webster, Juan A. Valero, and Bruce M. Leaman. 2009. *IPHC Biomass Apportionment Workshop summary and responses to significant questions arising from the workshop.* In (International Pacific Halibut Commission 2009)
[184] Official notes. International Pacific Halibut Commission Stock Assessment Workshop June 27-28,2007. Nexus Hotel. Seattle, Washington. http://www.iphc.washington.edu/meetings/workshop2007/SAW07Reportfinal.pdf

differences in the amount of fishing pressure that takes place before surveys are conducted in particular regions reducing the perceived abundance of fish in the region, and there can be behavioral differences among halibut from different regions – some being more 'catchable' than others[185]. Fishermen and politicians have used these and a number of other arguments to call into question IPHC's method for apportioning halibut resources.

All aspects of the IPHC stock assessment process contain assumptions about fish populations and acceptance of risk that could be scrutinized. Because the science and mathematics behind the apportionment process are more accessible, it is relatively easier for fishermen to generate and successfully employ arguments against IPHC's approach. This combined with the strong political and economic implications of the distribution of halibut resources by regulatory area, likely contributed to apportionment being one of the most hotly debated aspects of the 2009 annual meeting.

In an attempt to overcome some of the assumptions behind survey-based apportionment, the IPHC introduced a new element to the apportionment methodology called the "**hook correction factor**"[186] at the 2009 annual meeting. This factor is based on a concept of hook competition. The idea is that there are different levels of competition between halibut and other species in different regions of the fishery. In areas where there are a number of other fish species that compete with halibut, the result of the survey catch per unit effort (CPUE) will be lower than the actual abundance because other fish are stealing bait from the hooks and themselves getting caught in the line. This

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185 Hoag, S. H, R. B Deriso, and G. St-Pierre. 1984. Recent changes in halibut CPUE: Studies on area differences in setline catchability. *Int. Pac. Halibut Comm. Sci. Rep* 71.
186 Clark and Hare. 2009. *Assessment of the Pacific halibut stock at the end of 2008*. In: (International Pacific Halibut Commission 2009)

means that comparatively less halibut get caught in regions with high levels of competition than in regions with low levels of competition. The IPHC developed and presented this formula to describe the process:

$$C_h = k \cdot B_h = k \cdot F_h \cdot B_0 \cdot (1 - \exp(-z))/Z = k' \cdot D_h \cdot B_0 \cdot (1 - \exp(-z))/Z$$

The inclusion of this equation in this narrative is as much to give the reader a tactile sense of the type of technoscience interpretations that fishermen must face as they approach meetings such as these. Halibut fishermen who come to meetings with their own assessments and concerns for the fishery must read documents and witness lectures with many similarly impenetrable equations and must ask themselves the question: how can I engage with and enroll an argument against something like this?

Hook competition has never been explicitly studied in halibut populations, and the equation and theory behind the hook correction factor has primarily been derived from research conducted on Pacific sablefish, a groundfish that often occupies the same niche as halibut.[187] The effect of the hook correction factor is that regions of the fishery in which more survey baits are returned in tact (indicating less competition) – regions 4B and 4CDE both in the Bering Sea/Northwestern range of the fishery – receive cuts in the relative apportionment of halibut resources. Conversely, those regions with increased competition and less survey baits returned – most dramatically area 2A at the southern eastern end of the fishery – receive relative increases in their halibut catch limits. This hook correction factor would also become an important source of debate and contention among fishermen and politicians during the annual meeting.

[187] 2008 Clark, W.G. Effect of hook competition on survey CPUE. In: Int. Pac. Halibut Comm. Report of Research and Assesment Activities 2007: 211-215.

The above explanation demonstrates that the 2009 IPHC recommendations were developed through the following process: **survey and commercial data** is placed into a **halibut population model** to establish an estimate of **total exploitable biomass** to which a **harvest policy** is applied to determine a coastwide catch limit known as the **fishery CEY.** To this, a method of **survey-based apportionment** is applied to divide the catch among the regions. Finally, a **hook correction factor** is applied to the apportionment procedures to develop a final set of **catch limit recommendations** for each regulatory area. Each of these steps involves complicated quantitative fishery science techniques. They also rely on data about the fishery that are time, labor, and resource expensive to obtain. In addition, they rely on certain working assumptions about halibut populations, which for the most part have been developed through discussions and research conducted almost exclusively at the IPHC.[188]

In addition to the directed assessment data collection that the IPHC staff conduct each year (to get survey and commercial statistics), the halibut commission also engages in a number of research projects about general life history or biological parameters of the halibut populations. These include tagging studies to explore migration patterns, genetic studies to examine processes of stock differentiation and distribution, hook behavior and feeding studies. Although the results of these research projects are not explicitly inserted into the assessment processes they have an important impact on the catch limit recommendations that IPHC develops each year. Namely, these research projects can generate findings that call into questions some of the key assumptions of the IPHC assessment protocol. For example, tagging studies conducted in the early part of the decade, showed that halibut migrated extensively between regulatory areas and

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[188] Interview, IPHC director 4/09 and interview, retired senior assessment scientists 4/09

contributed to the decision to switch from a regulatory-area to a coastwide assessment model. These expensive IPHC controlled auxiliary research projects influence decisions to switch model approaches, something that happens about once every five years, and can also contribute to changes in harvest policy and apportionment approaches.

Idea Inclusion/Exclusion:

Although the IPHC is primarily a science-oriented institution, their recommendations need not solely be based on technoscience assessments of the fishery. The IPHC's assessment process contains several places where non-IPHC ideas about the fishery could contribute to the establishment of IPHC catch limit recommendations. In Figure 30 , the boxes with double arrows indicate places in the assessment process where outside knowledge or information could potentially influence to the establishment of IPHC recommendations. While many of these mechanisms provide the possibility for fishermen to influence the IPHC assessment process, in the end they often do little to meaningfully incorporate fishermen ideas into IPHC analyses. The IPHC recommendations tend to result primarily from the input of a small, elite group of halibut fishery scientists. As we will see later, this does not shut off all avenues for fishermen participation in the catch limit process; fishermen can still contribute their ideas and knowledge through the Conference Board recommendations at the annual meeting.

The IPHC staff seems committed to maintaining and improving interactions between the halibut biologists and the halibut fishing community[189]. IPHC provides educational workshops, easy access to reports (in fairly accessible language) about all

[189] http://www.iphc.washington.edu/halcom/about.htm

aspects of IPHC research, and year-round availability to answer fishermen's questions over the phone or via email. Their outreach activities have resulted in a highly educated and engaged fishery community.[190] The IPHC staff also does seem honestly committed to trying to communicate some of the esoteric concepts from their assessment process to the harvesting community. The IPHC director stated, "it can be a tough slug sometimes, getting across some concepts to folks. And if there's been an evolution, it's within us to try and continually improve how we transmit some of those things."[191]

During my tenure studying the halibut fishery, I observed two IPHC biomass apportionment workshops (September 5, 2008 and April 29-30, 2009) where IPHC staff discussed the intricacies and difficulties of the apportionment process with interest groups throughout the fishery. In the workshops, IPHC staff gave a series of power point presentations about various aspects of the fishery and the rationale behind their preferred method of apportionment. They also calmly listened to and fielded a number of questions from fishermen, processors, and politicians in attendance.[192] These kinds of outreach activities contribute to breaking down the "black boxes" of fishery science for fishermen, allowing them to have a greater understanding of and engagement with the technoscience processes that govern their lives. However, through the very set-up of these workshops, the learning tended to be more one-way. IPHC staff educated fishermen about their ideas for the fishery, but there was little forum for the staff to actively listen to and seek to incorporate fishermen ideas about halibut biology into their approaches.

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[190] According to IPHC director (4/09), the halibut fishery has "a very sophisticated user group, compared to a lot of other fisheries."
[191] Interview, IPHC director 4/20/09
[192] Field Notes: Biomass Apportionment Workshop September 4, 2008, Bellevue, WA and Biomass Apportionment Workshop April 29-30, 2009, Seattle, WA

One institutional process within the IPHC protocols that holds great promise for bringing multiple perspectives to the halibut assessment process is the **Research Advisory Board (RAB)**. The board is a panel of six halibut industry representatives – five fishermen and one processor – who meet with the IPHC director and key research staff once a year to discuss IPHC research activities. All of the RAB members have significant economic investments in the fishery and there are no native, community-based, subsistence, or sport fishing interests on the board, so in this way they tend to represent a perspective of a more economic elite. But, these representatives are also incredibly thoughtful and engaged with the biological processes at work in their fishery. The IPHC director describes board members as "incredibly creative thinkers"[193]. RAB members have an exclusive forum in which to interrogate, criticize, and contribute suggestions to the IPHC management protocols. The IPHC director had this to say about the RAB:

> That's the reason I formed it. I just felt that the Commission wasn't getting enough direct input from harvesters on not only the research we do, but also how we interpret the research we get. And I think both of those are really important. One, they can suggest or recommend to us projects that we should be doing, but I think they also bring their own ability to understand the results we do get. And their interpretations may not be the same as ours and it's important for us to understand that other perspective if we're going to evaluate it in as comprehensive a way as we can.[194]

In the 2008 meeting, RAB members and IPHC staff discussed ideas for future research, concerns about the fishery, and attempted to interpret results from current research. At one point the IPHC director expressed IPHC staff concerns about a particular aspect of the fishery and he asked the fishermen if they had any ideas about

[193] Interview, IPHC director 4/20/09
[194] Interview, IPHC director 4/20/09

how they would design a study to test that question.[195] They came up with some interesting ideas. At the meeting, fishermen and IPHC staff ideas about the halibut resource sometimes converged in surprising ways. For example, when a staff member presented puzzling results from a tagging study that showed that some halibut migrate long distances, but others do not appear to move throughout the fishery at all, one fisherman gave a knowing nod. He said that this was consistent with his experiences. He said that halibut fishermen call the fish that migrate a lot “highway fish” and they can be distinguished by their red bellies (from moving along and scraping against the ocean floor) and a fighting disposition. The other non-migratory fish occupy what they call “summer spots” and are more lackluster when they come up the line.[196] This is similar to a description about halibut movements patterns given by an Old Harbor charterboat fisherman as well[197].

It is not clear how this amazing dialogue is mobilized following the RAB meeting. While these elite RAB members may have some influence over the kinds of auxiliary research projects IPHC undertakes, it is not clear that they have much direct influence over the IPHC assessment process. Part of it may be that IPHC has yet to figure out how to incorporate many of the fishermen’s experiential, place-based assessments into the scientific and quantitative parameters of their research and assessment. Also, some staff members remain skeptical about the validity and usefulness of this kind of experiential knowledge for the purposes of assessing the stock. The IPHC director and an IPHC quantitative scientist both mentioned that fishermen could contribute meaningful information about the way the commercial fishery is enacted (i.e.

[195] Field notes from IPHC Research Advisory Board Meeting 11/10/08
[196] Field notes from IPHC Research Advisory Board Meeting 11/10/08
[197] Interview, Old Harbor charter fisherman 7/31/08

"hook type, size, spacing, so forth, swivels, non-swivels"[198]), however they seemed more skeptical that fishermen could contribute accurate information about the biology and status of halibut stocks. A quantitative scientist made the following statement:

> I know that people in the industry have ideas about like migration, spawning behaviors and so on. Everybody has ideas. They have a lot more knowledge than we have about these things than we've been able to derive from it. I think most of it isn't true, but . . . I mean there are a lot of things about biology that we don't know…[199]

In this statement he questions the validity of fishermen or "industry" based assessments of the fish populations saying, "I think most of it isn't true". But at that same time, he hints and the vast amounts of unknowns or mysteries that still plague the IPHC, perhaps leaving the door open that fishermen could contribute to increased understanding.

When it comes to key decisions in the assessment protocol, the IPHC seems more exclusive in the kinds of ideas and personnel that they include in the decision-making process. When I asked the director about who was included in discussions about important changes in the assessment protocol, such as the decision to switch population models, he replied:

> I don't know if there's a formula for that. Typically speaking it's the senior scientific staff that's involved in that evaluation. Typically the assessment staff may bring something to my attention and then we might have a discussion within the senior staff of the Commission or sometimes even in a broader context than that, although typically it's usually with the senior staff because that's a fairly significant decision.[200]

When he uses the term "senior staff", he refers to the staff members with PhD training in fisheries science. With the decision of who to include in these processes, the IPHC is

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[198] Interview, IPHC director 4/09
[199] Interview, IPHC retired senior assessment scientist 4/09
[200] Interview, IPHC director 4/09

making an explicit statement about the kinds of individuals and staff members that can contribute ideas to "significant" assessment decisions. They clearly prioritize those with specific kinds of fishery-based technoscience training and expertise.

Another avenue by which outsiders contribute to the IPHC assessment process is through a process of voluntary external review to which the IPHC subjects itself after significant changes in assessment procedures. The IPHC voluntarily underwent external review in 2007, after they decided to switch to a coastwide assessment model. For the review process, the IPHC contracted with an independent firm that hired a set of established fishery science experts (who are not connected with IPHC). These experts then examined the IPHC protocols and offered an evaluation of the strengths and weaknesses to the assessment approach and suggestions for improving it.

While this external review is an important check on the IPHC approach to stock assessment, it is also still done on IPHC terms and from the language and vantage point of technoscience. Since IPHC voluntarily submits their protocols to review, they are able to receive external input at a time when they are ready for it, as well as at a time when it might be politically helpful to convince fishermen of the validity of new assessment protocols that lead unfavorable catch rates in particular regions. The panel of external reviewers contains scientists with very similar kinds of training to IPHC staff. It does not contain fishermen, processors, or individuals who utilize a different way of knowing or understanding halibut populations. In this way, the external review process serves to reaffirm IPHC catch limit recommendations as deriving from exclusive, esoteric, technoscience knowing processes.

In recent years, the IPHC has shown a trend towards working to develop and communicate a singular, expert, IPHC exclusive form of halibut knowledge. At the 2007 annual meeting, the halibut commissioners approved a fishery policy that the IPHC staff had been attempting get passed for years – a ban on all tagging of halibut by non-IPHC entities. This means that no researchers outside of the IPHC can legally conduct tagging studies about halibut populations. In addition, because the halibut commission was established as a part of an international agreement between the US and Canada, the IPHC is protected by the American Immunities Act[201]. This means that the Freedom of Information Act does not apply to IPHC documents or data; any information that IPHC chooses to share is on a voluntary basis.

Considering these standards, the IPHC is incredibly forthcoming with data and information about the fishery. They publish extensive reports and data analysis. However, the immunities loophole also allows the IPHC to maintain a level of control over most kinds of research conducted on halibut populations. In order to utilize detailed IPHC datasets or collaborate on research projects, external scholars must sign Memoranda of Understanding with the Halibut Commission indicating that they will communicate their research findings with the commission, and allow the commission staff to review all publications or presentations of the data prior to their release.[202]

In addition, IPHC makes an effort to present a united front at the annual meetings where they release their catch limit recommendations to the general public. In my discussions with a retired quantitative fisheries scientist, he referred to this as the "party line". When I asked him to define what he meant by this term, he said:

[201] IPHC website: http://www.iphc.washington.edu/halcom/about.htm
[202] Personal experience developing a research project to explore halibut otolith growth

> Well, it's when we do an assessment or come up with some recommendation about a harvest policy. We try to thrash it out among ourselves and be clear on what the rationale - this is why we're recommending this and this is why we're not recommending that, so that people get the same message from everybody on that staff.[203]

Even if there is disagreement among the staff about particular approaches to stock assessment, the staff all agrees on a set of explanations and actively works to present a sense of unity to the public, particularly at the annual meetings. While this technique may seem nefarious, it is also important to consider the context of the annual meeting. The negotiations and the fishery science behind the recommendations are incredibly complex as it is. If IPHC staff were presenting conflicting visions about the fishery or debating one another, they might present a more honest reflection of the process, but the negotiations could spin into chaos.

In many ways, it seems counterintuitive that the IPHC is working to develop such a controlled and singular message about halibut biology in the face of such extreme uncertainty. Given the inherent uncertainty of fish populations and the admitted miscalculations that they and *all* fish population analysts have made in the past, one might think that they would be interested in listening to and cultivating as wide a variety of assessments and ideas about the fish populations as possible. Under these kinds of uncertainty and potentiality for miscalculation, one might expect them to be stepping back from the language of expertise and control, and assuming a more humble stance towards their assessments. However, in both regards, the IPHC continues to do the opposite.

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[203] Interview, IPHC retired senior assessment scientist 4/09

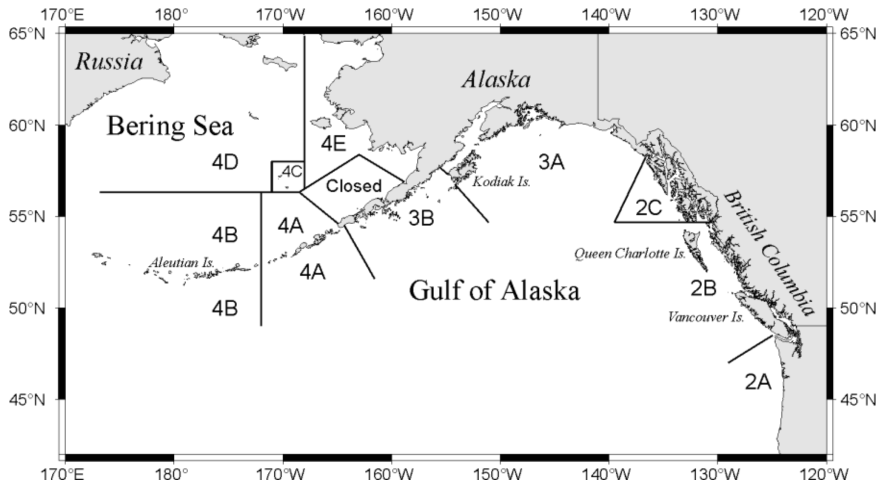
Colonial and critical scholars might argue that this kind of information control is part of a state, or in this case state-control agencies, exertion of control or power over populations through knowledge processes (Foucault et al. 2001; Latour 1987). The IPHC has established themselves in the powerful position of knowledge arbiters for the entire fishery. While a certain kind of knowledge domination ends up being the result, it is not exclusively the driving purpose behind this control of halibut ideas. In the context of the greater politics of negotiating a halibut biology, particularly the second kind of politics involving economic and political influences, IPHC see their attempts to cultivate an image of expertise as a mechanism to protect halibut stocks. Since fisheries are so connected to economic gain and livelihoods, there is always a strong economic incentive for users to look to increase their catch limits when possible. Very early in his career first IPHC director William F. Thompson recognized that fisheries science would need to cultivate a sense of rigor and expertise. In 1922, he stated, "Powerful interests have grown up who will vigorously object to curtailment of their activities. Something tantamount to legal proof is necessary."[204]

In this environment of economic and political pressure, uncertainties or inconsistencies in the scientific results become vulnerabilities that fishermen, processors, and politicians can exploit in favor of economic interests and to the detriment of halibut stocks. For the IPHC, creating a level of expertise, seeming in control of all halibut information, and presenting a united front are important steps to prevent the erosion of halibut stocks by economic interests. Still, regardless of the rationale, the IPHC has placed considerable effort into controlling halibut knowledge and excluding outside information from influencing their assessment process. This has both social justice and

[204] (Thompson 1922, p.542) as cited in (Smith 1994, p.241)

environmental knowledge implications because more marginal voices in the fishery have the potential to contribute valuable information about the biology of halibut stocks.

b. Conference Board (Fishermen) Recommendations:



Area:	IPHC:	**Conf Board:**	Change from IPHC:
4CDE	2.93	**3.59**	+0.66
4B	1.94	**1.94**	0.00
4A	2.65	**2.65**	0.00
3B	11.67	**10.90**	-0.77
3A	22.53	**22.53**	0.00
2C	4.54	**4.54**	0.00
2B	6.96	**8.10**	+1.14
2A	0.86	**1.10**	+0.24
TOTAL:	54.08	**55.35**	+1.27

Table 2. 2009 Conference Board recommendations for catch limits (in millions of pounds) in each of the eight regulatory areas of the fishery. Source: Conference Board Report 85th Annual Meeting, January 12th-16th 2009. Vancouver, B.C.

In the previous section, we saw that fishermen have few opportunities to meaningfully contribute their ideas about the fishery to the IPHC staff recommendations for catch limits. However, they do have the opportunity to express their ideas about the status of fish stocks and the appropriate catch limits directly to the six appointed commissioners in the form of the Conference Board recommendations. The table above contains the list of recommendations that were submitted by the Conference Board in the year 2009. Since these recommendations are made following and often in response to the IPHC recommendations, the last column of the table shows the extent to which their recommendations deviated from those of the IPHC staff.

The 2009 Conference Board consisted of 39 US and 27 Canadian fishing-based organizations. These organizations are generally halibut fishing interest groups who adhere around a particular sector or region of the fishery: for example a group like the Kodiak Vessel Owners Association will speak for the interest of halibut fishermen who are based out of the city of Kodiak, AK. The rules for becoming an accredited organization on the Conference Board are not very stringent. Essentially if an individual can come up with a credible name and interest group, he or she will be accepted onto the Conference Board. This year the Conference Board even accepted an organization called the North Vancouver Island Chef's Association which consisted of one halibut fisherman who also happened to own a restaurant. Each organization has one vote on the Conference Board. The Conference Board members vote on catch limit recommendations, the date of season opening, and regulatory proposals for the fishery. On the second to last day of the annual meeting, the chairpersons of the Conference Board submit a summary of their recommendations – often indicating the spread of votes on a particular issue and not just the recommendation with the highest number of votes – to the Commissioners.

The Conference Board members are faced with a difficult task. At the beginning of the annual meeting, they are given the IPHC catch limit recommendations along with a sea of paperwork – including a 176 page Annual meeting handout with over 40 pages of tables and figures – explaining the science and math behind these recommendations. They are also present for a four hour public session in which IPHC staff present and answer questions about their recommendations and the status of the fishery. Without the same level of expertise or financial resources, Conference Board fishermen must evaluate the validity of these IPHC technoscience recommendations and determine if, given their own experiences and ideas about the fishery, they agree with them. Although the fisheries science utilized by IPHC is highly technical, many halibut fishermen have become quite versed in the subject and ask intelligent and probing questions about particular recommendations or assumptions made by the IPHC staff.

The position of halibut fishermen is further complicated by this fact: experienced fishermen know that in several instances the IPHC staff have been very wrong. When the IPHC decided to switch to a coastwide model in 2006, they discovered that for many years they had been assigning catch limits that were too high for the regions on the southeastern range of the stock. In the mid 80s to mid-90s the halibut commission used and "steadfastly defended" a model approach called CAGEAN that it later turned out was "grossly underestimating present abundance"[205]. In fact, during this time, the actual biomass of the fishery was twice as large as the IPHC estimates of abundance.[206] An IPHC assessment scientist reported that during this time IPHC "was making errors as

[205] Interview, IPHC retired senior assessment scientist 4/09
[206] Hilborn, R. 2002. The dark side of reference points. *Bulletin of marine science* 70, no. 2: 403–408;

large as those guys were with the cod stock [which suffered a collapse]. We were just in the other direction."[207][208]

These wrong estimates do not necessarily indicate inadequacies of the IPHC, they simply highlight the difficulty in understanding and predicting patterns in elusive fish stocks. Estimating the abundance of an underwater moving fish population is incredibly challenging and fisheries scientists have struggled to do it accurately in a number of fisheries (Hilborn 2002). So, although fishermen cannot enroll the resources to replicate the halibut commission's experiments or to open all the "black boxes" in the assessment protocols, they must assess whether they agree with the IPHC recommendations, or if they believe that like several instances in the past, the IPHC has erred.

The fishermen also enter the negotiations under various kinds of economic pressure. Most regions of the fishery operate on an individual fishing quota (IFQ) system. This means that in order to enter the fishery, fishermen must purchase shares or rights to fish a particular amount of halibut in their region. Currently halibut shares cost between $20 and $30 a pound, which means that an entry level share of 10,000 pounds would require financing of at least $200,000. Most fishermen have a pretty aggressive schedule of loan payments through which to pay off this debt. The size of the quota shares that fishermen own goes up and down depending on the catch limits of the fishery. If the Commissioners issue higher catch limits, each fisherman gets more pounds of halibut, if they issue lower ones, fishermen get fewer. The 25% reduction in catch limits

[207] Interview, IPHC retired senior assessment scientist 4/09

[208] It is important to note that the IPHC scientists are adaptive in their science and when they discovered the extent of these errors they shifted their assessment protocols. So even if they had erred in the other direction, errors to this extent would likely never had led to a collapse like the one in the cod fishery. The cod collapse required a number of other factors that the halibut fishery does not possess including a politicians who were willing to cover up the problem.

recommended by IPHC in 2009 would translate to fishermen losing a quarter of their quota or share in the fishery. This means that fishermen must continue the same loan payment schedule with a quarter less fish to sell.

Despite these financial pressures, fishermen from the halibut fishery tend to have strong orientation towards conservation[209], and for the most part, their recommendations are either the same or very similar to those made by the IPHC staff. Representatives from each regulatory area establish their own catch limit recommendations so regulatory area catch limit recommendations tend to reflect the culture and conservation ideas of that particular region. In the 2009 Conference Board recommendations, four regulatory areas established catch limit recommendations that were the same as the IPHC recommendations, four regulatory areas established ones that were higher than the IPHC recommendations, and one region voted for a recommendation that was lower than the IPHC recommendation.

In each regulatory area, I will explore the type of information and justification that Conference Board organizations (fishermen) utilized in their catch limit recommendations. Conference Board members utilized two main rationales in the formulation of their catch limits. First, fishermen utilized experientially based ideas about the fish stocks in the region to develop and justify their recommendations. Second, fishermen employed economic arguments, stating the fishery cuts to the level the IPHC recommends would be too harmful to their region's livelihood and well-being. In some cases it was difficult to separate these two lines of reasoning from one another.

[209] Interview, IPHC retired senior assessment scientist 4/09

2A: *Recommends a limit of 1.10 which is 0.24 higher than IPHC*

Statistical area 2A is located in the southern end of the halibut range in the waters off the coast of Washington and Oregon. Due to a catch sharing plan established in 1988, Washington area treaty tribes (Makah, Quiliute, and Quinalt) are allocated 36% of the 2A catch each year. As a result of halibut and whitefish allocations, the Makah community has established a fish processing plant on their reservation and made halibut fishing an important part of their economy. Each of these three treaty tribes has an accredited organization and vote on the Conference Board. Of the three communities, the Makah tended to be the most vocally active at halibut commission meetings. These communities' strong role within the negotiation is likely linked to their unique colonial history. Their rights to 50% of fish within "unusual and accustomed" fishing areas was upheld in the 1974 Boldt decision and they have been actively involved in fishery management and co-management processes since that time[210].

Makah Fisheries employs an outsider fisheries scientist who conducts fishery assessments for the community. This fishery scientist is also able to analyze the halibut commission data and assessment protocols and suggest changes that might favor the Makah community. This Makah fishery scientist asked at least one question at nearly every halibut commission workshop and annual meeting I witnessed. Employing an experienced fishery scientist to work on behalf of the community, can be an important strategy to counteract the uneven power dynamics of fisheries technoscience.

During the public meeting and conference board discussions, a community representative of Makah fisheries made statements about the importance of the halibut

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[210] Wilkinson, Charles F. 2000. *Messages from Frank's Landing: A Story of Salmon, Treaties, and the Indian Way*. First. University of Washington Press, September.

fishery for the Makah community for commercial, subsistence, and ceremonial purposes. He stated that the 29% cuts the halibut commission is recommending for their area will have dramatic economic and cultural impacts on his community.

The fishermen from region 2A, dominated by the perspectives of the treaty tribes, recommended a catch limit of 1.10 million pounds which represented only a 10% decrease from the catch limit of the previous year as a "stop gap measure"[211]. For the most part they employed an economic logic behind their recommendations. However, fishermen from these regions also cited concerns about the survey-based apportionment and the validity of the survey results from a region in the fishery that had comparatively lower densities of fish.

4CDE: *Recommends a limit of 3.59 which is 0.66 higher than IPHC*

These northern most regions of the fishery are dominated by Alaska Native interests who are part of the Community Development Quota (CDQ) program. The CDQ program was established in 1992 to create fisheries related economic development opportunities for rural communities in the Bering Sea region. Six regional entities are given allocations of fish resources including halibut, crab, cod, Pollock, which they are directed to use for purposes of economic development. In this region CDQ communities have allocations to nearly 50% of the halibut resources[212].

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211 Conference Board Report 85th Annual Meeting, January 12th-16th 2009. Vancouver, B.C.

212 In 2009 CDQ programs in regulatory areas 4BCD were allocated 1,629,200 pounds of halibut quota, which is 48% of the total 3,378,800 pounds allocated to those regions. Source: NOAA fisheries harvest and landing reports: 2009 Allocations and Landings IFQ halibut/sablefish and CDQ halibut. http://www.fakr.noaa.gov/ram/09ifqland.htm

Many CDQ programs simply lease their quota shares to other fishermen and use the proceeds from those leases in ways that benefit the community. However, fishermen from the Aleut communities on the Pribilof Islands, and especially the community of St. Paul, have utilized the CDQ halibut shares to develop a local fishing industry. The Aleut community of St. Paul has a community-based halibut fishing fleet and a processing plant that cleans, freezes, and markets the local halibut catches.

The CDQ communities and especially representatives from the Pribilof Islands, have come to occupy positions of strategic advantage within the catch limit negations. There are eight accredited organizations representing CDQ interests at the Conference Board. The community of St. Paul alone has established three different Conference Board organizations that represent its interests: Central Bering Sea Fisherman's Association, St. Paul Fisherman's Association, and the Tribal Government of St. Paul. Establishing more accredited organizations gives these communities increased voting power on the Conference Board – allowing them to garner vote support for issues important to them. Also, since the Bering Sea region of the fishery is considered to be so biologically different and separate from the rest of the regulatory areas in the fishery, neither of these broad regions care all that much about what happens in the other. This means that Bering Sea CDQ representatives can trade their votes on issues important to fishermen in southern regions of the fishery for votes in favor of their interests.

In 2005, the Aleut communities of the Pribilofs used their political leverage to pass a regulatory proposal of great advantage to their needs. They proposed and passed a regulatory proposal that would allow a one-way door between the 4C regulatory area that surround the Pribilof Islands and regulatory area 4D which is in the greater Bering Sea region. The one-way door means that fishermen from the Pribilofs are able to leave their regulatory area and catch their quota shares in area 4D. But, fishermen from area 4D are not allowed to enter into area 4C to capture their fish. Not only do fishermen from the small Aleut communities of the Pribilof Islands have their own regulatory area – which means that the halibut commission staff assigns more importance to specific trends and issues in those areas – but they have the right to fish an additional regulatory area as well.

This is especially significant for fishermen from these regions because they operate small-scale fisheries where fishermen do not go out far and return each night. This kind of fishing can and has led to localized depletions in the halibut stocks. The one-way door allows community members to take longer trips to conduct fishing outside the range of the island. This will diffuse their fishing efforts and can allow localized populations of halibut to recover.

In addition to all this voting power on the Conference Board, the Aleut community of St. Paul has a representative who is appointed as one of the three US Halibut Commissioners. This means that a St. Paul fisherman has input into the establishment of the final catch limits *and* essentially serves as the boss to the IPHC staff. He can and has requested that the IPHC focus research and survey attention on problems particular to the Bering Sea region of the fishery. This ultimately influences the way that the IPHC builds their interpretation of the biological reality of halibut stocks.

At the 2009 annual meeting, representatives from 4CDE recommended a catch limit that was higher than the IPHC recommendation. They used their experientially based ideas about the fishery as well as skepticism over IPHC science to justify these recommendations. Their official statement read: “Conference Board recommendation

3.59 million lbs. harvest limit is based on not using the hook correction adjustment. It was felt the scientific hook adjustment information was better developed for areas outside 4CDE and therefore should not be used in these northern areas at this time."[213] Fishermen from this region did not observe changes in their local fish populations to suggest the 24% cuts the IPHC was proposing. But more importantly, based on their experiences, they were skeptical of the assumptions about hook competition in the Bering Sea that were inherent in this newly introduced **hook correction factor**.

Economic factors also played a role in this recommendation – the 24% cuts that the IPHC recommended would have had significant impacts on the small communities. But, fishermen from this region utilized these economic considerations in a secondary way. They stated that the science behind the hook correction was not developed enough to justify such large cuts to their local fishery.

Area 3B: *Recommends a limit of 10.90 which is 0.77* ***less*** *than IPHC*

In a rare maneuver for the fisheries world, the fishermen from regulatory area 3B, which includes part of Kodiak Island and the waters south of the Aleutian chain, requested a catch limit that was lower than the IPHC scientific recommendations. In the Conference Board report, fishermen from the region cited that they were "concerned about declining survey and commercial CPUEs"[214] in the region. Though their formal justification utilizes technoscience concepts (different CPUE datasets), their discussions leading up to the recommendation were grounded in experiential-based assessments of the halibut populations within the region.

[213] Conference Board Report 85th Annual Meeting, January 12th-16th 2009. Vancouver, B.C.
[214] Conference Board Report 85th Annual Meeting, January 12th-16th 2009. Vancouver, B.C.

Fishermen from the 3B region reported that in the 2008 season, they had trouble catching fish. There were reports of needing to stay in the area longer to catch the same amount of fish and some fishermen did not even meet their quota catch. Many Old Harbor fishermen fish their halibut quota in area 3B and during my 2008 stay in the community, I heard many reports about declining halibut in the region. One Old Harbor fisherman told me, "We went down to Alitak [in area 3B] and we had a hard time finding halibut there."[215] He teamed up on a vessel with two other Old Harbor fishermen to catch his quota shares and they ended up needing to take two trips instead of one (at a significant extra cost in terms of fuel, crew, and supplies) to catch their halibut shares.[216]

Though these Old Harbor fishermen were not present at the annual meeting, the assessments of the other, often more politically and economically connected, halibut fishermen from 3B were quite similar. The 2009 IPHC recommendations actually call for an increase in the 3B catch limit from the 2008 season. Given their assessments that halibut resources were getting more difficult to catch, fishermen from the region could not justify increasing the catch limit from the previous year. The fishermen elected to go against the IPHC recommendations backed by a complex machinery of scientific expertise, fishery models, costly research and survey programs, and 64 staff members. They recommended a catch of 10.90 million pounds of halibut which is 0.77 million pounds lower than the IPHC recommendation and the same as the 3B catch limit from the 2008 season.

It is interesting to note that in the 2010 annual meeting one year later, IPHC changed their perspective on area 3B and recommended a catch limit of 9.9 million

[215] Interview, Old Harbor fisherman 10/11/08
[216] Interview, Old Harbor fisherman 10/11/08

pounds, a number that is nearly 200,000 pounds lower than their 2009 recommendation. It seems that after tweaking their models and assessment protocols, the IPHC scientific staff began to uncover a similar declining trend to the one that fishermen had observed and been concerned about the previous year. If the fishermen had approved a higher catch limit in 2009, they might have done significant damage to their local fishery. In this case, we see how fishermen assessments of fisheries can play an important check to technoscience investigations. Lost in the minutia of complex datasets and correction factors and in Seattle offices far from the regions they are assessing, IPHC assessment scientists may not be able to step back and make such a simple evaluation of their recommendations: does this make sense given what has happened with the fishery on the ground for the past few years? This incident alone highlights the important role that fishermen can play in contributing to biological assessments of the fishery.

2C: *Recommends a limit of 4.54 which is the same as IPHC*

Area 2C, which is the region of the fishery in Southeast Alaska containing Sitka and Juneau, elected to support the IPHC recommendation of 4.54 million pounds. This recommendation is significant because it was made in the face of significant economic pressures. The IPHC recommendation represents a 26% decrease in the catch limit from the 2008 season, which was another 25% decrease from the 2007 season. In just two seasons, the catch limits from the region was to be reduced by nearly half. This has significant economic consequences for fishermen in the region, many of whom operate at a fairly small scale and have significant loan payments to return. All other regions in the fishery that were facing serious cuts (2A and 2B) requested catch limits that were significantly greater than the IPHC recommendations.

The 2C Conference Board recommendation was not a consensus view. Several fishermen from the region disagreed and were seeking catch limits significantly higher than IPHC recommendations. At the IPHC meetings, the 2C region was dominated by the perspectives of a politically powerful group of halibut fishermen called the Halibut Coalition. This group is very savvy in the regulatory processes of the fishery and actively involved in most IPHC activities – consistently engaging with both the science and politics involved. This group also has a significant orientation towards conservation when it comes to their halibut resources, not willing to take risks that could damage the halibut stocks and becoming involved in processes to limit the take of all sectors of the fishery.[217]

In the weeks prior to the annual meeting, IPHC accepts formal regulation proposals and catch limit comments from anyone involved in the fishery. Fishermen, processors, or other interests groups can send letters to the IPHC staff with critiques of the IPHC catch limit recommendations and their suggestions about how catch limits should be changed. These letters are all printed up, stapled together, and circulated at the annual meeting. Halibut Commissioners have the opportunity to read through these comments and they set the final limits. Several fishermen from area 2C sent formal catch limit comments that included requests for higher catch limits in their region. One non-native fisherman from the region made the following comment:

[217] The Halibut Coalition was heavily involved in processes at the North Pacific Fishery Management Council to develop a framework to better regulate catches from the sport fishing sector of the halibut fishery.

> I wish I was sufficiently versed in the scientific arguments you have made to respond in kind with an equally scientific argument as to why I feel you are traveling down the wrong path. Unfortunately for me my analysis as to the health of the 2C fishery is based on my participation as a deckhand and skipper over the past 25 years. The fish seem to have behaved in a remarkably similar fashion over this period as to the habitat they prefer and the times of year they show up and then leave. [218]

In this quote, the fisherman uses experience-based arguments (based on "25 years" experience) to question IPHC's call for dramatic cuts in the region. He states that he has not observed any sweeping changes in his local halibut stocks that these dramatic cuts in local catches would suggest. This quote also demonstrates in a palpable way, the feeling of diminished power fishermen can experience in the face of fisheries technoscience. You can sense his frustration in not being able to enroll the resources to argue against IPHC recommendations on their terms: with an "equally scientific argument". The fisherman feels alienated from discussions about halibut resources he has intimately known for 25 years. He writes that "unfortunately" he can only rely on experiential-based assessments of the halibut, highlighting a knowledge hierarchy within the halibut fishery. He knows that experiential knowledge will not weigh as heavily as the assessments based in science that he cannot generate.

This sense of frustration, powerlessness, and alienation in the face of fisheries technoscience is central to the connections between fishery management and colonialism. Through management institutions, state governments take control of resources to which indigenous communities have aboriginal claim. With natural resource technoscience, these resources come to be defined in esoteric, Western-oriented, scientific terms. This alienates many Native groups, though certainly not all as in the case of the Makah and

[218] 2009 Catch Limit Comments. Catch Limit Comment from James Larson. Received: 12/14/2008. Organization: F/V Spaniard's Bay. 2009 IPHC Annual Meeting.

Pribilof Aleuts, from meaningfully participating in a dialogue about the biology of historically-embedded fish resources. The quote from the non-native fisherman above, and countless other comments from non-native fishermen at IPHC meetings, suggests that feelings of isolation and frustration in the face of fishery technoscience are not limited to indigenous fishermen. Native and non-native fishermen who experience and understand halibut from more experiential and historically-embedded relationships to the resource, can both feel alienated from the technoscience management processes that govern access to local fish resources.

Later in the same letter, the non-native fisherman from above, begins to employ economic arguments to justify his plea for higher catch limits in his area. He highlights the large-scale economic impact of IPHC reductions in catch by saying the IPHC "proposals will have very negative economic impacts on many fishermen, processors and support businesses in Canada and Southeast Alaska."[219] He then describes the impacts that reduced catches will have on individual fishermen and families throughout the region.

> I've had to buy the entire halibut quota I own, like most fishermen (even a lot of those awarded the original IFQ have bought additional quota) those IFQ were bought and transferred with bank loans and collateral on the premise of predictability and stability in the fishery. There was no reason for anyone buying into the 2C halibut quota to foresee an almost 50% cut in the quota in the last two years and now a suggested additional 28% cut! These numbers make the recent losses in the stock market and housing market look tame in comparison. What's this going to do to our local economy? Or to individuals who secured their IFQ loans with their homes and boats?[220]

[219] 2009 Catch Limit Comments. Catch Limit Comment from James Larson. Received: 12/14/2008. Organization: F/V Spaniard's Bay. 2009 IPHC Annual Meeting.
[220] 2009 Catch Limit Comments. Catch Limit Comment from James Larson. Received: 12/14/2008. Organization: F/V Spaniard's Bay. 2009 IPHC Annual Meeting.

This fisherman's statements about the economic consequences of catch limit reductions bring to light two important points about these fishermen-generated catch limit recommendations. First, pleas from fishermen to raise catch limits for economic reasons do not always come from a place of monolithic corporate greed. Environmental groups often describe the fishing industry as a corporate entity seeking to maximize their profit at any cost to the local fish resources. In the halibut fishery, many of these fishermen operated on a smaller scale than this environmentalist imaginary and were often guided by very real and very personal financial concerns. While halibut fishermen wanted to protect the halibut resource they rely on, they were also concerned that with catch limit reductions they risked losing their boats or houses, going bankrupt, and even having trouble feeding their families.

Second, these statements can shed light on the rationale behind IPHC's knowledge exclusion processes. In this letter you can see how difficult it is to separate economic interests from genuine experience-based observations of the fishery. The 2C fisherman's letter oscillates so much between experience-based and economic arguments, he doesn't even seem capable of separating the two. How can regulators trust these fishermen-based recommendations when the economic incentives are so strong and so difficult to disentangle from genuine observations? In this context, IPHC decisions to limit experience-based assessments from many of their assessment protocols, can be seen as a tool to protect fish stocks and future fishermen from erosion by economic interests.

2B: *Recommends a limit of 8.10 which is 1.44 higher than IPHC*

Fishermen from the one regulatory area of the fishery in Canadian waters established a catch limit of 8.10 million pounds which is 20% higher than the IPHC recommended catch limit recommendation. This is by far the most aggressive deviation from the IPHC recommendations. Fishermen from this region primarily utilized technical and scientific arguments to justify their recommendations. However, economic incentives as well as an understanding of the relative political power of the Canadian delegation likely contributed to these aggressive recommendations.

The Canadian delegation speaks for only one of the eight regulatory regions of the fishery. Though it often fluctuates, in 2009 the Canadian sector was allocated 14% of the total halibut catch. Despite this relatively small use of the fishery, the Canadian delegation has considerable power in the political processes that guide the management of the fishery. Canadians have established 27 voting organizations on the Conference Board – this is 30% of the votes on the board. In addition, Canada has half the voting power at the Commissioner level because the US and Canada each appoint three Commissioners.

The Conference Board report, which summarizes the proceedings of the meeting, stated the following about the Canadian catch limit recommendations:

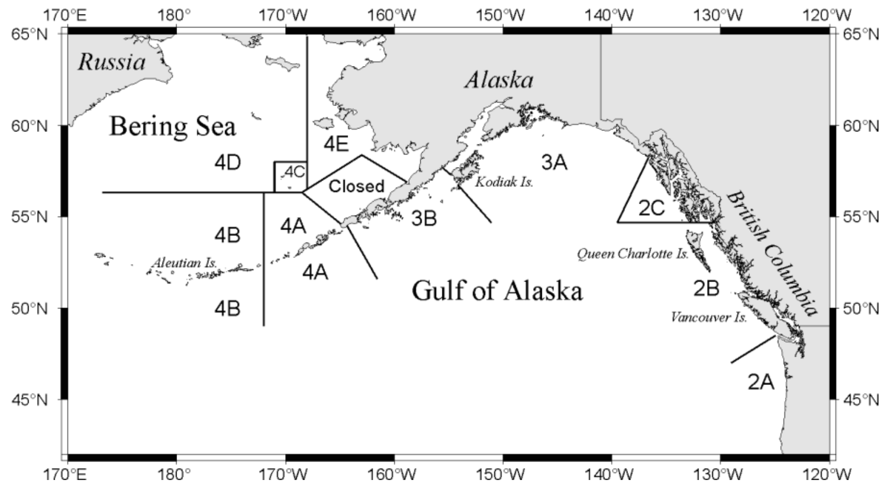
> The Canadian delegation reiterated their support for the coastwide assessment and opposition to the proposed apportionment scheme. The Canadian delegation noted that there were still many unanswered questions and outstanding issues (e.g. catchability) with the proposed apportionment scheme…Canada accepts that there is a decline in halibut abundance. Therefore, the Canadian delegation supported, on a vote of 24 to 0, a 10% reduction from the Area 2B 2008 catch limit as an interim measure for 2009 while there are continued discussions and work on halibut apportionment.[221]

[221] Conference Board Report 85th Annual Meeting, January 12th-16th 2009. Vancouver, B.C.

The Canadians justified their recommendation by critiquing the science and math behind IPHC's recommendations. They cited concerns with the IPHC's apportionment scheme – the means by which the IPHC staff divide up the halibut resource among the different regulatory areas. They were concerned about using a survey method for apportionment, because there are many potential sources of bias within the IPHC survey. While they acknowledged a decline in halibut in the region, they stated that they were not willing to accept such dramatic cuts until the science behind the apportionment scheme became better clarified. They instead recommended a smaller 10% reduction in catch from the previous year.

These Canadian recommendations demonstrate the way fishermen can exploit places of uncertainty within fisheries science for economic gain. Because the IPHC method of apportionment contains uncertainty – the most glaring of which is a question of "catchability" between different regions which is nearly impossible to test for – fishermen from some regions can put off accepting catch limit cuts. They do this even though through experience they recognize some "decline in halibut abundance". This helps shed light on the impressive work that the IPHC staff does to establish an aura of expertise and to work on communicating a singular message even if there is disagreement about particular issues. Fishermen can exploit these perceptions of weakness or uncertainty to put off conservation measures that are important for the sustainability of the stock.

c. IPHC Commissioners' Final Catch Limits:



Area:	IPHC:	Conf Board:	Processors:	**Commissioners*:**	Change from IPHC:
4CDE	2.93	3.59	3.68	**3.46**	+0.53
4B	1.94	1.94	2.03	**1.87**	-0.07
4A	2.65	2.65	2.78	**2.55**	-0.10
3B	11.67	10.90	11.23	**10.90**	-0.77
3A	22.53	22.53	22.74	**21.70**	-0.83
2C	4.54	4.54	5.02	**5.02**	+0.48
2B	6.96	8.10	7.63	**7.63**	+0.67
2A	0.86	1.10	0.95	**0.95**	+0.09
TOTAL:	54.08	55.35	56.06	**54.08**	0.00

Table 3. 2009 Pacific Halibut catch limits (in millions of pounds) established by halibut commissioners in each of the eight regulatory areas of the fishery. Above figure shows the location of IPHC regulatory areas. Source: 2009 IPHC Annual Meeting Handout.

The bolded numbers in the table above indicate the final catch limits established by the six appointed Halibut Commissioners for 2009. Prior to decisions about the final catch limits, the IPHC submitted their recommendations based on their scientific assessments of the fishery, the Conference Board submitted fishermen-based recommendations, and the Processors Advisory Group (PAG) submitted a set of recommendations based on processor (the companies that buy, prepare, and market the halibut caught by fishermen) perspectives. I did not attend any of the processor meetings, so I do not include an assessment of their recommendations here. In addition to these recommendations, the Commissioners weigh another factor in their decisions about catch limits: the political/economic interests of the respective countries that appointed them.

Although nearly anybody can be appointed Commissioner, most of the present and historic commissioners have had experience in the fisheries world, either as fishermen themselves or as staff at the Canadian and US fisheries agencies. Most but not all have a working knowledge of fisheries science, and several commissioners are or have been working fisheries scientists themselves. Though they do not possess the level of expertise of the fishery scientists at IPHC, they are at least able to wade through the procedures and assumptions behind the IPHC's assessments.

The negotiations among the Commissioners with regards to developing the final catch limit recommendations are closed to the public. This is quite different from fishery management procedures in US and Canada, which include open negotiations that can be witnessed and later read by any interested party. The closed nature of the IPHC catch limit negotiations stems from the fact that this process originated from a treaty and is rooted in economic negations between two nation-states. The closed-door negotiations leave many fishermen with a sense of unease, because they are unable to definitely witness the rationale behind decisions that are made within the fishery. Since the meeting was closed, I cannot provide accounts of the types of information that Commissioners used in their catch limit decision-making process. However, by examining the final numbers that the Commissioners established in comparison to the various recommendations given to the Commissioners, one can develop a fairly good picture of the types of information they incorporated into their decisions.

Total Coastwide Catch: *Final limit 54.08 which is the same as IPHC*

In their final announcement about the 2009 catch limits, the IPHC released the following statement with regards to the numbers:

> While the total of the staff catch limit recommendations arising from IPHC survey-based apportionment of the estimated coastwide biomass was accepted, there were differences from staff recommendations for most areas, and the Commission requested additional investigation of apportionment methods during 2009.[222]

From this statement it is clear that the Commissioners accepted the IPHC's scientific assessment of the total number of fish that could be harvested coastwide. Both the Conference Board and Processor Advisory Groups recommended coastwide catch limits that were higher than IPHC recommendations. Still, the Commissioners established a coastwide limit that was the same as IPHC recommendations. In terms of the fundamental decision of how many halibut could be harvested in 2009, the technoscience ideas of the IPHC, based on extensive data collection, staff consolation, and sophisticated computer modeling underpinned the Commissioners' decision.

However, when it came to the process of allocating that coastwide share among different regions, the Commissioners departed from the IPHC's recommendations in many places. In most cases, it seemed that political or economic concerns, rather than fishermen's place-based ideas about the biology of halibut populations, dictated these deviations.

[222] International Pacific Halibut Commission News Release January 20, 2009. *Halibut Commission Completes 2009 Annual Meeting.*

Area 3B: *Final limit 10.90 which is 0.77 less than IPHC and the same as CB*

In area 3B, the region near Kodiak Island and below the Aleutian chain of Alaska, the Commissioners established a catch limit that was identical to the Conference Board recommendations and lower than the IPHC recommendations. They accepted local fishermen's experience-based ideas about halibut of the region and heeded their concerns about conservation of stocks in the area. This demonstrates that in parts of the halibut management process, fishermen ideas can play a role in structuring the biological understanding of halibut and the formulation of catch limits.

However, we see that it is fairly easy for Commissioners to accept place-based assessments of fish stocks when the fishermen are asking for catch limits that are *lower* than the recommendations made by halibut biologists. In these instances, there is not the same difficulty in separating genuine observation of fisheries change from economic interests because fishermen requested a catch limit that went against their short term economic interests. The Commissioners did not fully accept the 3B recommendations for conservation of the stock in the region, however. They did not take the cut from IPHC recommendations that 3B suggested and subtract it from the total coastwide catch. Instead, with little biological rationale, they allocated this extra fish to be taken in different regions in the fishery. In this sense, accepting the 3B fishermen's recommendation for a lower catch limit was also politically favorable for the Commissioners, they were able to take the fish that 3B gave up and allocate it to regions that applied more political pressure towards generating higher catch limits.

Area 4CDE: *Final limit 3.46 which is 0.53 more than IPHC and 0.13 less than CB*

The Commissioners catch limit recommendations for area 4CDE which is in the Bering Sea and includes the Aleut fishing communities of the Pribilof Islands, were half a million pounds higher than the IPHC recommendation and only 100,000 pounds less than the limits suggested by fishermen in the Conference Board. In this case, it appears that the Commissioners were swayed by fishermen's requests for higher catch limits. In their broad statement at the end of the annual meeting, the Commissioners mentioned that they had concerns about the IPHC apportionment methods[223], so perhaps in this case, they agreed with 4CDE fishermen who highlighted their concerns with the "hook correction factor" that resulted in them being allocated less fish. One of the Commissioners is from the 4CDE community of St. Paul Island, so his personal assessments of the fishery as well as his economic concerns about the region, could have influenced these final catch limits considerably.

Area 2B: *Final limit 7.63 which is 0.67 more than IPHC and 0.47 less than CB*

Area 2B is the one Canadian region of the fishery. The Commissioners allocated this region the highest number of fish above the IPHC catch limit recommendations. They set catch limits of nearly 10% more halibut than the IPHC staff recommended. While the Commissioners went above the IPHC recommendations, they did not grant them nearly as many fish as fishermen from the region requested (a 16% increase from the IPHC recommendation). Though the Commissioners cited a broad concern about the IPHC apportionment methods, it is not clear if there was a specific biological explanation for such a high Canadian catch limit. It is likely that the relative political power of the

[223] Conference Board Report 85th Annual Meeting, January 12th-16th 2009. Vancouver, B.C.

Canadian fishermen in the Conference Board meeting, as well as the political power of Canadians in the Commissioner's final proceedings contributed to this high catch limit. While the perspectives of Canadian fishermen contributed to the development of the final halibut catch limits for area 2B, fishermen's recommendations may have been more linked to economic concerns than specific ideas about halibut biology.

Area 2A: *Final limit 0.95 which is 0.09 more than IPHC and 0.15 less than CB*

The Commissioners also established a catch limit that was higher than IPHC recommendations in area 2A which contains the waters off the coast of Washington and Oregon. Though the final catch limit did exceed IPHC recommendations, it was not as high as the catch limit recommended by 2A fishermen at the Conference Board proceedings. It appears that the requests and pleas of 2A fishermen of which the Makah tribal representatives were the most vocal, likely influenced the final catch limits for the 2A region. Another important consideration while considering this catch limit recommendation is the details of the catch-sharing plan for area 2A. Because of the presence of treaty tribes in area 2A, the region has a plan in place that once the halibut catch limits are set automatically allocates the halibut resources among the different user groups – treaty portion (commercial and subsistence/ceremonial), non-treaty commercial, by-catch, and sport. This catch sharing plan has a caveat that when the 2A portion of halibut gets below 0.95 million pounds, new conservation and distribution measures are put into place. Therefore, the Commissioners choice of a catch limit of 0.95 was likely related to preventing the region from entering into the new distribution measures.

Areas 4B, 4A, 3A: *Final limits which are 0.07 – 0.83 less than IPHC and CB*

Areas 4B, 4A, and 3A in the Bering Sea and Gulf of Alaska portions of the fishery, all received catch limits there were somewhat lower than the IPHC and Conference Board recommendations. In all these regions, the fishermen voted to accept the IPHC recommendations. Most significantly, the catch limit is area 3A was nearly one million pounds lower than the IPHC recommendation. In this case, it is not clear if there was a biological explanation as to why these regions received lower catch levels than the IPHC recommendations. Fishermen did not express concerns about the local halibut populations – both fishermen and biologists agreed about the harvest levels for the 2009 year. It seems that each of these regions received lower catch levels in order to support the increased catch levels of other regions while maintaining a coastwide limit that is equal to the IPHC coastwide catch recommendation. Fishermen from Canada (2B), the fishermen from Pribilof Islands and the Bering Sea (4CDE), and the treaty and non-treaty fishermen from the Washington Coast (2A) who all made convincing arguments or had considerable political sway appear to have gotten higher catch levels at the expense of these other regulatory areas.

Area 2C: *Final limit 5.02 which is 0.48 more than IPHC and CB*

Probably the most puzzling decision was the catch limit that the Commissioners established for area 2C which is the section of the fishery in Southeast Alaska. In this region fishermen elected to accept the IPHC recommended catch limit even though it meant considerable cuts in their catch. This regional reduction in catch was backed by a number of fishermen who have a strong orientation towards conservation. Despite this request, the Commissioners issued a final catch limit that was higher than both the IPHC and Conference Board recommendations. In a situation where the Commissioners have clearly agreed to cap the total catch limit at the IPHC recommended 54 million pounds and several regions in the fishery requested catch limits higher than the IPHC recommendation, it seems counter-intuitive that the Commissioners would give one region *more* fish than the fishermen requested.

There are at least two possible explanations for this maneuver. First, the Commissioners may have read some of the letters and requests from 2C fishermen who were not as vocally active at the annual meeting but who requested catch limits higher than the IPHC recommendation. These include the heartfelt letter from the 2C fishermen that I described in the above section. These descriptions of the kinds of financial hardships he might be facing as well as accounts that experienced fisherman have not seen the kinds of declines the IPHC suggests, may have convinced the Commissioners to raise the catch limits above IPHC recommendations. Another possible explanation relates to the political positioning of the US and Canadian interests. Area 2C is right next to Area 2B in Canada and these two regions of the fishery have similar population structure and abundance trends. Perhaps the US representatives felt that if the Commissioners were going to raise the Canadian share of halibut beyond the IPHC recommendations, they needed to do the same with the comparable US region of the fishery. Otherwise, it might seem like the Canadian representatives have more political power within the fishery structure than their US counterparts. In this case, the increased 2C catch limit could be a result of political posturing between the two nation states involved in the management process, rather than any biological ideas about halibut or socio-economic concerns.

Reflections and Opportunities:

In the first two chapters, I showed how both the International Pacific Halibut Commission and fishermen from the community of Old Harbor practiced forms of halibut science. Through historically-embedded techniques, each of these communities have developed unique but converging ideas about halibut biology. The idea that there are different, multiple perspectives on the ecological processes of the natural world, is not particularly new. Entire fields of study in local, traditional, and indigenous knowledge, have emerged to capture and understand non-Western science approaches to the environment. Books such as Cajete's "Native Science" have described the forms of environmental science that persist within indigenous worldviews[224]. While research in fields of environmental knowledge have shown the important perspective that non-Western approaches to natural science can offer, considerably less attention has been paid to the *stakes* involved in this multiplicity of approaches to the natural world. How are different approaches to the natural world structured and prioritized, and what does this *mean* for different participants in the commons? In this chapter, I utilized the negotiations surrounding the Pacific halibut catch limits to explore these stakes; to examine how different ideas about halibut biology contribute to decisions in the fishery such as catch limits that end up affecting all the users.

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[224] Cajete, Gregory. 1999. *Native Science: Natural Laws of Interdependence*. Clear Light Publishers.

There is no single narrative thread that encompasses all of the shifting power terrain involved in halibut catch limit negotiations. At different points, fishery scientists, fishermen, and politicians end up controlling parts of the negotiations. However, in the end, it appears that IPHC Western-science ideas about halibut populations dictated, structured, and dominated Pacific halibut catch limit negotiations. The final catch limits established by the Commissioners were actually quite similar to those recommended by the International Pacific Halibut Commission biological staff. The total coastwide catch limit was exactly the same as the IPHC recommendations. The distribution of the halibut catch among regulatory areas departed some from the IPHC recommendations, but never by more than 750,000 pounds. With one notable exception, the Commissioners decisions to depart from the scientific catch limit recommendations seemed to be more linked to economic and political rationales, than to ideas about the biology of halibut stocks.

We can see the dominance of IPHC ideas about halibut through the clear use of IPHC recommendations in the final Pacific halibut catch limits. But, IPHC approaches to halibut biology also dominated catch limit negotiations in another more subtle way. The IPHC established the framework and currency through which all other perspectives of halibut biology had to be channeled. The IPHC initiated the catch limit negotiations by announcing their recommendations. The rest of the participants in the negotiation processes were then forced to work within the parameters and language that the IPHC established. The conference board, processor advisory board, and final Commissioner's catch limits were direct responses to the IPHC recommendations. This is most directly visible in the format of all recommendations that I used to open up each section of this chapter: a table of numbers – of catch limit pounds. All participants were forced to express their ideas about the biology of halibut in their region through this strict format. The IPHC numbers are products of elaborate fisheries science models. They are disembodied from the place-based marine and fishing context through which the fishermen assess the fishery. Fishermen must undergo a significant effort to understand what those sets of numbers mean in the context of the fishery they know and have interacted with for years, even generations. They must then translate their experiences into a numerical, tabular format.

The question remains: what does the dominance of IPHC ideas about halibut biology *mean* for different participants in the fishery? The dominance of the IPHC framework means that other communities in the commons are placed in a position of diminished power within resource negotiations. They must develop a new set of experience and skills in order to understand and contest the IPHC ideas about the resource. They also must learn to convert their assessments of halibut into a set of terms that that Commissioners and the IPHC can understand. The time and effort necessary to develop this experience often leaves them a step behind in negotiations. Additionally, the sheer scale and expense behind the IPHC recommendations places fishermen in a position of diminished power because they can never harness the resources to reproduce IPHC's assessment efforts.

This chapter also demonstrates that the dominance of technoscience approaches in resource management means that users can become alienated from meaningful participation in the management of resources they rely on. Understanding halibut populations on IPHC terms requires a significant amount of time, money, training, and personnel. To be taken seriously, participants must be able to work within the esoteric framework of fisheries science, as well as understand the political terrain on which these negotiations take place. As I have mentioned above, some groups have proven quite adept at working within these parameters. Native and non-native participants in the fishery have developed positions of strategic power that allow their perspectives on halibut biology to influence the political process. However, these tend to be the fishing interests that are more financially connected to the fishery – interests such as treaty tribes in Washington State and CDQ communities in the Bering Sea. More marginalized communities such as Old Harbor, effectively become shut out of processes to define and regulate resources important to them. They simply do not have the resources to engage in the catch limit negotiations.

This chapter also provides some insight into *why* certain ideas about halibut biology end up dominating the management process. I believe that the difficulty in separating ideas about halibut biology from the economic interests of various user-groups, contributed to increased reliance on IPHC technoscience. In the halibut catch limit negotiations, there were many instances in which fishermen advocated for higher catch limits based primarily on economic interests rather than ideas about halibut biology. In order to protect halibut stocks, decision-makers needed to be very cautious about using fisher ideas and recommendations about the fishery.

Another, equally prevailing reason why IPHC approaches to halibut biology dominate ones generated from communities such as Old Harbor is history. The preceding two chapters describe the different historical paths of the communities of IPHC and Old Harbor. The colonial history of the United States and Alaska, into which the Pacific halibut fishery is embedded, produced Old Harbor as a marginalized community within the fishery. This history similarly placed the governments of the United States and Canada in a position of power with regards to the management of halibut resources. The colonial history enabled US and Canadian biologists along with political appointees to dominate the management agenda of fish resources in Alaska Native waters. The history of Western science and Western fishery science highlights the process through which technoscience is able to exhibit power over distant people and places. The marginalities produced through the connecting histories of colonialism and Western science become reproduced in the commons.

Opportunities:

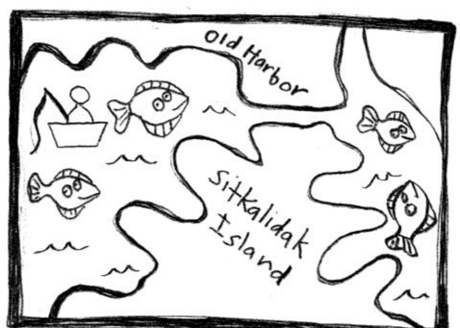
IPHC scientists are incredibly diligent and thorough in their assessments of the fishery and as such they have achieved a great reputation among other fisheries scientists as well as halibut fishermen. While I don't advocate that we dismantle fisheries science approaches to stock management in complete favor of the assessments of fishermen who (a) never designed their assessments of the fishery to answer questions of concern to broad-scale assessment of the stock and (b) are influenced by their economic and political concerns, I do think it is important to more closely examine the knowledge structure of the fishery to find points for inclusion. Finding ways to overcome the colonial roots of fisheries management and meaningfully incorporate multiple ideas about halibut biology into decision-making processes will be important to the many communities who have become marginalized and alienated in fishery management processes. More equal forums for knowledge sharing and incorporation will introduce more social justice into the fishery. Experiences from the IPHC catch limit processes also suggest that improved knowledge sharing and inclusion could also contribute to biological sustainability, especially in the face of such high levels of uncertainty. In the 2009 negotiations, fishermen perspectives led to a reduced catch limit in area 3B, which worked to protect a declining area of the fishery before fishery scientists were able to pick up on the decline.

Although they have yet to be fully realized, there are already the beginning of mechanisms and structures to increase knowledge equity within the halibut fishery. In this chapter, I showed how halibut fishermen have worked very hard to understand the biological processes of the fishery and to resist being fully controlled by Western fishery science. In several instances throughout the catch limit negotiations fishermen stand up to question and overturn IPHC assumptions about halibut science.

In each chapter of this dissertation, I try to highlight movements or institutions that suggest opportunity or potential within the commons for a new kind of management. In this regard, the Research Advisory Board is a promising structure for knowledge sharing and communication about resource management. Where else would you see PhD scientists look to a set of rugged fishermen and honestly ask them: what do you think we should do? With a few changes, this could be a seriously ground-breaking management forum. IPHC staff could consider increasing the diversity of representation on the RAB so more marginal, indigenous, and sport fishing groups have a better chance to contribute to dialogues about halibut biology. Also, IPHC could look to develop more specific ways that the products of these discussions make serious contributions to the research and assessments activities at IPHC. As it stands the RAB is a once a year meeting whose results often get lost in the day to day pressures of developing timely stock assessments for management. The IPHC could even consider establishing a new staff position, something like a fishermen/science liaison, who is a person that brings fishermen/industry ideas to the IPHC on a daily basis and is able to witness and comment on the many decisions that staff must make along the way of developing their set of nine catch limit recommendations.

Perhaps Latour's scientific "black boxes" and the sense of "powerlessness" they engender are not inevitable products of a technical society. There may be ways to diminish the opacity of the black boxes and allow non-scientists to participate in a dialogue about technical structures that impact their daily lives. We can learn a lot from the challenges and innovations of fishermen and managers in the halibut fishery who both work to increase fishermen engagement with the politics of knowledge surrounding the fishery. Halibut fishermen in particular, both indigenous and non-indigenous, are actively working to penetrate the black boxes and turn management into something new - into something that doesn't subjugate them or their ideas about fish.

II. MAPPING A MYSTERY



Chapter 6
Notes from the Field

Anagyuk (Partner)

During my stay in Old Harbor I spent some time working at the village's only general store. I worked there as a favor to a friend who owned the store and needed to leave town for a long stretch. Most days I didn't mind too much because it afforded me the opportunity to strike up conversations with the various community members and fishermen who stopped in. But, I hated working at the store when it was a calm sunny day. On the wind and rain battered island of Kodiak, nice days are a rarity to be pounced upon by any number of outdoor activities – all beginning with the step of rubber boots into a skiff.

On such a nice day, Laurence, an elder with whom I have developed a friendship, comes into the store and I ask him what he's up to. He says, "Nothin' - notta thing." We both agree that it would be a great day to go out. Finally, I look at him and say, "Well, let's do it. Let's get the hell outta here and head to the cabin for a night." I leave a handwritten sign on the store indicating that it will be closed for two days. Next, we go through a rapid process of packing for a night at the cabin. I grab some things: sleeping bag, rain gear, extra clothes, a warm jacket, books, notebooks, sunscreen, water, and stuff them into a dry bag. Then at his house, we gather some auxiliary food: pilot bread crackers, candy bars, rice, canned beans, and spices. We will catch fish to eat. We grab guns, fishing rods, a chain saw, a wheel barrow for hauling, extra life jackets, and a bunch of other stuff. I sit down at the skiff and start piling the monstrous amount of stuff that we bring for only one night's stay. It is kind of incredible considering how little Laurence actually owns. He goes back for one more thing. When he returns, I say, "I think that you forgot something." He looks up and says, "What?" I say, "You forgot the kitchen sink." He scoffs and pushes us off. We are on our way. The sun beats on our faces; the wind blows. As he steers the skiff, Laurence smiles widely and says to me, "This is the best kind of partner - one that will leave at a moment's notice."

The word he uses—partner—is a loose translation of a Sugstun word anagyuk. It does not refer to the romantic couple kind of partner, but to a deep friendship—to the relationship between two people who go hunting, adventuring, and merry-pranking together. The relationship between anagyuk is also very geographical. It is rooted in experiences that happen in the landscape: in movement throughout the island, adventures in the ocean, beaches, land, and mountains. It is rooted in places: cabins, camping spots, fishing holes, and secret hunting spots that only the two share. Under somewhat unlikely circumstances, Laurence and I became anagyuk – and for the record, this is the name he gave our relationship. Over the course of several years, I hung out with Laurence and traveled in his skiff throughout the island. These times are where I, a fisheries researcher concerned with growth trends and scientific plots, with policy language and regulatory areas, began to learn about a new fuzzier and hauntingly beautiful personal way of knowing and being connected with place.

Laurence is something of a recluse. He lives alone in a house that is separated from the village by a beach road which is flooded out during high tide. That house is in addition to the cabin he has on a lagoon many miles by sea from the village. He has no electricity or running water. He collects his water from a neighboring stream which in the summer nearly dries up, leaving sketchy dirt-flaked water to which he pays no mind. He lives in a small one room cabin with furniture and dishes that are well-worn with age, and a line that holds rows of drying, dirt-encrusted cotton socks. In the winter he leaves the window cracked opened so that cold birds can rest and sleep under his drying laundry. He has a small generator which he uses each night to watch an hour or two of TV. His favorite show is Cheers. He still tells the story about when he visited one of his sons who has moved to Maine. He flew into Boston and on their way up to Maine he asked his daughter-in-law if they could stop at the Cheers pub to have a beer and take a picture. She said no because they were in a hurry and she had to get to Maine. He still fumes over this when he thinks about it. It just would have taken a couple of minutes. He has told me the story at least three times. These are the kinds of things that make him upset.

He talks about his respect for animals and recounts in detail the community of animals (deer, bears, birds, foxes) that he has diligently watched pass by his cabin, then reminisces about the days when he was a young hunter shooting baby cubs for fun to watch how angry their mothers would get: always simultaneously confirming and contradicting any expectation that one might have of the 'true native'. Sometimes he can come across as unrelentingly ornery, mean, and unsentimental. Other times his eyes relax and you can see the underpinnings of true compassion and sorrow. He has such nostalgia for the past and the way that life used to be, sometimes it is painful to even hear him talk about it. He says:

> "That was a good life. Never going to come back. Never."

While every generation is nostalgic about the past, it is hard not to see some truth in Laurence's yearnings. Life in the village is vastly different from the way that he grew up. Increased regulations on hunting and fishing have eroded many of the outdoor freedoms that he enjoyed growing up. Laurence lived a life working hard and living free. He hunted, fished, worked in canneries; he worked as a bear guide leading outsiders on hunts; he hunted foxes and sold their pelts. He would seasonally roam the island with his friends—boating, hiking, fishing, hunting, and eating whatever animal or fish crossed their path along the way. He made pranks, lived with different families in different villages, slept in cabins and barabras (traditional Sugpiaq structures dug into the ground).

The word anagyuk has history for Laurence. His previous and real anagyuk, a man nick-named Lobaki, has long since passed away and I get the sense that when this man died, so did a piece of Laurence. He talks about him wistfully, almost as someone reminisces of a past lover. Laurence grew up in the village of Kaguyak which is a bit Southwest of Old Harbor. Laurence always moved about the island from job to job and adventure to adventure. One day he ended up in Old Harbor and met Lobaki. As many have recounted, it was love at first sight. From the minute they met they were joined at the hip. They were infamous rabble-rousers. There are countless stories of the kinds of pranks they would pull on fellow village members and the outsiders who would come to visit.

Laurence and Lobaki were bear guides, taking rich American hunters on trips to shoot large bears for display in their homes. For Laurence, this was the best life he ever had. He got to meet people from "all corners of the world. Most nice. Some assholes," but he didn't care, he would be rude right back to the assholes. They had near scares with bears and got to spend summers and falls in the woods and beaches. Laurence stopped being a guide when the guiding regulations and restrictions were put in place. These regulations created a bureaucracy that made it nearly impossible for Native hunters to become official guides. The last Native guide on the island passed away several years ago.

So how did Laurence become my anagyuk? Especially since he has sent many unsuspecting researchers and language recorders scurrying to the door. Laurence and I were introduced by a friend of mine who grew up in Old Harbor but has since moved out of the village. She and I worked together at Old Harbor's cultural camp. One day she suggested that we kayak over to his house for a visit. She said that she had always wanted to be closer to Laurence but never got the chance. She felt like he was an elder from whom she could have learned a lot. I am sure that without her I never would have had the stones to go over to his remote home. And for her gift in establishing this friendship, I will forever be grateful. When we met he told me that I should come back some time and I did, and we bullshited. Then I visited again. Then we went out in the skiff. Then we planned to go out in the skiff again. See, being a partner isn't in the talking so much as in the doing.

Laurence and I spent three summers, one fall, and one winter, hanging out and hatching little adventures. When the weather wasn't nice we would bullshit, tease each other, listen to the radio, watch for wildlife, and play cards. On nice days when the tides were right we were outta there, riding hog-happy in the skiff throughout the seascape.

We went to Barling Bay for humpies, to Herring Lagoon to stay at his cabin, to Three Saints Bay to look at ruins of an old cannery, to the edge of Kaiugnak Bay to catch black bass, to Big Crick to cast for silver salmon, to Sitkalidik Island to gather salmon berries, to Port Hobron to walk through the wreckage of the abandoned whaling ship, to MacDonald's lagoon to catch a view of the open ocean, to Amee Bay to go beach combing, and to Fang Point to tie driftwood logs to the back of the skiff and drag them home for firewood. All of this traveling in the open water exhausted me. Laurence used to tease me about my propensity for taking naps on the beach when we landed somewhere. He said, "you're just asking to get attacked by a bear sleeping on the beach like that."

On one trip, Laurence took me to Refuge Rock, a place of a tragic history for the Sugpiaq people of Kodiak Island. To get there we drove down MacDonald's Lagoon, a long bay. At the end of it, we parked the skiff and had to hike over a tall berm. From the top of the hill we could see the open ocean and a view of a small rock island with sheer cliff sides that one could only walk to during low tide. Refuge Rock was the site of a pivotal battle between the Sugpiaq people and the Russian colonists during which hundreds of Sugpiaq were killed. According to local legend, some Supiaq people jumped to their deaths off the cliffs of the island rather than be captured or killed by the Russian attackers. Months later, a woman from Old Harbor tells me that the Sugstun word for this place is Awa'uq which translates to 'we are numb'[225].

As we are cutting through the reeds to get a view of the island, I ask Laurence about what happened to his ancestors here. Never one to get sentimental in even the most emotional of places, he says mockingly, "I don't know, I forgot to ask them." I ask

[225] Stella Krumery, pers com; Alutiiq Museum pers com; Jeff Leer, pers com: the Alutiiq museum staff provided the proper Alutiiq spelling for the word. Many of these place names and spellings have been generated through the Alutiiq museum's collaboration with Jeff Leer from the Alaska Native Language Center, University of Alaska Fairbanks.

another question and he says, “shut up, you.” I am not fazed by this because incessant teasing is our way. It is the way of anagyuk. I ask him yet another question about the place and he says, “I forgot to look it up in the book” which is a joke, knowing that very little of this stuff is in a book. To which I reply, “which book is that: the book of assholes?” To which he counter-replies with a smirk, “yeah, and you wrote it.” After this banter we pause in silence for long while. Listening and watching as the waves crash against this historically-marked geographical feature.

One day in the skiff we see a large gray carcass floating. We slow down next to it and I say, “wow, what is that?” He says confidently, “it is a dead seal.” I am not so sure. I say, “are you sure, it is so gray, it doesn’t really look like a seal.” He says, “yeah it’s a seal. I wouldn’t have said so if I weren’t sure. If you fell into the ocean and floated for that long you would be gray like that too.” But, I can see that the floating body has claspers (shark sexual organs), which I know from my fish biology classes at the University far away, is indicative of sharks. I smile and say, “I don’t think it’s a seal, go back and check.” He groans loudly in such a convincing portrayal of anger that I have to ask him: “Are you really mad or just fake mad?” He laughs and pulls the skiff next to the carcass. When we get close, we realize that it is in fact a shark – probably killed as it was cut out of a tangled fishing net or line. He says, “well I’ll be darned” and I laugh in triumph. Western outsider knowledge, perhaps just this once, trumping the old man.

When Laurence and I are out at his cabin this year, we go along the beach to cut up driftwood to store for future use in the wood stove. After about an hour of working with the wood, I look back towards the cabin and see a little brown dot emerging from the grass right in front of the cabin. A bear! A cute little bear who has just been sitting there watching us work. I am totally amazed. I tell Laurence and he looks back and says, "Oh yeah, that guy's always watching me." He asks, "Do you have your camera?" I say, "Darn it, no I left it in the cabin." He says, "Too bad we could have gotten a really good picture." I say, "shoot". We work for a while and the bear continues to watch us. I am filled with joy, thinking about this amazing 'Sugpiaq moment', in which we are working chopping wood for the stove and a bear is watching us. I couldn't be happier. Finally we are finished and it is time to head back to the cabin. He says, "Do you see how the bear has moved down closer to the beach?" I say, "yeah." As we approach the cabin and the bear, Laurence holds his gun, because you never know what a bear is going to do. He jokes that he'll shoot right at him. I tell him no. As we get closer to the bear, I am having more trouble making out its shape—the object does not seem to be turning into a bear form. Until finally I realize it is not a bear at all. It is a giant log that sticks up in the grass with a couple of points that look like ears. When I say, "Hey, it's not a bear, it's a log", Laurence starts laughing uncontrollably. He had of course known the entire time and played the whole the bear's moving, gun toting scene for kicks.

One day, I bring small USGS maps of Kodiak Island with close up views of the bays around Old Harbor. I show them to Laurence and he casually picks up one of the maps and holds it out, moving it back and forth until it comes into focus. 'Huh' he says and I can see how in his mind he is doing the reverse of what I do with the maps. Instead of working from the map to the world, he's trying to get a bearing on how the entirety of the landscape that he has come to know through countless journeys and labors corresponds to the lines squiggled on this laminated page. After a moment it seems to click in place, he gets his bearings within the paper landscape and begins to look at the map as if he is reminiscing with an old friend. His thoughts seem to wander. He doesn't share much with me, letting out a few huh's, grunts, and sighs. He reads the English names that they have given for the various bays, lagoons, and rivers of the island, many of which he is seeing for the first time. He seems to delight in sounding out these new names, imagining what others who named the landscape might have encountered. He says, "'Deadman's Bay', oh-wee, that's a good name for that one. I used to hate going fishing down in there. It is so deep. You could get lost at the end of that bay. Was always happy to be done fishing there."

In this moment, I see that these multiple ways of knowing and naming place might be able to coexist; they don't always have to be in tension. The landscape surrounding Kodiak certainly has been imbued with all kinds of relations of power. It contains unmistakable traces of colonial influence. While this reality should be unpacked and revealed, we can take a moment to delight in the pure pleasure of place - of the multiple, layered, and changing relationships between the landscape, the individuals, and their partners who are inextricably wrapped up in one another. Place names, whether in English, Russian, Sugstun, or even the numbers and letters of fishing zones, speak to the wonder and possibility of locations experienced by people – by anagyuk.

I am reminded of an exercise on which I have been working with the Alutiiq (Sugpiaq) museum—attempting to record and write down the Sugstun names for all the oceanic places throughout the island. We would sit with a few elders and a giant nautical map and painstakingly go through all of the bay names asking what each one was called

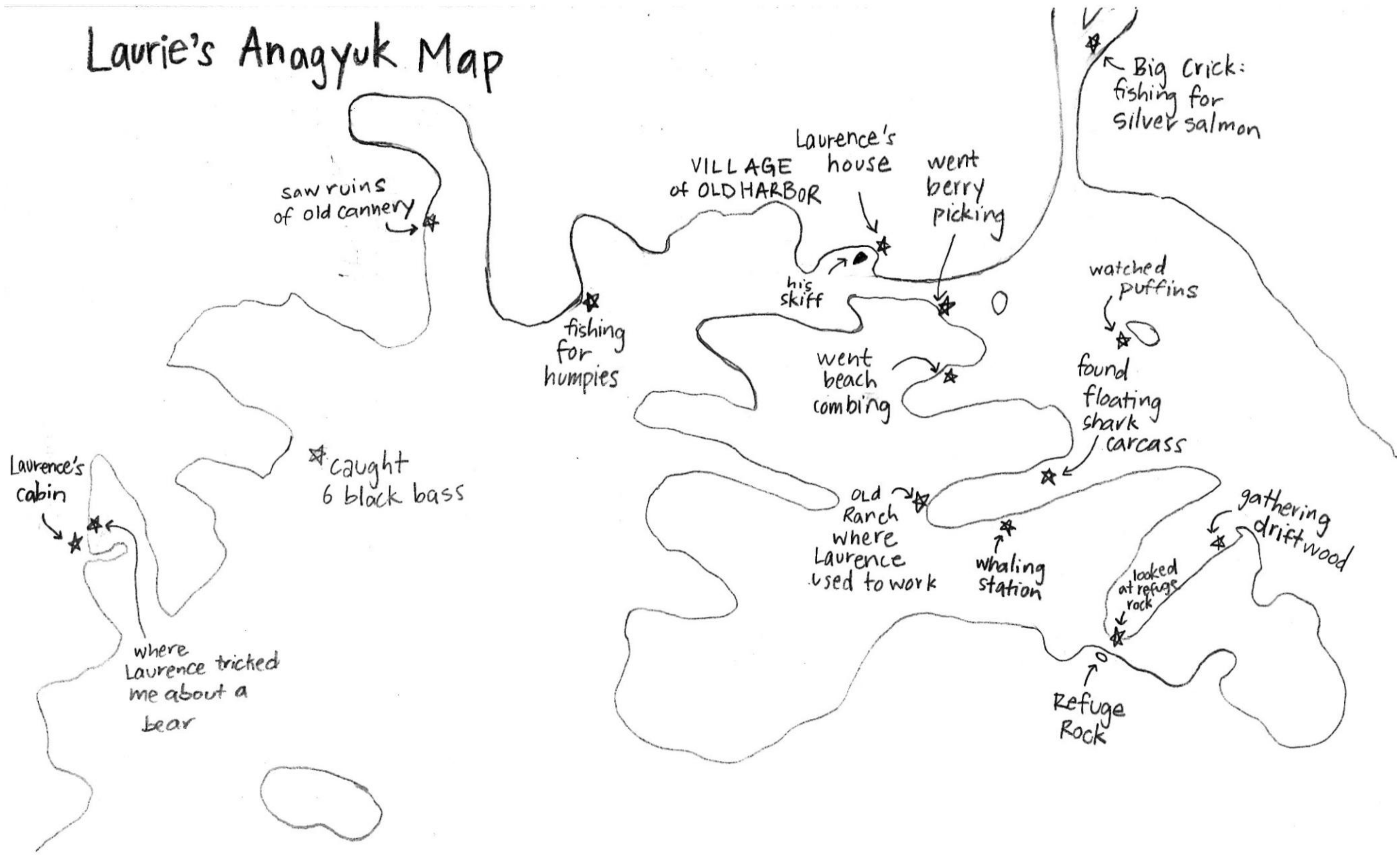


Figure 31. During my research, I often asked community members to map their worlds and movements throughout the Old Harbor seascape. This is a map that I drew of my world while living in Old Harbor. The map depicts the movements and experiences that I, as a research visiting Old Harbor, shared with my friend and partner, Laurence

in Sugstun. Without fail, each time we would end up reaching a point where the group could not recall the names of any more places. Either I or a museum representative would point to a bay and say, “What is the Sugstun name of that bay?” The group would look at each other and sigh, “Gosh, what is the name of that place? It’s on the tip of my tongue.” Then someone would say, “Hey so-and-so would know the name of that, you should go ask him.” Another would say, “Yeah, so-and-so used to fish there all the time, you should ask him the name of that bay.” As a group, they try to remember who, among those that are still alive, most inhabited that place.

The name of a place resides within the person who most sojourned there.

In my travels through the seascape with Laurence, a deeply personal connection to the landscape became clear. For Laurence, these places on the land or on the sea contain memories. They were places where loved ones were lost at sea, where times were spent with friends who have long since passed, where plans were hatched and lives were carried out. Some of the stories he told me, most he didn’t. Landscape, so often generalized in the form of maps and charts, boundary lines and borders, exists too on the tiniest of scales—in the minute filaments connecting heartstrings to terrain.

This personal connection with the landscape can be tenuous, though. It can and has been interrupted by natural resource policies which act to shape and regulate the relationship individuals have with the places they have come to know. It’s not that residents of Old Harbor are unconcerned about ‘conservation’ or the well-being of the resources in the area (though this is not to say that they are perfect conservationists either). But from their perspective, these policies can only be seen as a troublesome and unending string of interventions into their relationship with this place. Bear guiding restrictions work to prohibit community members like Laurence from maintaining a guiding career. Privatization of commercial fisheries limits fishing opportunities and the subsequent fishing journeys throughout the island. The delineation of regulatory areas in the local fisheries restricts the movement of Old Harbor fishermen through space. Seasonal, geographic, and take restrictions on the harvest of local resources such as the humpies, the silvers, the reds, the kings, the seals, the puffins, the oiuduks (clams), the deer, the bear, and even the driftwood and whale bones that line the beach, all serve to intervene upon the seasonal round of resource use.

Laurence told me, “I laugh at them and each new thing that they think to regulate.” Earnest regulators who are concerned with the status of a particular species might not fully comprehend the ways they also impact these personal maps of place. But, culture and the relationship with place are never static. These policies and regulations have a way of being incorporated into the process of people and place. This explains why on the opening day of deer season, Laurence smiles at me with a toothy grin and says, “Grocery store’s open.”

When I am not in Alaska, Laurence will sometimes call me for a quick conversation, never one to linger on. This means so much to me. One spring we discussed my visit the coming summer and he said, “I sure am looking forward to having you out here.” I tell him that I am looking forward to seeing him too. Laurence has become one of the most important people in my life. And I now know that he – our friendship and the things we have learned together – is the reason I came on this journey at all.

The house from which I write about this research is filled with maps of the island and pictures of places. One day a friend of mine looked at the maps and asked, “Are those hanging here for your research or just for you?” I paused for a second and said, “I don’t even know how to answer that question – the two are so intertwined.” I see that the maps on my wall are as much to reminisce as to write a research paper. They contain my memories as well as the ones of people I stayed with and interviewed. I started to think about my place in all this. I thought about how whenever one of us travels by the spot on the beach where he pointed to a log and told me it was a bear – either in real life or on a paper map – we will at least have a chuckle in our heads thinking: that is where Laurence so easily tricked Laurie into believing a piece of wood was a bear. I began to understand that on these skiff rides with Laurence, my anagyuk, my partner, I humbly, improbably even, had become a part of this landscape. And it – well – it had forever become a part of me.

* **Addendum:** When I first mentioned (over the phone) to Laurence that I might want to write about him he said, “piss on you” and hung up fairly soon after. His reaction affected me deeply. I felt like I had betrayed him and our trust. I began to seriously question my role and purpose as an academic scholar in an indigenous setting. How could I do this job and honor my relationships? In the immediate future, I was prepared to give up on the Laurence writing project altogether.

The next time that Laurence called, I discussed our relationship and the writing process with him in a way that I never had before. In a way, this particular project sparked a new kind of openness and communication between us – both about what I was doing in Old Harbor and about what our relationship means to each other. I told him that I was looking at fisheries issues and that through him and other people in Old Harbor I had begun to learn that fishing regulations are more than mere policies or changes to protect fish – they also affect the lives of fishermen in deeply personal ways. I wanted to be able to convey this kind of personal story in my writing. I then told him that I would never write anything about him that he didn't want me to and would drop the idea completely. He told me that he was glad that I brought it up and that he had been thinking about it a lot. He said that he would think about it some more and get back to me.

A few days later he called me back and said that he had considered it and that he felt I was right about the fishing policies and that what happened in Old Harbor with the loss of fishing was really bad. He said that when I come to visit I should bring what I wrote and that he had a few other things that he wanted to tell me.

I traveled to Old Harbor that summer and brought with me the above piece of writing. As we sat together in his small cabin I began to nervously read what I had written aloud. He listened, occasionally letting out a laugh, seeming more embarrassed than anything. At the end he barely addressed the content. He told me it was OK to print it. He then said, "I bet those guys back in the University are sure going to get a kick out of some of those stories. Nice things you said about me. Now, let's get out of here."

Three days later we went out on another skiff ride together to pick berries and grab some driftwood. As we entered into a long bay, Laurence turned to me and said, “Have you been to this bay before?” I said, “No I don’t think that I have, I think you only took me to MacDonald’s lagoon which is one bay over.” He smiled and said, “think about it.” In a minute I noticed the wreckage of the whaling station and said, “Oh yeah, we have been down here before.” Laurence smiled and he said, “Yes, remember? This is the place where we found the floating shark body, the one from your story.”

Chapter 7
Old Harbor Stories

The One With Chingaroo Chickaradi

One time there was an elder man from Old Harbor fishing in his skiff when the Fish and Game landed in their float plane next to him got out and told him that he was breaking the regulations. He was fishing with a rod and reel which is gear that is not permissible for 'subsistence' fishing. He looked at the Fish and Game official and told him "My fish, my land. You get out of here." The official told him that he was breaking the regulations and that he needed his name to fill out the tickets. For a time the old man refused to give him his name, then he told him "Chingaroo, my name is Chingaroo Chickaradi". The official wrote the name down and flew off again. A week later he flew into Old Harbor and started asked around the village for a man named Chingaroo. Some said "Chingaroo? Nobody with that name lives here", others who knew what had happened sent the official on a wild goose chase. They told him "Chingaroo, I think that guy lives down in Ahkiok [a village many miles south of Old Harbor]." Eventually, the official left the village with his tail between his legs. The name Chingaroo lives on in Old Harbor. It is used as a nickname to describe someone who thinks of themselves as a 'big cheese', or who is too big for his britches.

I heard this story many times when I was living in Old Harbor. The story was a particular favorite of Paul Kahutak, an elder with whom I spent a lot of time. On each occasion, he would enter into the story with a subversive grin and we would both end up laughing on the floor. The fact that this story was told so often and with so much pride and that the name Chingroo still lives on as a nickname in the Old Harbor vernacular, indicates that is a central part of the Old Harbor imaginary.

I believe that this story reveals something about the spatial nature of fisheries and fisheries management. The tale describes one of the central concerns of Old Harbor fishermen with respect to management: they are regulated by resource managers and enforcement officials who come from other places. For Old Harbor, this means that fisheries regulations are developed and enforced by individuals from urban areas such as Seattle, Anchorage, and Kodiak, who have no idea what life is like in the rural place of Old Harbor. In the story, this is evidenced by Chingaroo's outrage that an outsider Fish and Game official who was likely from the city of Kodiak or Anchorage, comes to his village and tries to tell him how he can fish.

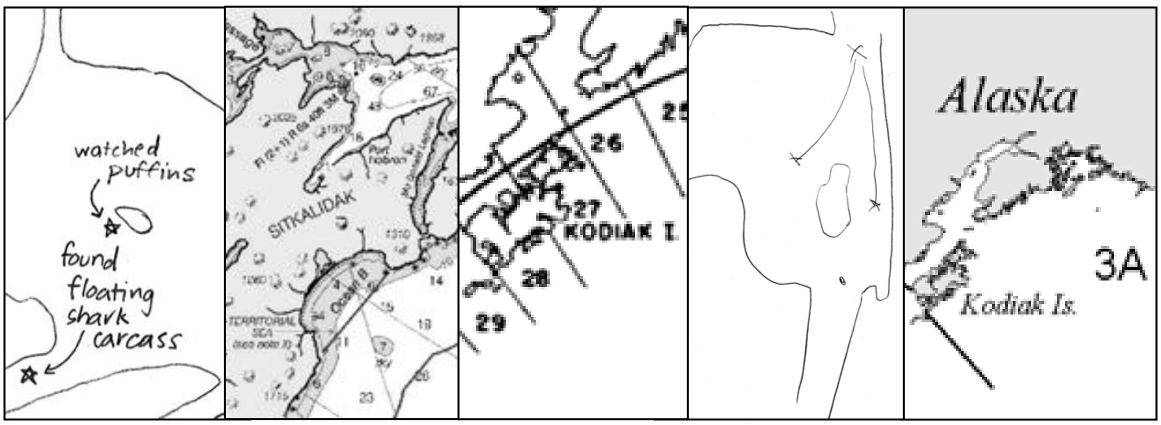
The problem with outsiders regulating Old Harbor fishermen is further evidenced by the Fish and Game regulation (which is no longer in place in the halibut fishery) which states that fishing with a rod and reel is not considered 'subsistence' fishing. The idea that subsistence fishing can only be conducted with a hand line seems to be rooted in outsiders ideas about what Natives should be – stuck in the past – rather than an understanding of who they are and how they fish. The policy itself reflects an ignorance about the lived experiences and practices of fishermen from Old Harbor.

The story reveals how the rural geography of Old Harbor can also be a source of strategic power for the remote community. Because the enforcement officer is an outsider with such a limited understanding of the place he is attempting to regulate, the fisherman from Old Harbor is so easily able to trick him. The officer immediately accepts the ridiculous name of 'Chingaroo' as legitimate. Also, it doesn't occur to him that the community would work against him together. Not only do they fail to turn in this fellow community member, village residents conspire to prevent him from distributing the ticket.

In the story we see how the geography of the halibut fishery – where urban individuals control regulatory and enforcement policies – contributes to certain disadvantages for fishermen who must be regulated by policies that show little understanding about the nature of life in remote villages. We also see how when used creatively, the remote geography can also give Old Harbor certain advantages when it comes to fishery management. In the next chapter, I will explore the politics of place-making and geography within the halibut fishery. I will examine how through historical and political processes certain ideas about the fishery geography and certain places come to inhabit positions of power within the halibut fishery.

Chapter 8
Analysis

Fishscapes and Power: The politics of place-making in the Pacific halibut fishery



– From left to right: section of my Anagyuk map, a NOAA nautical chart of the waters surrounding Kodiak Island, 1963 map of the IPHC statistical areas, Old Harbor fisherman's drawing of his subsistence halibut fishing spots, and the IPHC regulatory areas.

The area surrounding Kodiak has been mapped in numerous ways. The snippets of five maps included above are just the tip of the cartographic iceberg. Kodiak Island has been mapped to depict geologic and seismic activity, to establish national wildlife refuges around Old Harbor, to establish salmon exclusion zones, to show Sugstun place names, and to delineate Alaska Native corporation lands under the Alaska Native Claims Settlement Act, just to name a few. This is not to mention the immaterial maps that countless individuals possess – the personal maps that people have generated to name and imbue with meaning places on Kodiak Island that are significant to them. While in their paper format, each of these organizing ideas about place are mapped separately, in the lived reality of Kodiak Island, they interact with and shape each other in complex ways.

This dissertation explores the different ways that groups invested in the Pacific halibut fishery approach the commonly-held resource. In this chapter, I will examine the different ways that interest groups in the Pacific halibut fishery approach and map places connected to the fishery. I will explore how the colonial legacy of fisheries management can be exhibited in the relationship and political posturing between management agency and Old Harbor concepts of fishing place.

In this chapter, I use the term fishscapes to describe different approaches to geography within the halibut fishery. By fishscapes, I mean ideas about the oceanographic plane where fishing takes place. This includes both ideas about how fish are distributed in space and about places where fishermen fish. Even within the context of the halibut fishery, the waters surrounding Old Harbor have been mapped in many different ways. Examples of different halibut fishscapes include maps of Sugstun place names in bays where fishing traditionally took place, delineations of regulatory areas within the fishery, the locations of Old Harbor fishing spots, spatially-explicitly fishery models that conceive of fish in space, and fishermen's personal maps of places in the ocean that have meaning to them.

This chapter is not just meant to be an exciting journey into the diverse ways that the halibut fishery has been mapped. These different concepts of fishing place do not exist in isolation, they interact and do work on one another. The results of these interactions can have real consequences for fishermen and regulators connected to the fishery. For this reason, I focus on fishscapes *and* power to examine the relative positions of power of Old Harbor and regulatory agency approaches to halibut fishing places. Regulatory agency concepts of fish place have certain kinds of power because these ideas become institutionalized into management processes. But power need not always be one way, and Old Harbor ideas about place can have certain kinds of power by mapping place in ways that elude detection from regulatory processes or by lobbying policy-makers to consider their ideas about space.

Throughout these analyses, I argue that a fishery and fishery management is something that is enacted primarily through space. I argue that spatial decisions made by scientists and managers in the fishery act to control and order the lives of fishermen in distant places such as Old Harbor. This control has significant impacts on community livelihoods and fishing activities. However, I will also demonstrate how, through various spatial ideas and strategies, Old Harbor fishermen are able to resist control and in some cases exhibit power within geographic processes of the fishery.

Many of the spatial decisions made by fisheries scientists and regulators, such as decisions about what scale to model fish populations at or the delineation of statistical and regulatory areas, are viewed as 'objective' or 'scientific' choices. These decisions are often made by a select group of fisheries scientists as they are in the process of developing assessments of fish stocks. However, a closer analysis of these spatial decisions reveals that they are not objective, but are rather political choices that end up benefiting some users of the fishery and hurting others. For this reason, I advocate that these so-called scientific decisions about how the fishery is managed spatially should be made transparent and opened up to more of a public process and review.

I organize my discussion about the spatial politics of the halibut fishery around three general themes. *Areas and Meaning* examines how Old Harbor fishermen and fishery managers imbue places in halibut fishery with different kinds of meaning. These forms of meaning then serve as organizing structures through which they map and at times control the fishing landscape. *Scale and Power* examines the different scales at which Old Harbor fishermen and halibut fishery scientists imagine and assess aspects of the halibut fishery. The section then explores the power implications of these differing approaches to scale. Finally, the section *Places of Power* describes the rural/urban dynamic of the fishery and examines which places within the fishery – such as the urban areas of Seattle and Anchorage – come to have more power within management processes of the fishery.

This chapter draws from two distinct branches of literature to make its arguments. The first is a rich body of academic and non-academic literature that examines the elusive concept of sense of place (Feld & Basso 1997; Basso 1996; Chatwin 1988; Williams & Stewart 1998). This research explores the various understandings, attachments, and meanings that different communities, often indigenous, give to the places and landscapes they inhabit. Perhaps one of the most vivid examples is Keith Basso's descriptions of relationship to place among Western Apache (Basso, 1996). Basso critiques ecological models of place that view man-land relationships solely through material or practical concerns such as access to water, resources, and food. He outlines the rich and complicated relationship that the Apache have with their landscape, describing the meanings, stories, and moral fables – all in the Apache language – that are attached to particular places.

The second literary thread is writing and theory from critical geography that examines the political nature of space (Lefebvre 1991; Massey 1994; Mitchell 2002; Whatmore 2002). Many of these theorists argue that space, rather than an end of itself, is actively produced. Geographic scholars have begun to pay particular attention to the politics of space-making – the notion that certain groups have power to dictate spaces for others. Research explores the ways that spatial strategies can be a means to control and exhibit power over others. This theorizing about the politics of space has been brought to bear on environmental issues in the field of political ecology. Political ecologists have highlighted the ways the environmental landscapes – whether they be forests, prairies, or fisheries – are the result of political decisions made during management processes (Braun 2000; Braun 2002; Castree & Braun 2001).

Although both these literatures deal with concepts of place and space, they have rarely been brought together. The rich work about indigenous sense of place, often does very little to examine the way that outside and colonial spatial structures end up impacting indigenous concepts and uses of space. In Basso's descriptions of Apache landscapes, there is very little reference to the colonizer or colonial presence, though it undoubtedly influenced the Apache relationship to the landscape. On the other hand, the geography literature about the politics of space has often been limited to more theoretical discussions that sometimes fail to examine how the politics of space impact the lives of people who live within these politically produced spaces. For example, while Braun (2000, 2002) has shed light on the way that scientists and managers have defined geologic territory or mapped deforestation, he does little to explore what these top down definitions of subterranean lands or forests mean for people who inhabit or utilize those landscapes. In this chapter, I will attempt to bring these ideas together by exploring the political processes involved as fishery managers make fishing space, Old Harbor's sense of fishing place, *and* the ways that the Old Harbor community members' lives and understandings of place have been impacted by manager's top-down spatial decisions.

Areas and Meaning:

I first met Abalik one morning when, bleary eyed from sleep, I responded to a loud and persistent knocking on the door of the house I had been housesitting in Old Harbor. I peeled open the door and there stood an elder man I had never met before. He stood there with a wide grin, blinking through a large pair of glasses that overpowered his balding and oval head. He said, "You're Laura, huh?" I thought, well close enough, and replied, "Yes.". He then said, "OK. You're gonna come with me to the store." I said, "What?" He said, "My truck is out here. We're gonna go up to the store." I figured it was best not to argue, so I said "alright" and hopped into the truck. On the way to the store he pointed to the harbor and told me that he had a skiff in there and that he would take me out fishing sometimes. I said, "alright".

Figure 32. Paul Kahutak, "Abalik" in his kitchen, telling stories

Finally we arrived at the store. At the time Old Harbor had two general stores for village members to buy groceries (now there is only one). We entered the store and my new friend started scanning the aisles. It seemed that he didn't really have an item in mind and mainly traveled to the store as a daily diversion. He stopped near the canned goods section and he called me over. He pointed to a can and said to me, "that would be good." I looked closely and read the label out loud, "Canned cherries?" He said, "Yep. That will be great in the pie you're gonna make me."

A bit flustered I said, "Pie, huh? I guess I could make you a pie." He said, "good", grabbed the item and paid for it at the register. As he walked out, I lingered and talked to the clerk. I asked her, "who is that man?" She said, "Him. That's Abalik." "Abalik?" I said. She said, “Yeah. That’s his nickname: Abalik.” I asked, “What does that mean?” She said, “I have no idea, that’s just what everyone calls him.”

Thus began my relationship with Abalik, whose real name is Paul Kahutak. Every week I overcame my lack of domestic inclination and made him pies. And every week we would sit together and he would answer my questions, tell me stories, and go over his life history living on Kodiak Island. I am by no means that first researcher that has come to Old Harbor to study some aspect of life here. The community has been welcoming to researchers for many decades and there has been a steady stream. In a way Abalik seems used to the drill. A new researcher comes into town, he invites them in and shares his story in exchange for camaraderie, friendship, and in my case pie. His stories are amazing and have painted such a stark and beautiful picture of life on Kodiak that I can hardly say the exchange was equal. I will be forever grateful for his openness and generosity.

I met with Abalik nearly once a week during my time living in Old Harbor. Occasionally, we would go out fishing, but more often than not, I would visit him in his house and we would drink tea, eat smoked salmon, and he would tell me stories about his life. On seven occasions, I recorded these interviews. Often during these discussions we would keep a map of Kodiak Island open on the table.

What fascinated me most about these visits with Abalik was the way in which he organized and structured telling me his history. Instead of thinking about his life chronologically – moving from his birth and up to his present state – he thought and he recounted his life spatially describing the way that it unfolded within the geography of the region. As we lingered on the maps he would drift onto a place and tell a particular story about an event that took place there. As an interviewer I would often try to drive and organize the process into a more chronological structure. I would ask him things like, "when did that take place?" or "did that happen before or after that?" But, Abalik is hard of hearing and mostly discounted my questions – this spatial structure was the way that he sought to tell the stories.

With his stories, Abalik mapped his Kodiak Island and what it meant to him. It is through events that happened to him and people that he knew that different bays, ports, and spots took on meaning. Abalik's stories remind us that maps can exist on the scale of the individual. These kinds of maps and understanding of space are often discounted because their scope is so small – that of one person – and because they are not often visible. They persist in people's minds, in their memories, and in their day to day interactions with the landscape around them. It is difficult to put this experience on paper and even more difficult to transport it out of the physical and cultural context from which it is derived.

In

Figure 33, I attempt to present Abalik's ideas about the Kodiak landscape in a paper format. This 'Map of Abalik' shows the Kodiak Island landscape being comprised of stories from Abalik's life. A more lengthy version of each of these stories, which are certainly worth reading, is contained in Appendix A at the end of the dissertation. With the map, I hope to show that this personal, story-based way of connecting to and describing the landscape can be just as legitimate a way of organizing space as any other cartographic techniques we may employ.

The work of Keith Basso and countless other anthropologists, suggests that indigenous place names can provide important insights into indigenous groups' sense of

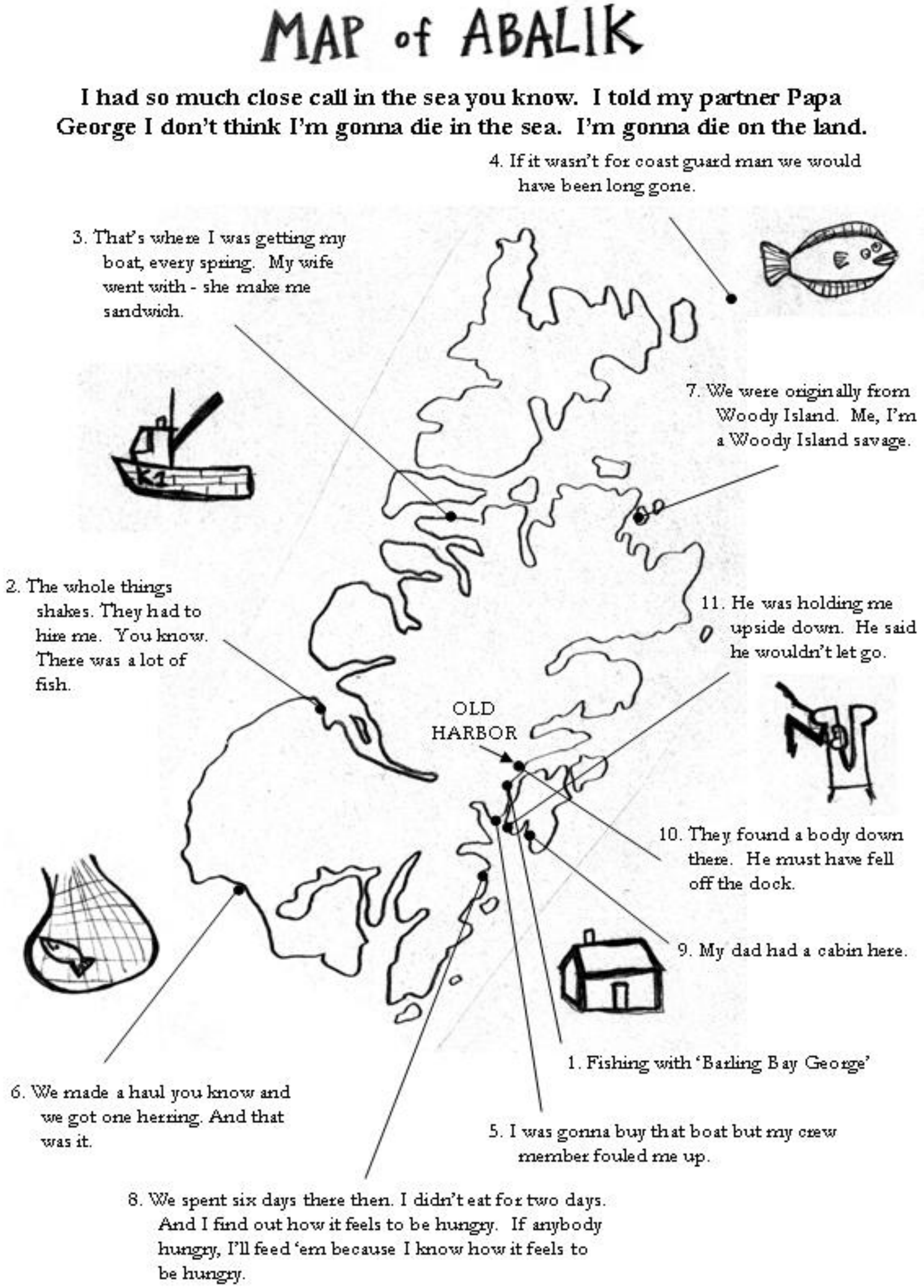


Figure 33. Map of the locations where key events and stories from Paul "Abalik" Kahutak's life took place. Compiled from six oral history interviews recorded 2007-2008. Interviews recorded with a map present. Longer versions of stories contained in Appendix A.

place. When I traveled to Old Harbor, Keith Basso's *Wisdom Sits in Places* is the only book that I brought with me. Its dog-eared pages followed me on skiff rides, camping trips, and to the various houses of generous community members who took me in. I had an idea that what Keith Basso did with the Apache in *Wisdom Sits in Places,* I could do with the Sugpiaq from the community of Old Harbor. While Basso looked at the Apache relationship with the land through an analysis of place names and stories, I would examine Sugpiaq relationship with the sea through the names and stories they associated with places in the surrounding ocean. Armed with Basso's ideas and techniques, I began asking Sugpiaq elders from Old Harbor about place names – about names of the different bays and rivers where they and their ancestors used to fish and about any stories associated with those places.

One day I looked at a map and pointed to a nearby bay and I asked an elder, "What is that place called?" She looked at me and said, "Herring Lagoon". I said, "Yeah, but what is the Sugstun name for that place? She said: Oh, um, I think they used to call that Inisuk. I repeated it, "I-ni-suck. What does that mean?" She said, "What?" I repeated myself, "What does Inisuk mean?" She gave me kind of a funny look and finally she said, "Inisuk, Inisuk means Herring Lagoon." I said, "Yeah but what does the word translate to? How does it break down?" She gave me a long, blank stare as if she didn't even know what I was talking about. I then asked, "Well, are there any stories in Sugstun about Inisuk, any moral parables, things that happened there, people that used to go there?" She looked at me with unblinking eyes, laughed and said, "Inisuk is Herring Lagoon."

The concept of indigenous places has often been romanticized – these names are evoked as some kind of window to an untrammeled, utopian indigenous past. The above elder's comments about Herring Lagoon served to snap me out of these romantic notions immediately. The process of unearthing Sugstun place names was often quite chaotic and messy. I quickly learned that when you get a bunch of elders into a room and ask them the indigenous names of places, a straightforward answer is never what you are going to get. There were lots of questions marks, guesses, laughter, and diversions into commentary about more recent stories and events. I began to see that place names, like cultures are not static. They are dynamic through history – changing as a result of encounters with new people (Russian and American colonizers) and as a result of changing uses and meanings associated with places. Even this complicated connection with Sugstun place names reveals something about a uniquely Old Harbor relationship to place.

In some ways, the process behind trying to unearth place names revealed more about Old Harbor sense of place, than the actual Sugstun place names did. While the place names can reveal how Sugpiaq ancestors understood the Kodiak fishing landscape, the conversations about these place names showed how many Old Harbor elders lived within these places today and in their lifetimes. For this reason, I have included a map of the Sugstun Place Name Process (Figure 34, Appendix B). Instead of presenting a compilation of Sugstun place names for the area, which the Alutiiq museum is doing the great work to develop and release, this map provides insights into the often fun and lively process through which we attempted to learn Sugstun place names for the waters surrounding Old Harbor. The map indicates places where elders were unsure about

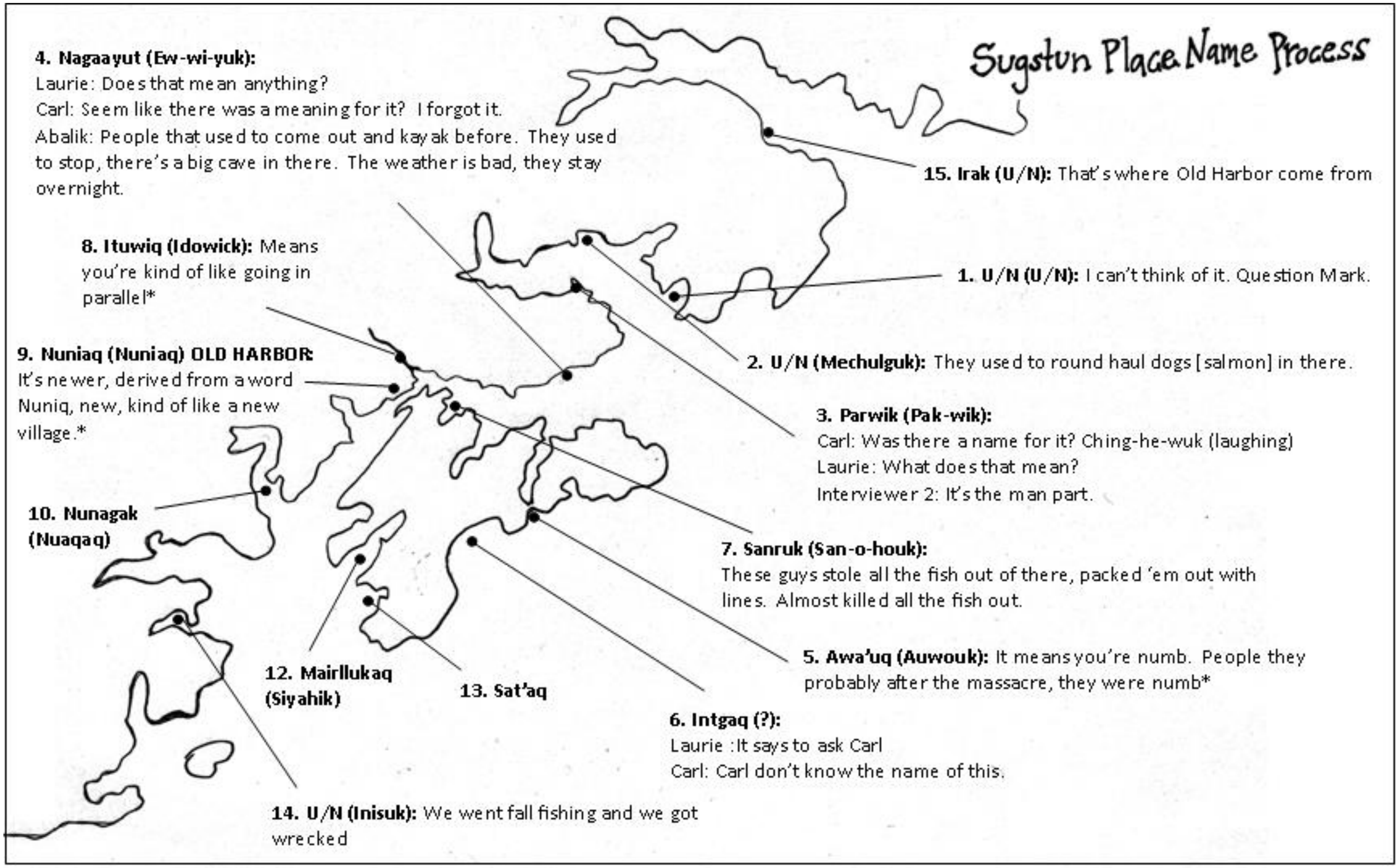


Figure 34. **Map of Sugstun place name process. First bolded names represent the official name and spelling courtesy of the Alutiiq Museum (Sven Haakanson Jr, pers comm, Jeff Leer pers comm.); place name in parentheses represents the phonetic spelling that an interviewer and I derived from conversations; text is excerpts from three language sessions with elders Paul Kahutak, George Inga Sr, and Carl Christiansen Sr, in 2008 about Sugstun place names; * = personal communication, Stella Krumery; more detailed excerpts from the process in Appendix B.**

places names. The map indicates people that elders felt would have known a particular place because they used to travel there a lot. The map also includes the many side stories and discussions that emerged when we were trying to rein in a group of elders to get them to tell us the Sugstun names of places.

The discussions and relationships with Sugstun place names and the oceanic places they describe are part of what I have called the fishscape. They give insights into the way that Old Harbor fishermen understand the fishing terrain that surrounds their village. The names connect to bays, islands, inlets, straits, and peninsulas where people fished for salmon, halibut, cod, and many other species. The stories that elders remembered when talking about particular places were nearly always connected with fishing – with trips they took to those reasons or stories they heard from their elders about the kinds of fish resources that used to be there. Finally, elders seemed to remember best the Sugstun names of places where they fished the most. It seems that fishing itself is what crystallized these places and their names in their minds.

Recollections of stories and discussions surrounding places names are just some of the ways that Old Harbor relationships with and meanings inherent in the places around them are revealed. While the Abalik map reveals that personal maps can persist to the level of the individual, there were also concepts of place that existed on a more community scale. The story *Anagyak (Partner)* at the entrance of this chapter reveals how concepts of space can be created on the scale of two – two friends or partners who relate to the sea together. In Old Harbor there were also certain bays and cabin sites known to be associated with particular families. The process of uncovering Sugstun place names, showed that some concepts of place couldn't be revealed until groups of different individuals gathered together and helped to jog each other's memory and unearth each other's stories. These are community forms of knowing place. Keith Basso writes that when the Apaches share stories about place "a massive physical presence is fashioned into a meaningful human universe." Through individual stories, partnered movements, and community conversations, Old Harbor community members gave glimpses into the "meaningful human universe" that surrounded them.

At the same time Abalik and other Old Harbor elders were traveling and fishing throughout the island, making these personal maps of place[226], the International Pacific Halibut Commission in Seattle was beginning to do work to determine how it would organize and understand the places, including Kodiak Island, where Pacific halibut reside. Many of these ideas about halibut fishing space would interact with the geographies and lives of Old Harbor fishermen that I have described above.

Following the 1924 Halibut Convention, William F. Thompson was appointed as the director of the International Pacific Halibut Commission. In this role he continued work to conduct biological research about the halibut fishery for the purposes assessing the stock and making recommendations to better sustain the fishery (Bell 1981). One of the first actions that he conducted was to divide the extent of the fishery in smaller areas, "for convenience in analyzing the statistics."[227] In 1931, he published maps of the extent of 35 IPHC statistical areas (Figure 35).

Thompson stated that he specifically did not delineate these areas based on the extent of fishing grounds – that is some statistical areas could encompass large numbers

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[226] Most of the stories that Old Harbor community members told me about the places surrounding Kodiak Island took place during their lifetimes, in some cases the lifetimes of their parents few stories date to earlier than the 1930s.
[227] (Thompson et al. 1934, p.46)

of halibut and others smaller amounts. To delineate the areas, Thompson drew a curve along the coast of the area of the fishery curving from Oregon and up around the Gulf of Alaska to the Aleutian chain. Then, along this curve, he lines as right angles “at distances equal to one degree of the corresponding latitude.”[228] Statistical areas were defined using Thompson’s arbitrary methodology of delineating them at one degree latitude marks along the coast. The location of the lines separating the 35 statistical areas, now referred to as “Thompson lines”, would ultimately have important implications for fishermen in different regions of the fishery.

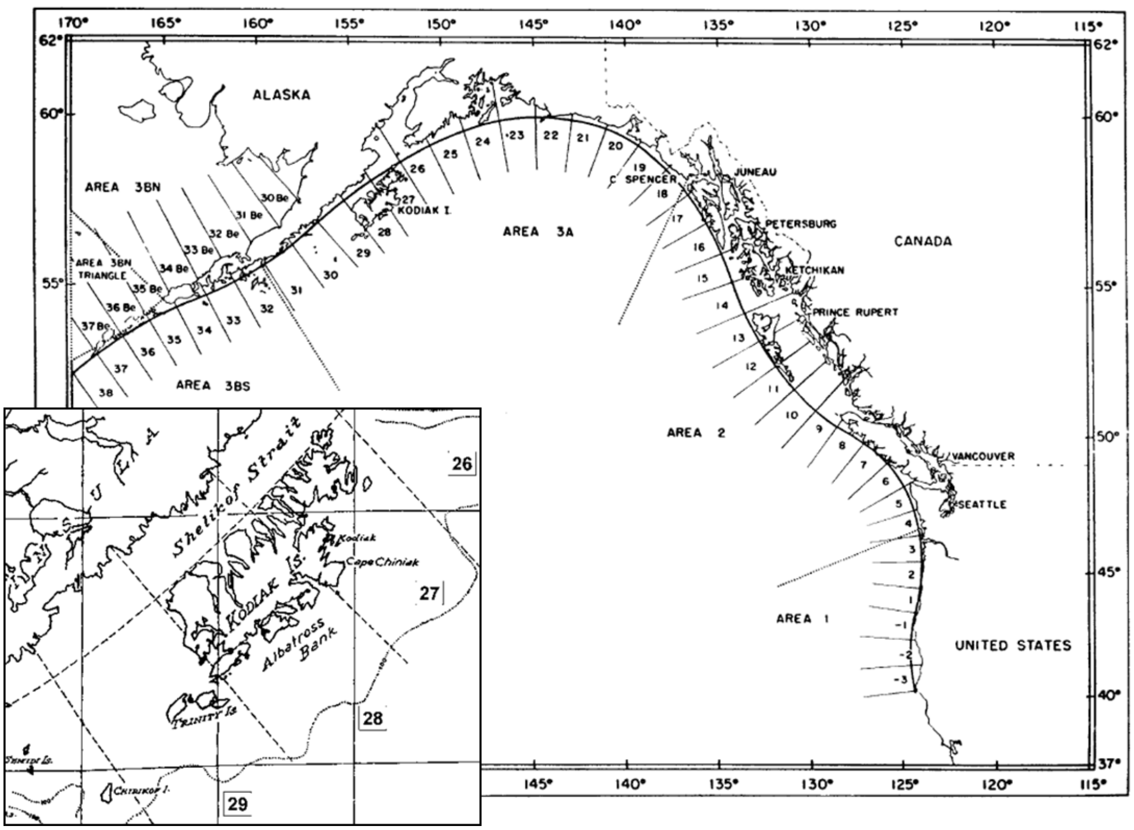


Figure 35. Map of the IPHC statistical areas from 1963. The map shows the curve from which director W.F. Thompson drew “Thompson lines” at one degree latitude markers. The first 35 areas depict the original 1931 statistical areas. Additional areas were later added in the Bering Sea. Inset is a close view of the Kodiak portion of a 1931 map of the IPHC Gulf of Alaska statistical areas. Source: (Kong et al. 2004)

[228] (Thompson et al. 1934, p.46)

Statistical areas as a geographic organizing structure reflect IPHC ideas about what aspects of the Alaska coast are meaningful. The IPHC staff seeks to divide and visualize space within the fishery for the purposes of understanding the dynamics of halibut populations and fishermen including "migrations of the fish, the drift of eggs and larvae, and the movements of the fleet."[229] The IPHC designation of statistical areas shows an orientation towards the halibut fishing landscape as something to be broken down and analyzed.

As the fishery evolved over time, the statistical areas have been significantly amended. Today there are more than 100 IPHC statistical areas. A map of the current statistical areas surrounding Kodiak Island show that these areas have not changed much since their original designation by Thompson (Figure 36). The waters surrounding Kodiak Island are divided into three areas by two different Thompson lines. The village of Old Harbor is located in statistical area 280, but is closely surrounded by a line designating statistical area 290 to the West and area 270 to the east. All three of these statistical areas encompass traditional Old Harbor fishing

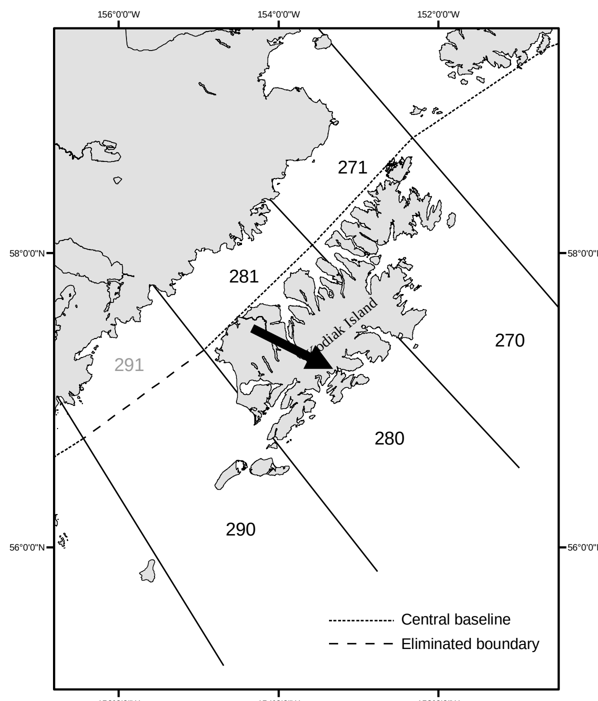


Figure 36. Map of IPHC Statistical Areas surrounding Kodiak Island. Arrow points to the location of Old Harbor. The division between regulatory areas 3A and 3B lies on the line between statistical areas 280 and 290.

[229] (Thompson et al. 1934, p.46)

grounds. Although Kodiak statistical areas didn't change much, many statistical areas were added as the fishery expanded into the Bering Sea. In addition, the IPHC staff writes that, "by the mid-70s, it became necessary to define more-localised fishing areas, as regions of interest became more defined."[230] Under this logic, many statistical areas, mainly in the SE Alaska and BC regions of the fishery, were split into smaller areas.

The size and location of statistical areas is not just a biological or scientific concern. It also has significant implications for fishermen and other users of the resource. The statistical area is the smallest scale or level to which IPHC scientists will aggregate data about fish stocks. This means that regions of the fishery that have more statistical areas are able to get more attention to their fish stocks and a better and smaller-scale understanding idea about the movements and use of fish in their areas.

For this reason, it is important to understand how decisions about the locations of statistical areas are made. Investigations into the history of the statistical areas reveal that these decisions have been made primarily by IPHC staff, with little input from politicians or the public (Kong et al. 2004). While the initial areas were developed uniformly along latitude lines, recent changes to the areas have been less systematic. The IPHC documentation says that overtime "regions of interest became more defined."[231] This suggests that political decisions about what areas were "of interest" or needed attention played a role in the delineation of regulatory areas. Under this logic, areas of the fishery with a stronger political voice, may have been able to bring increased attention and increased re-working of the statistical areas within their region.

[230] (Kong et al. 2004, p.9)
[231] (Kong et al. 2004, p.9)

IPHC scientists continue to use these statistical areas to aggregate data about commercial catch, survey catch, and life history characteristics of halibut. By aggregating halibut data they can compare halibut statistics from one part of the fishery to another. In one of their first statistical area analyses of the fishery in 1930, the IPHC staff found a great disparity in the level of fishing effort and status of halibut populations in different regions of the fishery (Thompson et al. 1934). Specifically, they found that halibut populations in the statistical areas at the southern range of the fishery near Washington, British Columbia, and Southeast Alaska, were severely declining, however, the populations in the northern and western regions of the fishery were thriving (Thompson et al. 1934).

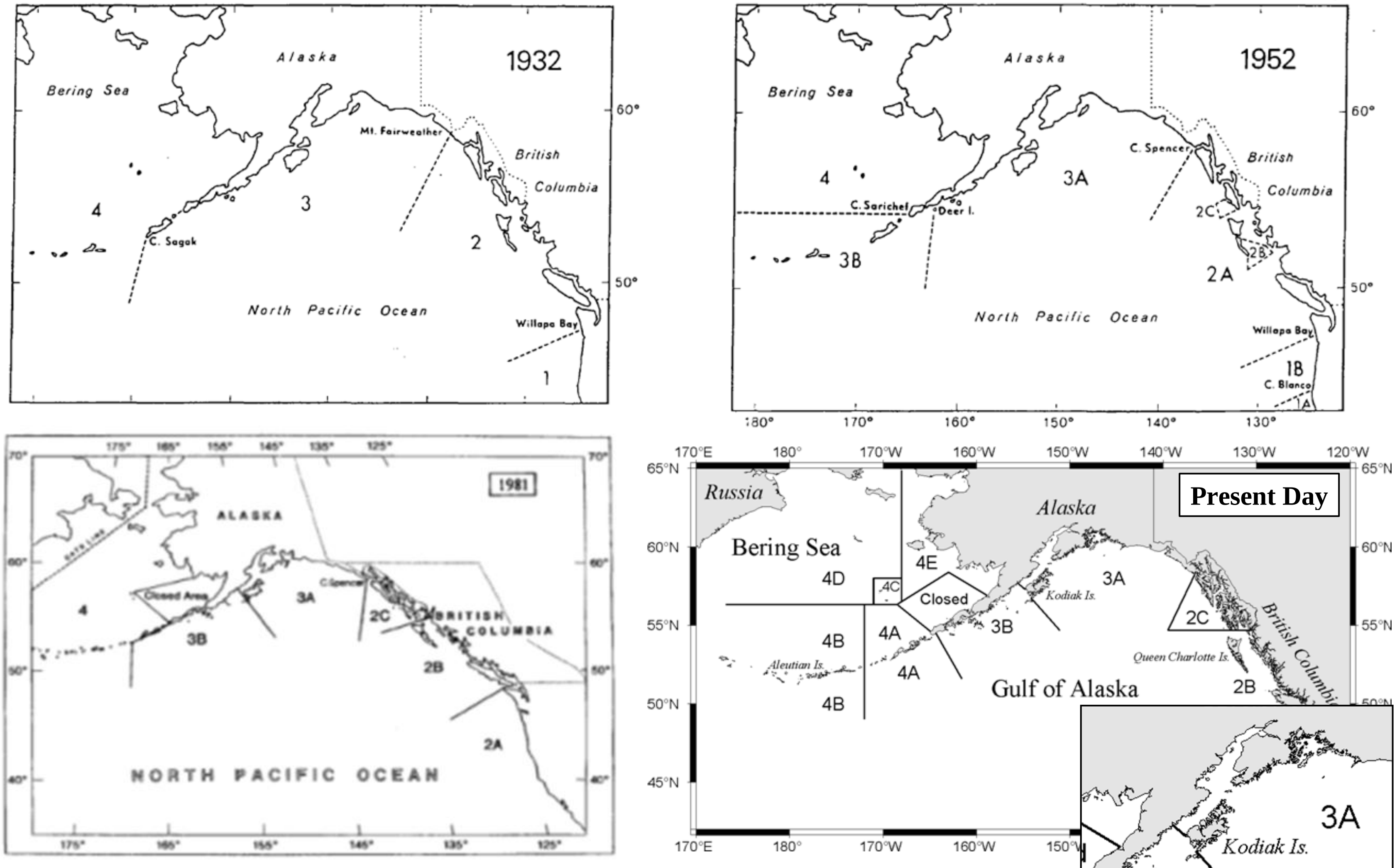
This information led scientists to understand that even though halibut can migrate over large distances, they don't necessary distribute or replenish evenly throughout the fishery, especially in conditions of high harvest. Some areas of the stock could be fished to near depletion, while others continued to do well. It is from these statistical area analyses that halibut scientists came to understand a fishery as something that needed to be regulated through space. It wasn't just the number of fishermen that mattered, it was the distribution of these fishermen – the number of fishermen fishing in different parts of the fishery. These ideas about halibut fishing would come to dominate decisions about another spatial organizing structure in the fishery: regulatory areas.

While statistical areas are primarily designed for biological analysis of the stock, a larger IPHC unit called the regulatory areas structures the way that the fishery is managed and implemented. Catch limits, seasons, and restrictions are all implemented on the regulatory area scale in the fishery (Kong et al. 2004). Each regulatory area on the fishery can have a different catch limit and an entirely different set of rules and restrictions for fishermen. This means that the locations and rules associated with regulatory areas have a large and ever-present impact on the lives and movements of halibut fishermen.

The 1923 Halibut Convention established IPHC jurisdiction as broadly encompassing the territorial waters off the coast of Canada and the United States, and 1930, 1937, and 1950 Conventions that followed it specifically gave IPHC the authority to create subdivisions through which to regulate the fishery (Skud 1977). The regulatory areas of the halibut fishery have undergone several changes over the course of IPHC management of the fishery; some of these changes are highlighted in Figure 37. IPHC staff began with four regulatory areas in 1930 and today there are 10 regulatory areas of the fishery. These figures specifically highlight significant changes to regulatory areas surrounding Kodiak Island.

Generally, the IPHC moved and added regulatory areas in order to increase fishing pressure in the more outlying areas of the fishery where few fishermen ventured, this would allow them to achieve, "greater exploitation of the stocks that were not being fully utilized."[232] Initially, regulatory are 3 spanned from the boundary with area 2 in Southeast Alaska to Cape Sagak in on the Aleutian Chain. In the 1950s the IPHC divided area 3 into two parts (area 3A and 3B) with a line running through Deer Island on the Alaska Peninsula. Prior to the division, the majority of fishing in area 3 occurred around the populated ports of Seward, Homer, and Kodiak. With the division, the western area 3B was granted a separate catch limit from 3A, thus more fishermen would move out to that area to fish.

[232] (Skud 1977, p.9)



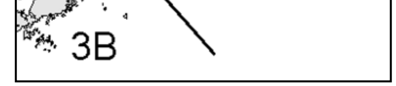


Figure 37. The location of IPHC regulatory areas in 1931, 1952, and 1981. Note the addition and movement of the boundary between area 3A and 3B. Source: (Skud 1977; Hoag et al. 1993)

Here we can see that the strategic delineation of regulatory areas is an important means through which managers control and manipulate the behavior of fishermen. In many ways, the placement of these regulatory areas help to achieve stock conservation by working to distribute fishing effort throughout the region instead of have it concentrated on one portion of the fish's range. By examining these spatial strategies, you can gain also insights into regulators' ideas about fishermen. From the regulator's perspective fishermen from one area are exchangeable with those in the other. The goal is simply to get fishermen and fishing effort into other areas. But the cartographies from fishermen in Old Harbor reveal that the places they fish have great meaning and history to them. They would not consider fishing in a different area equivalent to fishing in the areas surrounding their home.

A regulatory area shift that is designed to move fishermen to fish in waters further out benefits some kind of fishermen and hurts others. First, these maneuvers tend to benefit wealthier, larger-scale fishermen who have large vessels that can travel long distances and stay out to sea for many days. Some fishermen from Old Harbor operated large salmon seining vessels, but many of the halibut fishermen operated on smaller boats, some even out of small skiffs. The addition of new regulatory areas further out also benefits those fishermen that are willing to travel far from home to catch fish. Many fishermen from Old Harbor practice a more community-oriented style of fishing where they are near to the village and come back home every three days. These kinds of fishermen would be less interested in traveling long distances.

After 1952, the dividing line between regulatory areas 3A and 3B moved around a bit and for a period was taken away. Then, most significantly for Old Harbor, in 1981, the regulatory area line was moved to Cape Trinity on the southwest side of Kodiak Island (Figure 37). Regulatory area boundaries always align with statistical area boundaries, in this case the "Thompson line" separate area 290 and 280. Therefore the process guiding the development of statistical areas also plays a role in the location of these important regulatory area boundaries.

Discussions with Abalik and a number of other fishermen from Old Harbor has revealed that in the 1980s fishermen from Old Harbor primarily fished near and sold out of two ports – Alitak which is on the far South Western tip of the Kodiak Island near the waters of 3B and Kodiak which is northeast of Old Harbor squarely

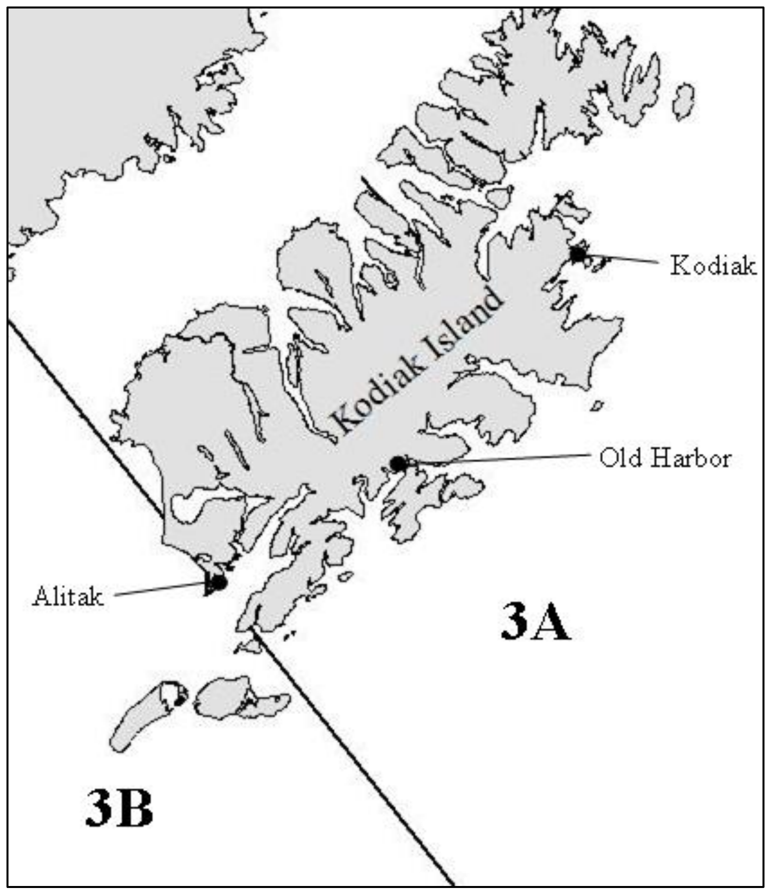


Figure 38. Close-up of current division between regulatory areas 3A and 3B with location of major ports for halibut landing for Old Harbor fishermen.

near area 3A[233]. The waters off Old Harbor itself are in area 3A. With the new Cape Trinity placement, the IPHC literally established a regulatory boundary in the middle of traditional Old Harbor fishing grounds and territories. Living with a regulatory area line in their backyard has created some particular challenges for Old Harbor fishermen.

Until 1994, the halibut fishery was open to any participants and was managed through the designation of short openings during which fishermen could catch as much halibut as possible. During this time the regulatory areas did not present that much of a challenge to Old Harbor halibut fishermen, because they could decide which port they wanted to fish near and either fish out of area 3A or 3B accordingly. But, when the halibut fishery was privatized in 1994, which I will discuss in detail in the next section, individual fishermen were allotted quota shares to fish halibut *only* in the specified regulatory area. If Old Harbor fishermen were granted quota in area 3A, they couldn't fish for halibut in area 3B and if they were granted quota in 3B, they couldn't fish in area 3A which encompasses the waters directly outside their village.

One Old Harbor fisherman that I talked to had fished for halibut in both Alitak and Kodiak during the qualifying years for which regulators determined how much quota to give to fishermen. This meant that when the halibut quota shares were awarded to him, he was granted 600 pounds (which is already a really small share) divided between both areas, "about 100 and some [in 3B] and 400 and some for 3A."[234] This means that if he is to fish his halibut shares, he needs to take a complicated trip that covers both regulatory areas. He says that he wishes that they had awarded him all quota in area 3A,

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[233] Interview, Old Harbor fisherman 11/7/08

[234] Interview, Old Harbor fisherman 10/12/08

“That way I wouldn’t have to run all the way down there [to area 3B] just to fish for 100 pounds and then come all the way back up this way.”[235]

The community of Old Harbor bought halibut quota from regulatory area 3B to lease out to fishermen from the community in a program that I will describe in the third section of the dissertation. They had hoped that this program would encourage more small-scale fishermen to participate in the fishery. However, since the quota was in 3B, fishermen from Old Harbor had to travel a fairly long distance to the southwestern side of the Island in order to catch their fish. Many fishermen told me that fishing in area 3B was a great challenge because, “it’s too far, the price of gas having to travel all the way down towards Ahkiok [3B]”.[236] Also since area 3B was not in front of their village, they reported not knowing the fisheries there as well, so it took longer to catch halibut. One of the staff members working for the community quota program said, “I think that well the IFQ’s that we were able to purchase are from area 3B and that’s way far away so that’s where - that kind of takes a lot of the little skiff guys out of the pool.”[237]

It is clear that the designation of a regulatory area near their village has created some challenges and limitations for Old Harbor fishermen, especially after the implementation of the quota program. The stringency of the regulatory areas has meant that fishermen have less freedom and flexibility to fish in all of the different fishing grounds surrounding their community. However, when I specifically asked fishermen if they had any specific problems with the regulatory area boundary or if any of them were

[235] Interview, Old Harbor fisherman 10/12/08
[236] Interview, Old Harbor fisherwoman 10/19/08
[237] Interview, Old Harbor fisherwoman 10/26/08

interested in having it moved somewhere else, most of them shrugged it off[238]. One fisherman told me, “well, they had to put lines somewhere. I mean you gotta’ manage sections - you can’t just manage a whole fishery”[239]

Spatial policies such as the designation of statistical and regulatory areas serve as an important means through which regulators control the behavior of fishermen and implement their ideas about place onto the entire fishery. While, designation of statistical and regulatory areas seem straightforward, objective or scientific processes, closer analysis reveals that they stem from very particular cultural orientations towards places in the fishery and that they are guided as much by social and political processes in the fishery as biological ones.

These IPHC spatial structures come from very different ideas about the meanings and significance of places in the halibut fishery. IPHC scientist organize place around their ability to conduct biological assessments and to facilitate the exchange and movement of fishermen throughout the fishery. Old Harbor cartographies reveal sources of meaning through personal experiences, memories, and ancestral ties. Old Harbor fishermen don’t seem all that immediately concerned about the locations of regulatory and statistical areas – they’ve got bigger problems to think about. In addition, with the advent of the quota program, it would be almost politically impossible to advocate for a change on regulatory area boundaries.

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[238] E.g. interviews Old Harbor fishermen 10/11/08, 10/13/08, 11/7/08

[239] Interview, Old Harbor fisherman 10/11/08

However, the challenges with fishery area definitions do stem from larger issues that community members from Old Harbor do think about a lot. Mainly the issues derive from the fact that fishery managers have very little understanding about what the places in Kodiak Island mean to fishermen from Old Harbor. This issue is alluded to in the Chingaroo Chickardee story at the beginning of this section. Old Harbor has developed a particular strategy to work to overcome this challenge.

While many Alaska Native communities have preferred to keep outsiders and prying researchers and journalists out of their communities, Old Harbor has for a very long time welcomed researchers, educators, and even wildlife managers themselves, to visit, live, and conduct research in Old Harbor. I am not the first, nor will I be the last dissertation, that has been composed about live in Old Harbor. Graduate students have conducted archeological work in sites near the village, have done research about mask use and carving in Old Harbor, have studied the salmon fishing culture, have studied the use of driftwood, and two years prior to me a researcher had spent time in Old Harbor and several other Alaska Native villages to study the impacts of fishery privatization on Kodiak Island fishing communities (Carothers 2008).

Old Harbor families have welcomed National Geographic and other filmmakers to document local bears and fishing culture[240]. Also, importantly, Old Harbor welcomed Craig Mishler an employee of the State of Alaska Department of Fish and Game to live and interact with them over many years. He eventually wrote a book titled: *Black Ducks and Salmon Berries: An Ethnography of Ousinke and Old Harbor, AK* (Mishler 2007).

[240] Old Harbor field notes 2008

Because he worked for the state fish and wildlife agency, he could bring what he learned about in Old Harbor directly to regulators who made policies governing fishing and hunting in the state.

Much of the discussion surrounding the ethics of research with indigenous communities focuses on the imbalances of power and of communities as potential victims to improper protocol or publication of information about themselves. These concerns are very real and efforts towards developing proper protocol towards conducting research with indigenous communities remains essential. But, sometimes this discussion can take the focus away from the fact that indigenous communities can and do often act as agents of their own destinies in the decisions they make about whether or not to partner with researchers. By continuing to welcome and partner with researchers, film crews, management officials, and other outsiders, Old Harbor community members are able to help circulate information about their community outside of the village. In this way, they can bring their ideas about place and their place itself to an outside audience – an audience that includes the very regulators and policy makers who make decisions about managing their fisheries.

Scale and Power:

In the first section of my dissertation, *Communicating with a Mystery*, I described how both fisheries scientists and Old Harbor fishermen developed different kinds of expertise about halibut biology. One of the main differences that I highlighted between

Old Harbor and IPHC approaches to biology was that IPHC scientists who were focused on assessing the stock for management focused on the dynamics of the stock in a broader area of the fishery whereas Old Harbor fishermen knew much more about the micro-movements of local halibut stocks. In other words, they focus on different scales of the fishery. In this section I will describe a bit about Old Harbor and the IPHC's approaches to scale in the fisheries of Kodiak Island. Then, I will describe the relations of power and interaction between these converging ideas about scale.

As I described above, many Old Harbor fishermen practiced a more community-centered form of commercial fishing where they fished in waters surrounding Kodiak Island and came back to Old Harbor frequently between trips[241]. Charter and subsistence fishermen fished almost entirely in the waters a few miles off the shore of Old Harbor. This meant that fishermen understood the spatial distribution of halibut stocks on a scale that approximately encompassed the southeastern quarter of Kodiak Island's coast. They developed a language and set of geographical markers to describe the distribution and movement of halibut at this scale. They also carried in their minds detailed maps of the fishing terrain in this region, with an eye towards places where they might catch certain species of fish.

The concept of a fishing spot is a commonly used geographical term in Old Harbor. A spot describes a place where one might go hunting or fishing. There are crabbing spots, clamming spots, red, silver, pink, and king salmon spots, and of course

[241] Interview, Old Harbor fisherman 8/23/08; Old Harbor field notes 2006-2009

halibut fishing spots[242]. Fishing spots reflect a more fine-scale understanding of the fishing landscape. Spots also to a degree resist the mobilizing, generalizing forces of cartography because they are ephemeral and dynamic. A good fishing spot might change or shift over time based on movement of fish or even the price of gas which is needed to reach a location.

Fishermen from Old Harbor have developed methodologies to remember and communicate the locations of fish spots to others. One elder told me, "the old people they used to put a mark where they always get big ones you know. They know exactly where to drop their anchor and they mark them you know in that place, so they knew."[243] Fishermen would make the locations of fish spots on maps or sometimes on rocks and outcroppings near to the spots. A fisherman told me that he would pick three landmarks on the landscape around him so that he could triangulate and return to that spot in the future[244].

Fishermen also developed different names for fishing spots. Some of these names were associated with the terrain or bays. For example: "out by Table, in between Table and the outside of Barnabus right in that little bay or cove that's where we were jigging from. There's a little area there where you can, where they're pretty thick."[245] Spots could also be named after the people who fish there. For example, "that's where [person's name] runs his skates."[246] In the section of *Notes from the Field* at the beginning of this section, I described a type of geographic organization that was beyond

[242] Old Harbor Field Notes 2006-2009
[243] Interview, George Inga Sr., 6/25/07
[244] Old Harbor Field Notes, July 2007
[245] Interview, Old Harbor fisherwoman 8/3/07
[246] Interview, Old Harbor fisherman 11/7/08

the level of the individual – that of partners. Most Old Harbor community members had one specific person or partner that they always went fishing and hunting with (whether it be commercial or subsistence fishing). Some fishing spots were named for the partner set that frequented there. Spots could also be named with the specific purpose of obfuscating their locations to others. One charter fisherman named his best halibut spot, "the honey hole"[247] because it was a place where he could catch a lot of fish, but he didn't want any other fishermen to know where it was.

As a result of their mico-scale movements throughout the waters surrounding Old Harbor, community members were able to map, often in their own minds, and communicate the oceans, bays, and rivers, in their region in much finer detail than could ever be conveyed on a map. This level of detail allows them to better communicate with other village fishermen about the location of good fishing spots or places where they have left fishing gear such as crab pots. These might include details like rock features in a bay or particular twists and turns on a river.[248]

In Figure 39, I have included one of my favorite examples of Old Harbor's fine scale understanding of the local fishing terrain. The figure contains a map that an Old Harbor fisherman drew of Big Crick, which is an important salmon fishing river located behind the village. Big Crick experiences large silver salmon runs in the late summer and early fall. When the salmon hit the creek, community-members seek out any skiff they can bum a ride from and head up the crick in droves to cast for the salmon. The river is complicated to navigate due to the changing position of log snags and sand drifts.

[247] Interview, Old Harbor fisherman 7/27/08
[248] Old Harbor field notes 2007-2009

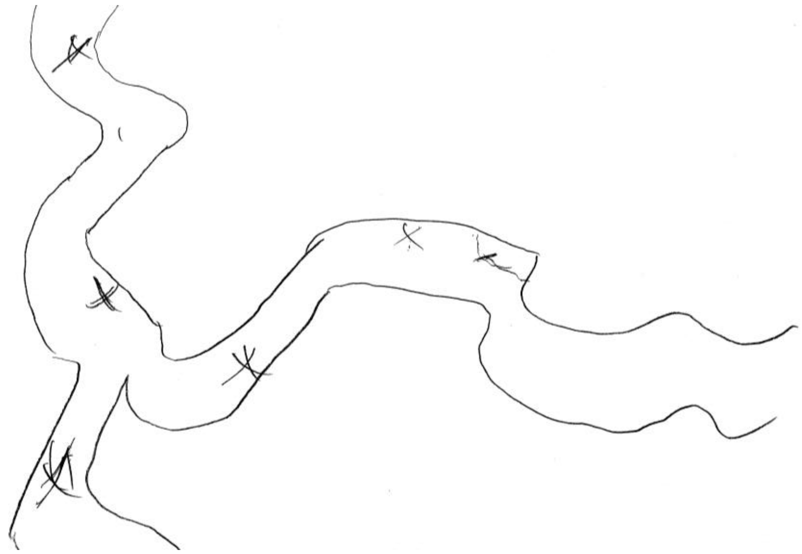

Figure 39. Old Harbor fisherman's drawing of Big Crick fishing spots 10/13/08 with fisherman's description of fishing spots recorded 11/7/08:

Fisherman: Well, you know the first deep hole you get to, right? **Laurie:** Yeah.
F: Some people call that the first 'deep hole' or 'the first bluff that you get to after you…' because you've got a bluff here. When you get in here there's a bluff here at the mouth of Big Crick you know. But as you go in, as you go in and you start to make the dogleg to the right, when you hit that gravel bar or that gravel spit, that's the first deep hole. That's the first place the fish are going to sit.
L: So you would say to somebody, 'I found some in the first deep hole.'
F: That's the first deep hole. Yup.
L: And they would know what you're talking about.
F: And then the next one is, you just tell them, and the next one I usually say is the long, the stretch between the big, the first hole and the Y. Because you know as you get, as you go past, as you come out of that hole, you start to go in and you dogleg to the left. Then as you go past that, you end up in that long straightaway there. That's all pretty deep water. Then as you get to the end of that you dogleg to the right and you come to the royal Y's. One way goes back up against the hill and another Y goes up and goes around the corner. And then the next one that they - they don't talk about that area right in there too much because there really, the fish are in there, but most people don't stay there and fish. They will go up to the next sand spit below the shortcut. And the shortcut, remember where [my fishing partner] and I were at? **L:** Uh-huh. **F:** OK, that's the beaver slew. That slew that we were in, they call that the beaver slew. OK. You've been in there enough you know where I'm at now? **L:** Yeah. **F:** OK, so as you come up past the Y you go to the left, and you go up a little ways and you're going to go back to the right again; it kind of makes a turn. Then it goes back toward the hill, this direction. Then you end up there's a little tiny sand spit on your left. It's got a deep hole right there in front of it, but that hole is not very big. Once you go past that, there's all that real shallow stuff, and when you get past that there's a place where it splits and you can either go to the right, left or the right. The right-hand is 'the shortcut'. It Ys again, and that shortcut, because you know as you're going through it, the shortcut, you come past that it's that sandbar and sand spit. The beach is coming here and it goes like this. OK, this is all deep, but you come through there and you get on the other side of this and this is all shallower than hell. This is all really shallow. Unless it's been raining like hell this is all shallow. When you get past it, then…

Underneath the map a fishermen drew, I include excerpts from another fisherman's nearly ten-minute long explanation of gave of every feature, detail, snag, twist, and turn of the river as a place for fishing.

At the same time Old Harbor fishermen have been developing and communicating these fine-scale, community-based maps of the fishing terrain and fish populations surrounding Kodiak Island, the IPHC scientists who study the fishery have been moving in a direction to understand and map the fishery at an even broader scale.

As I described a bit in the first section, in 2007, the IPHC announced that they would be switching from a regulatory-area approach to modeling halibut stocks to a coastwide approach. This means that instead of viewing each regulatory area in the fishery as distinct and calculating abundance and catch limits for each regulatory area separately, the staff would estimate the abundance of the stock as a whole (from Oregon to the Bering Sea). They would develop a catch limit for the entire coastwide stock and then using apportionment divide that catch limit among the different regulatory areas of the fishery.

What this coastwide model means is that the IPHC seeks to understand abundance, growth, and other biological trends in halibut stocks at the broadest level possible. The conversation to a coastwide approach to modeling the stock has also led many fishermen and politicians to believe (falsely according to the IPHC director[249]) that the regulatory area distribution of the stock doesn't matter as much. Therefore, if politicians accept the IPHC scientific recommendations about catch limits for the entire

[249] Interview, IPHC Director 4/09

coastwide stock, they can tweak and play around with how this coastwide catch is divided between regulatory areas.

As I showed in Chapter 5, this contributed to some lively political debates at the 2009 IPHC annual meeting to establish catch limits. The conversion to a coastwide model has also meant that regulatory areas that are more powerful and politically active in the catch limit negotiations are able to get higher catch limits than those areas that are less so. In the 2009 catch limit negotiations, the politically powerful Canadian portion of the fishery was able to receive a catch limit recommendation that was 480,000 pounds higher than the scientific recommendations. The majority of this increased catch came from regulatory area 3A (where many Old Harbor fishermen fish), who ended up with a catch limit 830,000 pounds lower than the IPHC recommendation, despite that fact that no biological evidence suggested a need for this decline.[250]

IPHC's broad scale approach to fisheries assessment and management is further evidenced by their informal policy not to address what are called localized depletions in the fishery[251]. Localized depletions are considered significant declines in pockets or sections of the halibut stock at a scale smaller than the regulatory area. For example if there are particular bays that many halibut fishermen continue to fish in, they can wipe out the halibut populations in that small area, but have no net impact on the amount of halibut in the entire regulatory area. Localized depletions can also be common near small

[250] 2009 IPHC Annual Meeting Handout
[251] This policy is not written in any documentation but referenced to by staff in interviews, referenced by the IPHC director at a NPFMC meeting [NEED DATE].

communities where fishermen tend to fish in waters surrounding the community where they live, contributing to a decline in halibut populations in that localized area.

The IPHC staff's approach to localized depletions has been particularly challenging for the Aleut community of St. Paul, located on the Pribilof Islands in the middle of the Bering Sea. St. Paul has a small community-based fleet that fishes for halibut in the waters surrounding the islands. They also have a processing plant that fillets and freezes the halibut and ships it to various markets. In the mid-2000s the community began experiencing declines in their halibut catches surrounding the village. They were not sure whether these declines were linked to environmental conditions or to overharvesting in areas closer to the island. This localized depletion was of significant economic concern to the community because most fishermen from St. Paul were day fishermen, meaning that they took day trips in smaller vessels and came back home after fishing each night. Their fleet and style of fishing was not capable to moving further out to sea in areas where there continued to be more halibut. Because of the IPHC's localized depletion policy, the community of St. Paul had a very difficult time getting IPHC to pay attention to these declines and the mechanisms behind them. Without this kind of research, they also found it difficult to develop management strategies that could help replenish their local fisheries.[252]

Fishermen in Old Harbor have experienced converse, but equally challenging problems associated with the IPHC's localized depletion policy. Because the IPHC is

[252] This assessment of the issues of the fishery on St. Paul are taken from notes of an unrecorded interview that I conducted with a fishermen from St. Paul island in July 2007. I traveled to St. Paul island and was able to observe their halibut fishery for two weeks in the summer of 2007.

generally only concerned with issues and depletions of halibut stocks as the scale of the regulatory areas, fishermen from the rural village of Old Harbor have found themselves unfairly punished for localized depletions that have occurred in urban areas that are far from their community but are still in the same regulatory area. A Gulf of Alaska community spokesperson described the issue in this way during her testimony to the North Pacific Fishery Management Council:

> We ask the council to remember that Alaska's remote fishing communities must have maximum sustainable flexibility and utilization of local resources. These communities are generally very low impact on the resource but their economies are too often driven by high impact areas far from their shores.[253]

This issue has come up most centrally in the halibut charter industry. Old Harbor has been working to develop a small charter fishing industry where they house and guide sport fishing tourists. While the charter industry is relatively small in Old Harbor and Kodiak Island generally, it has developed to outrageous levels in the more urban areas of Homer and Seward, Alaska (which are also in regulatory area 3A). The booming charter industries of Homer and Seward have contributed to extremely high catch levels of halibut at times nearing the level of commercial catches. They have also contributed to localized depletions in the halibut populations surrounding those areas. An Old Harbor charter operated highlights the challenge of this depletion for Kodiak based charter operators:

> What they've done is they've grouped the Kodiak with the Homer boats which doesn't really seem, they don't make a distinction, you know we're all 3B or 3A [3A in this case] or whatever and I mean, you look at the amount of fishing pressure, even from Kodiak's point of view, you know there's not many guides

[253] Gale Vick, GOAC3 public testimony at North Pacific Fishery Management Council meeting 10/4/08

> there and you look at our fishing pressures and I mean we fish 40 miles, 20 miles in each direction, you know for 8 – 6 boats there's no way we're wiping the halibut out here.[254]

The charter depletions have led both the IPHC and the North Pacific Fishery Management Council to develop mechanisms to regulate and reduce the impact of the charter fishery. Policies have included a moratorium on charter permits, which means that no new individuals can enter the charter industry in area 3A without another charter operator dropping out. They have also established further bag limit restrictions on sport fishermen, that have meant charter tourists can only take home one halibut per day as opposed to two[255]. The difficultly for Old Harbor is that these charter policies have applied to them, even though they have not experienced the same localized depletions as the Homer region. The moratorium is especially difficult because Old Harbor has few avenues for economic development and with the moratorium one potential avenue – charter boat operating – has essentially been blocked for Old Harbor community members.[256]

Further examination and conversations with the IPHC staff reveals just how arbitrary the choice about what scale of the fishery to focus on as well as the decision regarding what scale constitutes a 'localized depletion' can be. When I asked the IPHC director why the Commission has a policy not to focus on localized depletions, he gave a somewhat nuanced response. He said that halibut have a "fairly broad basis to the

[254] Interview, Old Harbor fisherman 7/31/08
[255] These policies have been set by the North Pacific Fishery Management Council with significant pressure from the International Pacific Halibut Commission. Charter bag limit restrictions for area 3A were set at the NPFMC meeting in October 2008.
[256] Interview, Old Harbor fisherman 7/31/08

production"[257]. By these he means that because halibut can move so much, processes that contribute to the production of the stock happen on a broad scale. He said the following about localized depletions:

> That doesn't mean that there aren't negative effects on an individual area [from localized depletions], but the point being is that there's nothing that you're going to do from a stock management perspective that's going to deliver more fish into that area because the recruitment process into there is a broad scale based thing and it's going to do what it's going to do.[258]

The IPHC director says that they tend not to focus on more localized depletions, because even if they were to be alleviated, they would not do anything to improve the status of the halibut on a broader scale because addressing localized depletions does little to improve broad-scale processes like recruitment that could lead to increases in halibut populations throughout the regulatory areas or throughout the fishery. But, in his statement, he also makes a subtle prioritization about what scales matter. These "individual area[s]" that experience the "negative effects" of localized depletions are of less concern than broader scales such as regulatory areas.

A possible assumption in his assessment about localized depletions is that all fishermen can move to in order to fish in areas throughout the scale of the regulatory area. So if there is a localized depletion in a small area, that is not a concern because fishermen can move to other spots within the same regulatory area of the fishery. They still have access to the same amount of fish in the regulatory area, they just might have to move to different areas in order to catch it. The problem is that not all halibut fishermen

[257] Interview, IPHC director 4/09
[258] Interview, IPHC director 4/09

are willing or able to move distances on the scale of the regulatory area. Small boat operators and community-based fishermen, like those from St. Paul, are less able to move to fish in new areas if a localized depletion takes place. Therefore, localized depletion policies might unfairly discriminate against smaller scale and less mobile halibut fishermen – this can often include more economically disadvantaged fishermen who lack the means to purchase and operate larger vessels that travel farther distances.

When I asked the IPHC director what scale constituted a localized depletions he had a bit of trouble pinning down the definition. He said, "that's a good question. I don't think I have an absolute standard for that."[259] Although he mentioned that the answer depended on two factors, "the effective radius of the harvester of that area and it depends on the movement patterns of the fish that are in that area."[260] What I asked him, if after the movement to a coastwide assessment of the fishery, the regulatory area scale ceased to matter, he replied, "No, no it does. It matters very…That's how we're managing. We're not managing on a coastwide basis. We're still managing on a regulatory area basis."[261] With this statement he clarified that for halibut scientists and managers, the regulatory area scale continued to be of significance.

The IPHC director made the following statement at the North Pacific Fishery Management Council meeting in Anchorage when he was asked to clarify their position on localized depletions:

[259] Interview, IPHC director 4/09
[260] Interview, IPHC director 4/09
[261] Interview, IPHC director 4/09

> Historically when people are talking about local area depletion, they're talking about extremely small local area depletion – you know Sitka, Juneau, Ketchikan, things like that. Um and the Commission has not argued that that is a stock management issue. That may be a local management issue but given the replenishments that we had, we had as far as we'd seen the fact that stock movements are substantial, we don't regard that as a stock management problem. Um, we certainly regard regulatory area which is the 2B/2C type of scenario as a stock management problem.[262]

In this statement in a more official setting than my interview, he highlights that the IPHC continues to see importance and focus management attention at the regulatory area scale. When, however, I asked him if then his definition of a localized depletion at least meant something smaller than the regulatory areas scale, he said, "yes, yes. I mean, that's a…I don't think there's a good answer to that."[263] First agreeing to the statement, but then hedging his bet.

The fact that the IPHC director can't completely agree that localized depletions always constitute a scale smaller than the regulatory area, highlights the potentially arbitrary nature of IPHC scale choices in the fishery. Halibut research about the spatial structure of the stock reveals that it might be possible for certain regulatory areas in halibut fishery to become depleted without impacting the overall production of the stock. Regulatory areas at the edge of the halibut's range such as area 2A and to some extent areas 2B and 2C which are on the southeastern edge of the fishery, are not believed to be the productive centers of the fishery. IPHC scientists believe that these regulatory areas benefit largely from in-migration of fish that were produced (hatched and reared) in other

[262] Interview, IPHC director 4/09
[263] Interview, IPHC director 4/09

areas.[264] If fishermen in these areas were to overharvest local halibut resources to the point of collapse, this might not have much impact on the halibut fishery as a whole. But, the depletion of halibut resources in those regulatory areas *would* have significant and lasting impacts on the economic conditions of those regions in the fishery. A collapse would contribute to an economic disaster for the communities surrounding those regulatory areas. This would be especially significant because one of those areas – 2B – constitutes the entire Canadian portion of the fishery.

The goal of conducting this analysis and questioning about localized depletions is not to try to pick apart the IPHC's directors statements or to specifically try to catch him on an inconsistency. In fact, I am not suggesting that the IPHC decisions about scales are necessarily inappropriate. The IPHC is guided under an international treaty that directs them to manage the fishery on a broad scale. They operate on a limited budget and do not have the resources to focus on every little problem within the fishery. But, I do think that the director's struggles to answer these questions highlight a larger concern that is not his issue alone, but is one that he inherited with the job of directing the research and assessment activities of IPHC. Namely it points out that decisions about scale are not straightforward and they are also not completely biological. Ultimately, decisions about scale are value questions and not biological ones. Although they require input of biological information about the spatial scales upon which halibut stocks produce, they are grounded in economic political decisions about what scales and what areas matter more from the standpoint of sustaining stocks in those areas.

[264] IPHC staff 2009. International Pacific Halibut Commission Eighty-fifth Annual Meeting Handout. Vancouver, WA.

The above overview of the difference between Old Harbor and IPHC's approaches to scale shows how different scales can matter to different groups. The IPHC with their international initiative is concerned with stock conservation on broader scales in the fishery. Small communities like Old Harbor and St. Paul, on the other hand, are concerned with conservation on a smaller-scale. Since they operate community-based fishing initiatives where they tend not to travel long distances, conservation at scales smaller than regulatory areas – at scales the extent of their fishing grounds – are more relevant to their needs. To these smaller communities a localized depletion that might not be a concern to IPHC managers could be devastating to their fishing livelihoods.

The IPHC director does make an important point in his discussions about localized depletions, though. In the IPHC's eyes, paying attention to localized depletions in one part of a regulatory area is sort of an allocation question – it focuses on how much halibut different regions within one regulatory area get. According to the conventions guiding the IPHC's activities, questions of allocation beyond the regulatory area level are not under the purview of IPHC but are "the business of governments."[265] This means that questions of localized depletions can and should be addressed by the fishery agencies of the United States and Canada who are charged with regulating and allocating their shares of halibut, in Alaska the agency charged with that would be the North Pacific Fishery Management Council (NPFMC).

One of these mechanisms has been the development of Local Area Management Plans (LAMP). These are management plans established by the NPFMC to provide for

[265] Interview, IPHC director 4/09

management of resources on a smaller scale. LAMP plans have been established (to varying degrees of success – mostly unsuccessfully) in parts of Southeast Alaska. The difficulty with IPHC's decision to devolve all issues relating to localized depletions to the respective governments is that the IPHC conducts the majority of research on the fishery. If the IPHC can't or won't focus research attention on the mechanisms behind these localized depletions, then the governments may not be able to develop appropriate management plans to address the issue.

IPHC decisions about scale in the assessment and regulation of the fishery tend to dominate Pacific halibut fishery management, even when policy decisions are made by the US government's NPFMC. Decisions about scale have very real consequences for different kinds of fishermen participating in the halibut fishery. It seems that more broad scale approaches to management have presented particularly difficult challenges to small, remote, indigenous fishing communities such as Old Harbor and Saint Paul.

In addition, if you closely examine the processes by which halibut scientists and managers make decisions about scale, you can see that issues of scale are rooted in political questions about value and economic priority. Yet, currently most of the decision-making surrounding scale in management of the fishery is made by scientists at the IPHC. The IPHC has done a good job trying to navigate this issue under the difficult political position in which they are placed. However, because these issues of scale are so rooted in questions of value, I believe that it is important that scale decisions are brought to the forefront and in some way opened to a public process for debate and review.

A closer examination of Old Harbor fishing geographies, reveals that their approach to the fishing landscape is of a fine scale and is connected to community – for example fishing spots might be known by the community members who fish there. This means that many of Old Harbor's approaches to the landscape are 'off the map' they are of too fine a detail or connected to community ideas that could not easily be transported outside the region. This approach to fishing geography gives them a small kind of power. It means that they are able to keep ideas about the best places to fish away from outsiders and become local experts about fishing in the areas surrounding the community. But, the IPHC approach to scale in the fishery holds perhaps an even greater power in the fishery because it becomes institutionalized into regulatory protocol. IPHC's approach to scale has meant that Old Harbor's small-scale issues are ignored by biologists who are focused exclusively on large-scale problems in the fishery

Many Old Harbor fishermen are well aware of the impacts that spatial decisions by halibut managers have on their fishing activities. Several community members have been involved in strategies to reshape halibut fishery management in a way that better accommodates their scale of interest. Most prominently, community-based fishermen from all around Kodiak have worked on a process to get a local area management plan (LAMP) developed for salmon area K, which encompasses most of Kodiak Island. With a LAMP, Kodiak halibut fishing issues would be separated from the issues in Homer and Seward. So far efforts to establish a LAMP in Kodiak have been stalled. But this represents one mechanism by which Old Harbor community members are working to re-imagine fisheries management.

Places of Power:

As a result of political and historical processes, the majority of the biological and regulatory decisions about the Pacific halibut fishery are made in the cities of Anchorage and Seattle. Following the 1976 Magnusson-Stevenson Fishery Management and Conservation Act, the North Pacific Fishery Management Council staff offices were established in Anchorage, AK, and although their meetings move throughout the region, the majority of them take place in Anchorage. Because William F. Thompson, the IPHC's founding director, had and wanted to maintain connections with the University of Washington School of Aquatic and Fishery Science, the IPHC offices are located in Seattle, WA near to the campus (Dunn 2001). These historical and political processes have meant that agencies in the places of Anchorage and Seattle, have a bulk of the power in dictating the terms through which the halibut fishery is regulated. In the spatial convergence of the halibut commons, not all places are created equal. In this section I will discuss what it has meant for Old Harbor to be a rural, remote community connected to a fishery system where the majority of policy decisions are made in faraway urban areas.

In some ways the remoteness of Old Harbor has served as a source of subversive power for Old Harbor fishermen. Because Old Harbor is off the road system and so small, with a population of only 200, it doesn't figure much on the radar screen of enforcement officials. This has meant that for subsistence and sport fishing activities, Old Harbor community-members can mainly fish as they want. When I asked one community member how she felt about the regulations guiding subsistence fishing in Old

Harbor she laughed and said, “I don’t pay attention to em. I really don’t. It’s out there it’s our resource we can fish it and no one’s gonna tell me I can’t I don’t have - I’ve never filed for a subsistence license not since I was young.”[266]

Other community members were a bit more wary. They worried about getting caught by the state trooper. There are only a few state troopers based out of Kodiak who are responsible for monitoring and enforcing fishing regulation for the entire Kodiak Island as well as the Pacific side of the Alaska Peninsula[267]. Give that they have such a large jurisdiction, these officers have gotten surprisingly good at monitoring the region. One of the state troopers has a pilot’s license and flies a float plane around the island, observing potential fishing violations from the air and landing to issue tickets. Under this enforcement approach, a few Old Harbor fishermen have been caught for illegally setting pots for crab[268]. When I talked to one of the state troopers about his approach to enforcement, he said that he was more strict in enforcing subsistence violations around the city of Kodiak (what he calls “town”), “but still, in the villages, it truly is a subsistence life out there, and so I’ll give them some slack, basically.”[269]

While the rural nature of Old Harbor may have given them some power in evading enforcement of subsistence and sport fishing regulations, this remoteness does little to help them gain advantage in commercial fishing. Commercial fishing is tightly regulated at the ports where halibut resources are sold. If an Old Harbor halibut fisherman wants to sell any halibut to a processing plant, he must have the quota shares

[266] Interview, Old Harbor fisherwoman 10/26/08
[267] Interview, State Enforcement Official 7/13/08
[268] Old Harbor field notes 2008
[269] Interview, State Enforcement Official 7/13/08

and paperwork necessary to do so. Old Harbor residents can participate in informal selling of halibut they catch (where they clean the halibut themselves and send it to people they know) and this does happen a bit in the village[270]. This kind of selling of halibut is permitted up to $300 as customary trade of the resource and given the limitations of processing halibut in the village it is unlikely that this kind of informal or underground commercial sale could reach levels much greater than that.

As the fishing fleets surrounding Kodiak Island grew in size, regulators started making more restrictive and sweeping decisions about the use of the fisheries. Since the majority of these commercial fishing regulations are made in urban areas, fishermen from rural villages found themselves out of the loop on management decisions that ended up having a big impact on their fishing careers. Many fishermen that I talked to reported that they learned this lesson the hard way in 1995 after the implementation of the IFQ program which initiated privatization of the halibut fishery. In the next section, I will describe how the IFQ program had significant and long-lasting negative impacts on fishermen in Old Harbor.

About the IFQ program, one Old Harbor fisherman told me that, "I didn't know about it until after it happened, you know it was just too late."[271] Some fishermen reported that they had no idea because they were out herring fishing when the decision was made. The program was implanted prior to widespread use of the internet, so it was very difficult for Old Harbor residents to get information about policy processes taking place. Another Old Harbor fisherman told me about the IFQ program, "I mean I was

[270] Old Harbor field notes 2006-2009
[271] Interview, elder Old Harbor fisherman 7/27/08

paying attention, I was against it you know and stuff but I wasn't engaged in the process of which I should have been."[272] Although he was aware of the potential policy, he did not go to Anchorage for the political meetings when the decision was made.

In 1995, the halibut fishery was privatized under an Individual Fishing Quota (IFQ) program where individual halibut fishermen were issues rights to shares (or pounds) of halibut based on their fishing history. The program included something called a Community Development Quota (CDQ) program where rural, Alaska Native villages in the Bering Sea were awarded set amounts of quota shares that they could lease to community members to fish. These rights to halibut shares have served as a source of economic development for Alaska Native villages in the Bering Sea. Unfortunately, that program was not implemented for the rural communities on Kodiak Island. When I asked a politically-active Old Harbor fishermen why CDQ's weren't implemented in the Gulf of Alaska region he said simply, "the main reason that we didn't get anything was cause we weren't at the table and you know, whose fault is that?"[273] They missed out on an opportunity that could have protected many Old Harbor fishing careers and even potentially led to the development of more fishing opportunities, all because they weren't at an Anchorage meeting.

After the IFQ program was implemented, several Old Harbor fishermen made a commitment to never be out of the loop on another important fishing policy again. It turned out that this decision to be politically engaged in the processes relevant to their

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[272] Interview, Old Harbor fisherman 8/27/08
[273] Interview, Old Harbor fisherman 8/23/08

local fisheries, required substantial effort and came with significant cost. The North Pacific Fishery Management Council meets five (!) times a year for a week or two at a time in order to make decisions about Alaska's fisheries. Usually three of the meetings are in Anchorage, one is in more rural fishing community, and one is in Washington State. The State of Alaska Board of Fisheries, which sets regulations for the state's fisheries most significantly salmon, meets 4-6 times a year in different parts of the state.

In order to participate in policy processes, Old Harbor fishermen also help organize Alaska Native voices by attending the annual Alaska Federation of Natives (AFN), conferences, they have traveled to Washington DC to lobby politicians, and this is not to mention the numerous subsistence, community, and fisheries related boards, meetings, and public processes they try to attend. Given these commitments, most Old Harbor fishermen have decided not to attend the IPHC meetings to participate in catch limit negotiations. Not that the IPHC makes it easy. In the last ten years only one of their annual meetings was held in Alaska. This is despite the fact that Alaska accounts for more than 75% of the total halibut catch in the fishery.

The commitment to be engaged in political processes comes with significant costs to fishermen from remote communities. These are costs that fishermen living in cities like Seattle, Anchorage, and even Homer, do not have to bear because they tend to have more easy access to a lot of the public processes. Travel in and out of Old Harbor for these meetings is draining and expensive. To get to Anchorage, village residents must first take an unreliable flight on a bush plane to Kodiak (which is often canceled due to weather complications).[274] Then they must fly Kodiak to Anchorage which is a short one hour flight, but is often delayed or canceled due to fog. Travelers can often be stuck on one leg of this trip for days. The airfare for this trip costs at least $600. Getting out to Seattle, or Washington DC is of course even more complicated and expensive.

Staying politically involved requires a nearly insane investment of time. For fishermen this is time that they could have been spending fishing and practicing a subsistence lifestyle. It is kind of ironic that in order to be engaged in political processes to protect their community's fishing and subsistence lifestyle, Old Harbor residents have to be involved in bureaucratic processes completely away from it.

Importantly, political engagement also takes away time that they could have been spending with their family. One politically engaged fishermen from Old Harbor told me that he ended up having to spend a lot of time away from the family he said, "you know I've - ask my wife and my kids - when I wasn't home fishing I was gone 2 or 3 weeks a month all winter I come home for a week or two, change clothes, get settled in with the family and, and so I sacrificed a lot and I regret it."[275] But when he thought more about what the consequences might have been for community-based fishermen in Old Harbor if he hadn't been at meetings to stop damaging policies, he qualified this regret, saying, "So um not that I regret you know cause I believe that I mean I guess the rewards are that I believe that we would have really been ran over the top of."[276]

[274] Old Harbor field notes 2006-2009
[275] Interview, Old Harbor fisherman 8/23/08
[276] Interview, Old Harbor fisherman 8/23/08

One last challenge that Old Harbor fishermen face when they are involved in political process is related to geography and scale. When community-members go to policy processes to advocate for fisheries issues, they are only able to speak on behalf of 200-300 people who live in their village. When policy-makers are considering comments from hundreds of different interest groups throughout the state, these comments might not hold very much weight. Because of an issue of scale, community issues are not always at the forefront of policy decisions.

Community members from Old Harbor have come up with a number of unique strategies to overcome the challenges and power differentiation associated with management decisions being centralized in urban areas. As a response to realizing that he was caught off guard by the IFQ decisions, one fisherman told me, "that's why my boy moved to Kodiak so we can stay on top of what's going on." He literally had his son move into Kodiak to better keep the family abreast of fisheries issues. Several other communities, partly due to the stress of traveling out of the village so much for meetings, ended up moving to Anchorage. These community members live in Anchorage for the winter months where they are able to participate in political processes and live in Old Harbor in the summer to fish. Although, this kind of outmigration is not without its own set of difficulties and challenges both for the community members who stay in Old Harbor and for those who move.[277]

In the late 1990s Old Harbor fishermen and group of representatives from small fishing communities throughout the Gulf of Alaska gathered together to discuss common

[277] Old Harbor field notes 2006-2007

challenges of trying to stay involved in fishery management processes. They decided to form an organization that was dedicated to articulating small community interests in the larger fishery political processes and to developing policy strategies that protect and rebuild fishing interests in these resource dependent communities. The Gulf of Alaska Coastal Community Coalition (GOAC3) was a means by which these small and dispersed communities could work together to cultivate a strong political voice in the fishery. They maintain a staff to keep abreast of fishery politics and organize political opposition or support for key issues. This staff lobbyist assures rural fishermen that they will have someone with their interests at heart attending every meeting even if they cannot make it.

The GOAC3 has also been very politically strategic in developing political alliances to protect small community interests in the fishery. One of their board members is also a voting member of the management council. This means community-based interests continually have a voice and vote at every meeting.

One of the ways that GOAC3 has reasserted community ideas about fish property rights is through work they have done to shape fisheries policy discourse in a way that brings increased visibility and support to coastal community interests and understandings of fish resources. The mission statement of the organization is:

We believe:
People and Communities are Inherently Valuable
Communities Need Economic Opportunity Based on Sustainable Resource Use
Truth and Fairness Are Essential[278]

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[278] Mission statement for Gulf of Alaska Coastal Communities Coalition (GOAC3) http://www.goac3.org/

As a result of GOAC3's efforts, the word community has come to be utilized in fishery policy debates with a very specific meaning. In the fishery world, 'community' refers to small, isolated, rural, populations that are actively involved in fishing for economic and cultural reasons. By claiming the romantic concept of community as their own, GOAC3 garners important sympathy and visibility from policy makers. As a result of their efforts almost no fisheries policies are passed in Alaska, without the Council first considering how these policies might impact "communities".

Reflections:

Throughout this chapter, we can see that geography and space can play a large role in producing certain kinds of inequities within governance of the commons. While successful management of the commons connects all users of a resource from many different places throughout the range of the resource, for the most part management decisions end up being carried out in only a few more centralized and often urban places. This situation means that rural and remote communities will tend to have greater challenges associated with being involved in management compared to their urban counterparts who can more easily access the bureaucratic procedures.

This chapter also gives a small insight into the notion that different interest groups within the commons can have very different ideas about what places and space within the resource's range mean. For example, while Old Harbor fishermen view the bays and oceans surrounding Kodiak Island through the lens of memories and a history of experiences that took place there, IPHC scientists map these same regions with an interest of developing ways to better divide and analyze statistical data. Additionally, while the IPHC has a specific commitment to focus their attention on large scale processes in the halibut fishery, Old Harbor geographies have shown an attention to finer scale detail and movement in the fisheries near their community. Because IPHC approaches to place are institutionalized into management processes, these ideas dominate those from communities like Old Harbor. This domination can contribute to negative impacts on Old Harbor fishermen as well as their geographies.

In this chapter, I argued that fisheries management is something that is conducted significantly through space. Once we see that spatial strategies such as the delineation of regulatory areas and decisions about scale play a large role in structuring and ordering the lives and work of fishermen, we realize that these decisions need a great deal more attention and scrutiny. The ability to control spatial decisions of the fishery, gives fisheries scientists a surprising amount of control over fishermen in the fishery (about which many scientists may be unaware). Many spatial decisions like the development of statistical and regulatory areas and choices about scale have been considered strictly biological and as a result have been relegated to scientific staff at the IPHC. But a closer analysis reveals that many of these decisions involve political and value judgments.

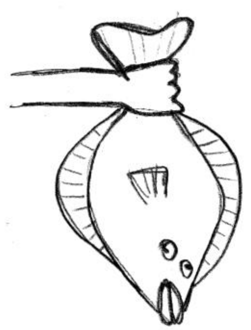
There are a few specific ways that fisheries management could be adjusted to overcome the social justice concerns associated with spatial decisions in the fishery. First, managers could work to develop a more transparent and systematic process through which decisions about area delineations and scale/localized depletions are made. Right now the processes behind these decisions seem fairly arbitrary and they are not explicitly articulated in any formal document. In addition, the decisions are almost exclusively made on the fly by a small number of IPHC scientists. These decisions should be better opened up to public debate and input.

Second, managers could work on developing better ways to consult with communities and understand community needs and interests in the fishery. This could include having managers themselves as well as researchers travel to communities to better see what their interests are. To some extent this is already happening. The Alaska Fisheries Science Center (NMFS) now employs anthropologists and social scientists to conduct research on different fishing communities in Alaska and report these findings to decision-makers.

Finally, managers could look to help institutionalize and fund the community organization process that takes place in the GOAC3. One of GOAC3's biggest issues is getting enough funding to stay afloat. If this group could have more consistent funding – or somehow be associated with the Council itself, it might be better able to last. The NPFMC currently has a statistical and scientific advisory committee and an advisory panel (of industry representatives) that offer the Council advice before they make decisions. The NPFMC could also consider developing some sort of community panel or advisory committee that plays a similar role providing advice and comments about community interests in particular policy issues

Old Harbor has already acted in many ways to influence the nature of the halibut fishery commons and ensure that their ideas about place and scale are incorporated into regulatory structures. These efforts have included welcoming researchers to study and communicate information about Old Harbor as a place, working to develop a Kodiak Island local area management plan, and developing a non-profit community coalition to advocate for community interests and ideas. We can learn a lot from these efforts as well as work to strengthen and institutionalize them. Their articulated visions for change in the management process can help to provide a path for a way that fisheries management can incorporate multiple ideas about scale and place as well as work to equally address rural and urban concerns within fisheries management.

III. POSSESSING A MYSTERY



Chapter 9
Notes from the Field

That Morning

28 June 2008

I woke up at about 6:00 this morning to hear the sound of the CB radio again crackling into place. Then the distinct line: “may-day, may-day, we have a man in the water”, “repeat, may-day, may-day, we have a man in the water. He has been there for 20 minutes.” My mind was racing trying to figure out what this could refer to. My immediate thought was that it must be the call for help from a fishing vessel out in the waters near Old Harbor where one of the crew had fallen in. As many may know, the term “man in the water” takes on new significance in Alaska where even in the summer water temperatures are in the mid-thirties. Once they hit the water, people do not have a lot of time. I turned out to be completely wrong. The call came from an incident that took place on the Old Harbor community dock, where two young boys (age 19) were hanging out after an intense night of drinking. Through some kind of accident one of the boys had fallen in the water. The other boy tried and failed to rescue him. The combination of the alcohol in his system, his inability to swim, and the temperature of the water, meant that he was on the path to death the instant that he fell.

Later the coast guard helicopter arrived. It began to conduct searches back and forth along the shore, looking for the body. As more time passed it became clear that they were no longer looking for a live body. The area near to the dock was filled with the muffled sounds of friends and family crying. Then a car arrived carrying the missing boy's sister. I heard a blood curdling scream – "my brother, I want my brother". The helicopter search continued and the coast guard deployed divers to search the water. They soon find the body. He was wrapped around one of the legs of the dock, probably trying to climb back up, but weighted down by his sweatshirt. The rescuers brought the body around into the harbor and carried it up the dock into Old Harbor's lone ambulance. Friends and family began openly crying, wailing, screaming at the sky.

The toughest part about this scene is that this was "nothing new" (quote from one of the most unsentimental elders I have ever met). Several other community members had died in alcohol-related drowning or accidents in recent years. The boy's brother had jumped off the bridge in a successful suicide attempt four years ago. For the family this was another brother, another son. Deaths or near deaths from alcohol related instances are all too common in Old Harbor.

It might be difficult to argue that issues with fishing are responsible for Old Harbor's high rate of suicide and alcohol related mortality. There are so many factors that can be linked to these difficulties of life in the village – historical trauma, poverty, and colonialism to name a few. The villagers conjecture many such reasons. However, at the same time, this death and others are not unconnected from the fisheries. Changes in the structure of fisheries management and allocation procedures have made commercial fisheries like the halibut fishery more exclusive and difficult to enter, particularly for community-based fishermen. Old Harbor residents are literally surrounded by thriving fish populations that they do not have the rights to commercially fish. This loss of fish access has led to a significant decline in commercial fishing participation in the community. The decline in fishing participation has left what villagers refer to a lost generation of born fishermen who are unable fish. This has been particularly difficult for men within the village who are attempting to re-figure out what it means to be masculine without participating in fishing labor. Many community members believe a loss in fishing has contributed to increased substance abuse and suicide. In a way, this connects fisheries managers, policy makers, and even fishery biologists, with the boy who fell off the dock today.

This type of link is one that conservation biologists and other environmental scientists have a difficult time articulating and exploring. The connections between all of these things is not linear. It requires broad thinking. The answer to the questions: how did things get to be the way they are? why are things so hard? cannot be answered with cause and effect understanding. The reasons are diverse, diffuse, and elusive. The ecological and social world of fisheries and the community of Old Harbor is a vast web, snarled up like the ropes in a hopelessly tangled fishing line.

Chapter 10
Old Harbor Stories

The One Where He Chased Him Down Deadman's

One afternoon a bunch of boats were fishing for herring near Deadman's Bay which is a very long and deep bay. Carl Christiansen Sr. (Old Harbor born and raised) and one other outsider-operated vessel were at the mouth of the bay when they both heard over the radio that there was a school of herring down at the very end of the bay. Both boats made a mad dash to try to get to the school of herring first. The outsider boat was further inside the bay when they got the call, so it had a distance advantage. Carl called his crew to run the boat at full steam. They began throwing things (extra drums, equipment, anything unnecessary) off the back of the vessel in order to lighten it so it would go faster. They began catching up, but by the time they got to the end of the bay, the outsider boat had already reached the school of herring. His skiff man had stretched the net and was beginning to pull it in a circle to make a haul. Carl rode ahead at full steam, then pulled back on the throttle and jumped over the herring net. He then drove his vessel in circles inside of the net causing all the herring to run out of the net through the hole where the set had not been completed. After he finished, the vessel operator of the outside boat pulled down his window, looked at Carl and said: 'This sure is a heck of a way to meet Carl Christiansen!'

I heard this and many other stories about the ‘territorial fishing days’ from many Old Harbor community members including Carl Christiansen Sr.[279] himself. These stories originate from a period of time from the 1970s to the1990s when the Old Harbor salmon fishing fleet was large and dominated the local fishing spots. Old Harbor fishermen would often work together and use forms of intimidation to protect local spots and keep outsider fishermen from fishing in their region – at least until Old Harbor fishermen had filled their boats.

I heard the Deadman’s bay story many times during my stay in Old Harbor from different fishermen as well as from Carl himself. I believe that the story reveals something about Old Harbor’s orientation towards fish property rights. The actions of Carl Christensen reflect an idea about who has rights to fish in the region of Kodiak Island surrounding Old Harbor and who doesn’t. In the story, Carl Christiansen takes great pains to ensure that this outsider boat catches no herring; even though Carl’s efforts will not get him any herring catch either. He expends energy and fuel that he could be using to catch fish elsewhere in order to make the statement that outsiders do not have a right to local fish. The outsider fisherman’s response: ‘This sure is a heck of a way to meet Carl Christiansen!’, shows that even outside of Old Harbor, Carl’s reputation as a territorial fisherman preceded him.

Carl’s actions as an aggressive and territorial fisherman indicated a clear orientation with regards to fish-property rights. They reflect a logic of adjacency – an idea that fishermen who live next to resources have more of a right to catch fish in those areas. In addition, the fact that these stories are told so frequently and with such nostalgia

[279] Carl Christian Sr. consented to use of his full name in interview and story accounts

in Old Harbor *today* show that these ideas about fishing rights, whether they are enacted or not, still persist in the present.

This section deals with ideas, discourses, and actions surrounding fish property rights in the waters of the Gulf of Alaska surrounding Old Harbor. I will examine negotiations and consequences when different ideas about fish-property rights are brought together in the commons. In particular I will explore how Old Harbor ideas about fish-as-property interacted with and were impacted by the import of private property structures into the Pacific halibut fishery. In the next section, we will see that when the right to fish is converted into private property, fishing rights become something that can be taken away and fishermen, people, and communities can become dispossessed.

Chapter 11
Analysis

Allotting the Oceans: Fish possession and dispossession in Old Harbor surrounding the 1995 privatization of the Pacific halibut fishery

Every village on Kodiak Island sit there and from centuries back, in the diggings, archeological diggings, or whatever you call it, find fish bones, fish tools, hooks. And then they take the water away from us and give us land. How could we live without the water?

-Sven Haakanson Sr., Old Harbor, deceased[280]

In the above quote, Sven Haakanson Sr. highlights the centrality of the ocean and its fish resources to Sugpiaq people who had been fishing and navigating the waters surrounding Kodiak Island for generations. The quote was recorded as part of a 1986 Alaska Public Radio program that reflected on the legacy of the Alaska Native Claims Settlement Act (ANCSA). ANCSA was the landmark 1971 policy that reinstated Alaska Native title to more than 40 million acres of land. While ANSCA granted title to land, it did not acknowledge aboriginal title to marine space or marine resources. Sven Haakanson Sr. laments the loss of ocean rights in favor of land rights because in the Sugpiaq community of Old Harbor, the ocean, perhaps even more than land, is an integral part of community life.

[280] Holding Our Ground: A Radio Documentary Featuring Alaska Natives Part 2. 1986 Alaska Public Radio Network http://www.ankn.uaf.edu/curriculum/ANCSA/HoldingOurGround/Holding2.html

Because the Alaska Native Claims Settlement Act purported to extinguish aboriginal claims to marine resources, it left Alaska Native fishermen from communities such as Old Harbor subject to state and federal authority with regards to fish access and management. In 1995, with a process not unlike American Indian allotment, the North Pacific Fishery Management Council (NPFMC – the federal agency charged with managing Alaska's fisheries) began allotting Pacific halibut fish resources to individual fishermen. Individual fishermen were granted property rights to a set amount of halibut based on their fishing history. These property rights called Individual Fishing Quotas (IFQs), became commodities that could be bought, sold, or traded on the open market. This fishery privatization scheme created a boon for historical vessel operators who were granted access rights to halibut resources at no charge. At the same time, it meant that any new fishermen would have to secure financial backing to purchase halibut quota and enter the fishery. The act of privatization was a watershed moment for the halibut fishery. With the IFQ program, the NPFMC established a new, culturally-particular property and ownership structure to the entire Alaska fishery system.

The privatization of the halibut fishery was so controversial at the time that the NPFMC initiated a five year moratorium on privatization procedures until they could properly observe the impacts of the program. In the years since, the program has been touted by environmentalists, economists, and managers as a success story and taken as a model in privatization schemes for a number of other fisheries (Festa et al. 2008; Fujita & Bonzon 2005; Garrity 2009). An article in the journal Science even goes so far as to suggest that catch share or quota programs like the one in the halibut fishery are the key to preventing global fishery collapse (Costello et al. 2008).

At the same time, though, a number of researchers have begun to pay close attention to some of the sociological impacts of fishery privatization and they have observed some troubling trends in a number of geographical contexts. Their research has shown that privatization schemes have increasingly marginalized small-scale, rural fishing interests who lack the resources to finance purchases of fish shares (Lowe & Carothers 2008; Carothers 2007). Research has shown that fishery privatization disproportionately impacts small communities generally and indigenous fishermen in particular (Carothers 2008; Carothers 2007; Carothers et al. 2010). These social justice concerns lead us to more critically examine the impacts of the halibut IFQ program on resource users and fishing communities. They also force us to revisit the narrative of the halibut fishery IFQ as a success story and to reconsider movements to implement privatization schemes on additional fisheries throughout the globe.

This dissertation deals explicitly with the idea of fish as mystery. It centers on the idea that elusive fish populations become vessels for different user groups to fill with different meanings. The commons creates a situation where many users must share a resource for which they have different knowledge and understanding. This leaves a space for politics and disenfranchisement where certain ideas about the resource can come to dominate and marginalize others. This chapter examines the negotiations surrounding different ideas about fish as possessions – that is ideas about who has more of a right to catch a limited number of fish resources or frameworks for fish property rights. With establishment of the IFQ program throughout the fishery, neoliberal ideas about individual property rights became the dominating idea about fish possession that supplanted all others. However, the individual property rights regimes inherent in the

IFQ system were not the only ideas about fish property rights in the fishery. Alaska Native fishermen exhibited a number of beliefs, values, and active systems depicting their own particular ideas about fish property rights, both historically and in the present.

In this chapter, I will examine the ways that community members from the Sugpiaq village of Old Harbor have navigated the implementation of this new private property structure to a fishery they had been participating in for generations. I argue that the import of a private-property system under the IFQ program worked to erode Old Harbor ideas and systems of property rights within their local fisheries. As a result, the IFQ program contributed to a dispossession of Old Harbor's fish resources and to devastating impacts on the livelihoods of community members. However, I will also explore the ways that community members have worked to reassert community ideas about fish property rights within the framework of this new IFQ system.

I will explore Old Harbor's experience with fishery privatization in four parts. First, I will discuss historical ideas about fish property rights or tenure expressed in Old Harbor's oral history, storytelling, and contemporary practices. Second, I will describe the cultural and historical rationale behind the 1995 decision to privatize the fishery. Third, I will describe the impacts of fishery privatization on fishermen and community members from Old Harbor. Finally, I will present some of the strategies through which the community of Old Harbor has acted to reassert their ideas about fish property rights and regain access to halibut resources.

It is important to note that the privatization of the halibut fishery applied only to the commercial sector of the fishery. Old Harbor residents still maintain the right to fish halibut resources for subsistence and ceremonial purposes. However, Old Harbor residents are not just involved in subsistence and ceremonial fishing, they also have actively participated in large scale commercial fishing since salmon canneries were established on the island in the late 1880s. Therefore, commercial fishing plays a large and vital aspect of local economy, culture, and identity.

Theoretical Framework

This chapter, like the dissertation, emerges from the tension between two disciplinary approaches to natural resource issues: Conservation Biology and Indigenous Studies. A Conservation Biology perspective is concerned with the status of halibut populations and the complex ecological communities of which they are a part. Conservation biologists focus on developing institutional and policy tools that promote the sustainability of fish stocks. Success of a tool like the IFQ program would be connected to its ability to limit overharvest of halibut stocks and promote sustainability of the fishery. The conservation benefits of IFQ programs have been well documented and espoused by proponents of fishery IFQ programs (Costello et al. 2008; Fujita & Bonzon 2005). Fishing quota programs can be a precise tool for limiting the amount of fish commercially harvested each year, since the size of individual shares goes up or down depending on the amount of fish or catch limits available each year. I will describe some of the conservation benefits of IFQ programs (and note that they are not the only fish property rights system capable of sustaining healthy fish populations) when I explore the motivations behind establishing the IFQ program. However, this chapter will focus primarily on the implications of the IFQ program from an indigenous studies perspective.

Many researchers have studied the sociological impacts of IFQ programs on fishing communities and have uncovered some alarming trends to suggest that fishery privatization can have negative impacts on small-scale fishermen and fishing communities (Lowe & Carothers 2008; Carothers 2007; Carothers et al. 2010). However, few of these researchers have explored the reception of IFQ programs from a historical perspective in order to consider how the IFQ program compared to concepts of fish property rights that persisted in communities prior to privatization. The erosion of pre-existing concepts of property rights might help to explain some of the negative impacts of the IFQ program. In addition, few of these scholars have examined IFQ programs from an indigenous studies perspective that considers how the IFQ program and its impacts on indigenous fishermen might be connected to a continuing context of colonialism. In an analysis of halibut quota-share transfers, Carothers et al. 2010 found that Alaska Native fishermen were more likely to sell or lose their quota and less likely to purchase quota shares than their non-native counterparts. This statistic alone calls for a more indigenous-focused examination of the IFQ program.

Although the concepts of fisheries privatization and transferable quota programs are fairly recent, indigenous communities have experienced forced privatization of their resources since the beginning of the colonial period. Colonial era research in Africa, Australia, and the Americas has shown that an important element of colonization has been the imposition of private property systems of land ownership onto indigenous populations (Ruppel 2008; Berry 2000; Meyer 1994). While the imposition of private property systems for land ownership has been a global phenomenon, this chapter will draw references from and comparisons to private property schemes imposed on American Indian communities in the form of allotment. American Indian allotment, through the Dawes Act of 1887, initiated a process of privatizing and allotting American Indian lands to individual tribal members (Otis & Prucha 1973; Ruppel 2008). Policy makers established allotment because they believed that a communal form of land ownership was one of the key impediments towards both the assimilation and economic development of American Indian communities (Ruppel 2008; Otis & Prucha 1973; Meyer 1994). With allotment, US politicians hoped that American Indian communities might shift to more agrarian forms of life and take on the economic model of the "Jeffersonian yeoman" (Ruppel 2008; Otis & Prucha 1973).

Despite the fact that the allotment policy contained certain kinds of protections to hinder the sale of land, the act led to large-scale losses of American Indian lands and a series of stifling land entanglements that continue to the present (Ruppel 2008; Otis & Prucha 1973). In the period of time from when it was initiated until it was finally repealed, allotment contributed to the loss of nearly 90 million acres or two-thirds of American Indian lands held in 1887 (Ruppel 2008). Many of these were choice lands for agriculture, forestry, grazing, and mining, leading to losses of sources of labor and economic development (Ruppel 2008; Meyer 1994). Reservations that have experienced large land losses as a result of allotment are often referred to as "checkerboards" because outsiders have purchased various land tracks within the reservation lands leading to a breaking up of contiguous tracts of tribal lands into a veritable checkerboard of tribal and non-tribal ownership (Meyer 1994). Researchers have also pointed out that in some instances American Indians utilized private forms of land ownership to their own advantage and one such strategy includes the development of trusts to buy back lands and ensure they remain protected for community ownership and use (Ruppel 2008).

Lessons from colonial land privatization can help us understand the impacts of fishery privatization on indigenous participants. In this chapter, I will examine parallels between the land privatization strategies such as allotment and the establishment of private property systems in the halibut fishery. However, because fishery privatization implants private property systems on mobile, elusive fish populations, these property structures and their impacts also differ from land ownership systems in important ways. In addition, the motivations for halibut fishery privatization were quite different from the motivation for land privatization strategies such as allotment. Fishery privatization was linked to concerns about developing economically-efficient strategies to conserve limited fish populations. Insights from this distinct fish-based form of private property can contribute to the ways that indigenous scholars think about private property systems and indigenous communities.

History: Emergence of the NPFMC as the community with regulatory and allocative authority in Alaska waters

North Pacific Fishery Management Council (NPFMC) is the institution that implemented the Pacific halibut IFQ program in Alaska waters. NPFMC, which is part of the United States federal government, is charged with managing and allocating fish resources in the US waters in the 200 mile Economic Exclusive Zone (EEZ) off the coast of Alaska. The council establishes regulatory policies and develops allocation plans for most of the fish stocks, including halibut, within the Alaska EEZ. Since Pacific halibut management is guided under an international treaty, the procedure for halibut management is somewhat complicated. The International Pacific Halibut Commission (IPHC) conducts biological research on halibut stocks and through six appointed commissioners establishes catch limits for each of the regulatory areas in the entire international fishery. The International Pacific halibut commissioners also delineate regulatory areas, control research agendas, and set the start date for the fishery each year. Once catch limits are established, the NPFMC then has the authority to make regulations about how those limited halibut resources are allocated and fished among different users in Alaska waters. Thus, the IPHC determines how many fish can be caught in Alaska and the NPFMC has authority to allocate and regulate the distribution of that fish. The NPFMC then is the governing body that establishes property rights regimes for Alaska's halibut fishery.

The NPFMC (or "the council") is one of eight regional fishery councils in the United States. The council is comprised of eleven voting members representing different agencies and jurisdictions. Six members are from Alaska, three are from Washington State, one is from Oregon, and one is a federal representative. Non-federal voting members represent state fisheries agencies, commercial and recreational fisheries, fishing communities, and the general public. Seven of the council members are appointed by the US Department of Commerce on recommendation of the governors of Alaska and Washington. The remaining four members are fixed – set as the directors of state and federal agencies. The council meets between five and six times each year to review and votes on regulations for Alaska's fisheries. These meetings are open to the public and include significant time for scientific and public testimony with regards to management decisions. In 2009, only one of the eleven voting council members was of indigenous decent and only two members appeared to specifically speak for Alaska Native and community interests.

The NPFMC has not always been the regulatory community with designated authority to allocate halibut resources in Alaska waters. Its emergence as the regulatory authority in Alaska's fisheries has a politically and culturally embedded history that is specifically connected to the colonial legacy of Alaska and the United States. Prior to Russian and US contact, Alaska Natives living on the coast practiced their own forms of resource tenure, allocation, and management. Archeological research on Kodiak Island suggests that pre-contact Sugpaiq engaged in territorial practices to protect resources and lands (Steffian et al. 2006). After their arrival in the 1700s, Russian traders forcibly assumed control over Alaska's marine resources. Russians forced Alaska Natives from Kodiak Island and Southeast Alaska as slave labor in the fur industry – leading to the near extirpation of local otter and seal populations (Harriman & Merriam 1902). In 1867, the US purchased Alaska from Russia. The United States did not honor Alaska Native title to natural resources and over time began to develop policies and institutions through which they regulated and allocated Alaska's fish resources.

The 1923 Halibut Convention between the United States and Canada put into place the International Fish Commission (which later became the IPHC), one of the first US institutions for regulating open ocean fish resources in Alaska's waters. In the early years the IPHC was not only responsible for conducting biological research on the fish species, they also promulgated regulations and coordinated enforcement (Bell 1981). The IPHC regulations were focused solely on the commercial fishery. The commercial fleet was not very large at that point, so the Commission did not make specific allocative decisions, and instead regulated for overfishing by establishing a winter closure, and in some years lay-up periods between fishing trips where commercial fishermen had to wait for a period of time after each trip before they could begin fishing again (Bell 1981).

The Halibut Convention established an international institution and directive for regulating halibut resources. At the same time, the United States government worked on their own to lay territorial claim to marine space and resources off the coast of the United States and to establish federal institutions to regulate and allocate these fish resources. In 1903, the United States government established a Bureau of Fisheries under the Department of Labor and Commerce for the purpose of studying and managing commercial fish stocks (Smith 1994). Overtime, the Bureau developed six regional offices, including one directed towards the Alaska region. When Alaska became a state in 1959, Alaska state government gained jurisdiction over the waters up to three miles off the coast, which included the bulk of the state's salmon resources. Since halibut is a bottomfish that spawns in deep water offshore, the management and regulation of all halibut, both within and outside of the state's three mile zone, has remained under federal and international purview.

Amid growing concerned about (1) the severe decline and near collapse of many of the United States' fish stocks, and (2) the proliferation for foreign fleets fishing off the US coast and gaining fishing income that the government believed should remain in the US, in 1976, the federal government passed a comprehensive fisheries legislation known as the Magnuson-Stevens Fishery Conservation and Management Act. The act established an exclusive economic zone (EEZ) 200 miles off the shore of the United States. The act stated, "United States claims, and will exercise in the manner provided for in this Act, sovereign rights and exclusive fishery management authority over all fish, and all Continental Shelf fishery resources, within the exclusive economic zone."[281] With this language, the federal government established sovereign authority over marine territory, while at the same time failing to recognize the aboriginal claims of multiple indigenous groups who had occupied and utilized those resources for centuries prior to colonization. The Magnuson Act also established the council systems and designated the North Pacific Fishery Management Council as the body with regulatory authority over the fish resources in Alaska waters.[282]

Some American Indian groups have been able to successfully retain aboriginal rights to fish resources under the Magnuson-Stevens Act through the framework of treaty rights. As a result of the 1974 Boldt decision, treaty-tribes in the state of Washington, including the Makah, Quileute, and Quinault, are allocated a percentage of traditionally harvested fish resources including halibut. The tribes then have the authority to allocate and regulate these resources as they see fit. Under a catch-sharing plan, treaty tribes receive 36% of Washington's halibut catch limit. Due to their unique political history, being first colonized by Russian and much later by the United States, Alaska Natives did not negotiate or sign treaties that might have granted them specific claims to marine resources. The one avenue by which Alaska Natives have been able to argue for resource access is through the development of legal forms of protection of the often narrow category of subsistence rights (Case 1984). Unfortunately, subsistence rights do not encompass the large-scale commercial fishing that Old Harbor residents have been involved in since the 1880s.

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[281] NOAA (National Oceanic and Atmospheric Administration). 1996. Magnuson-Stevens Fishery Conservation and Management Act. Silver Spring, MD: NOAA. Technical memorandum NMFS-F/SPO-23.

[282] The US Department of Commerce must first approve all Council generated regulations.

The 1982 Halibut Act established a framework for the way that the International Pacific Halibut Commission and the North Pacific Fishery Management Council would share their designated authority over the management and allocation of halibut resources. The Act authorizes the NPFMC to:

> "…develop regulations governing the United States portion of Convention waters, including limited access regulations, applicable to nationals or vessels of the United States, or both which are in addition to and not in conflict with regulations adopted by the Commission…If it becomes necessary to allocate or assign halibut fishing privileges among various United States fishermen, such allocation shall be fair and equitable to all such fishermen, based upon the rights and obligation in existing Federal law, reasonably calculated to promote conservation, and carried in such manner that no particular individual, corporation, or other entity acquires an excessive share of the halibut fishing privileges..."[283]

The Act assigns NPFMC the job of allocating halibut resources among fishermen – whether through limited entry programs or other means. But, it also states that NPFMC acts in addition to the Commission (IPHC) and its regulations shall not conflict with those of the IPHC. It is important to note that the act specifically states that allocation procedures be "fair and equitable". We will explore if that became the case with the IFQ program. The Magnuson-Stevenson Act and the Halibut Act established a legal framework that gave the NPFMC authority to govern the use of fish resources off the coast of Alaska. Through this history, the NPFMC has emerged as a community with regulatory authority in Alaska – even authority over Alaska Native fishermen who had been fishing those resources for centuries.

[283] 1982 Halibut Act as cited in (NOAA Fisheries Alaska 2010)

Old Harbor Ideas about Fish Property rights

Proponents of IFQ and similar fishery privatization programs advocate that they work to establish property rights for the first time on a completely open resource system (Fujita & Bonzon 2005). Oral historical research reveals that this was not the case. Instead, the IFQ program on Kodiak Island was established on top of complex conceptions and structures of fish property rights that had persisted for many years. These systems of fish use show a distinctly Old Harbor understanding of fish property rights that, while certainly rooted in the past, was also highly contemporary in form.

Often when scholars discuss indigenous land or marine tenure, they tend to describe practices from a deeply ancestral past (Bobroff 2001; Cronon 2003). However, many of these Old Harbor practices of marine tenure and ideas about fish property rights arise from the late 20th century and even today. Most of the accounts of fish use and property rights I use describe fishing practices from the 1940s onward. This section will explore Old Harbor *ideas* about fish property rights. Some of these ideas were actively practiced in local fishing systems and behaviors while others were expressed through Old Harbor stories and discourse about the fishing past and present.

Cabins, Families, and Partners

Residents from Old Harbor had a number of systems by which they diffused resource use throughout the seascape. Oral history accounts and present activities demonstrate that the community of Old Harbor has several cabin, family, and partner-based systems through which local fish resources were utilized and divided among community members. These fishing practices show an orientation towards fish use and distribution that is linked to networks of kinship, friendship, and community.

In oral history discussions with several elders, it was revealed to me that Kodiak Island used to have a dense network of hunting and fishing cabins. These cabins appeared to play an important role in diffusing resource use throughout the Kodiak landscape. When discussing the state of the island when he grew up in the 1940s, one elder told me: "Yeah people like here before they had cabins all over."[284] The cabins were primarily for hunting purposes, but some cabins were established for salmon fishing activities. In the winter months, Sugpiaq residents of the island would hunt and sell fox pelts as an extra source of income. On the south side of the island, summer cabins were built to support set-net salmon fishing during the summer months. The cabins were established far from the village and separated from one another as a means to disperse hunting and fishing effort throughout the island and not limit it to one area. The occupants of the cabin had temporary rights to the resources within its vicinity.

Old Harbor elders recount that cabins did not belong to individuals but rather to particular families. Through oral history accounts, one learns that in the early and mid-1900s, nearly every immediate family in Old Harbor established a hunting or fishing cabin in a particular bay of the region[285]. The majority of these hunting cabins have since been abandoned and demolished, but some bays near Old Harbor are still referred to by the names of families who owned cabins there (for example Newman Spit)[286]. Families

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[284] George Inga Sr. 7/23/08
[285] George Inga Sr. 7/23/08, Paul Kahutak 7/23/08, Paul Kahutak 7/27/07
[286] Interview, Old Harbor resident 10/19/08

had the right to use resources of the area while they were staying at the cabin, "but after they go home and they went back, anybody could hunt any place."[287]

While few of the cabins are still in use, Old Harbor residents report that a family-level organization of resource use and access still persists in the subsistence fisheries of today[288]. One fisherman told me that there are particular fishing spots around Old Harbor known to be fishing grounds for particular families – that "families here fish in different spots than other families."[289] If a fishing spot is known to be associated with one family, other families and fishermen stay away.

Another important organizing structure in the distribution and use of local resources is the concept of partners. Oral history and ethnographic accounts indicate that the notion of partners in hunting in fishing has persisted for many years. Elders still use the term *anagyuk* which is the Sugstun word for partner[290]. Partner does not refer to a romantic relationship, but rather to a deep friendship between two individuals that has emerged out of shared experiences hunting and fishing throughout the island's seascape. Many Old Harbor residents (men in particular) had one set person that they went hunting and fishing with. In the present, partners tend to persist more in subsistence fishing activities, but in the past, partners went on commercial fishing trips together as well. Since the landscape of Kodiak can be so dangerous, a partner provided fishermen with a companion on whom they could rely and trust in difficult situations.

In addition to family-based resource use, structures of fish property rights have organized around this community partner system. Even in the present, there are specific

[287] Interview, George Inga Sr., 7/23/08
[288] Interview, Old Harbor fisherman 9/21/10;Old Harbor field notes 2008
[289] Interview, Old Harbor fisherman 9/21/10
[290] Group Discussion, George Inga Sr. and Paul Kahutak 7/23/08; Old Harbor field notes 2008

spots, bays, inlets, or coves that are known to be used primarily by a particular partner set. Paul Kahutak the elder I discussed in Chapter 8 fished with his partner Papa George for nearly all of his fishing career. Papa George was referred to as "Barling Bay George"[291] because from the 1940s to the 1980s, he and his partner always fished in that particular bay. Other fishermen tended to keep away from those spots, a practice which suggests that the resources in that area belong primarily to the partners who have claimed it[292]. Partnership represents an idea about fish property rights that is rooted in community relationships and community understanding.

Knowledge as Ownership

Many Old Harbor fishing stories, interviews, and practices reveal a notion that fish should belong to those who have the most knowledge and skill to catch them. Because fish are this elusive, mobile "mystery", a new kind of property rights hierarchy can persist where the most knowledgeable fishermen are the ones who get to take the most of the resource. In Chapter 4, I discussed some of the ways that fishermen have developed knowledge and expertise in fish behavior and capture. In Kodiak Island, that knowledge can and has been transformed into a property rights structure. Importantly, this ownership structure has worked to favor local, historically-embedded fishermen.

In the previous chapter, I introduced the concept of fishing spots. Fishing spots describe places in the sea where fishermen go to seek fish resources. Spots are ephemeral and dynamic and a good fisherman will have working knowledge of the best fishing spots and this will enable him to capture the most fish at the most efficient rate. Because of their historical and geographic association with the surrounding fish resources, local

[291] Group Discussion Paul Kahutak and Carl Christiansen Sr. 7/9/08
[292] Old Harbor field notes 2007, 2008, 2009

fishermen are likely to have better knowledge and understanding of the best fishing spots and therefore be able to catch more fish at a more efficient rate.

Prior to the IFQ program, the halibut fishery and other local fisheries were managed such that fishermen with the most knowledge about the fish resources often were the ones who had the most rights to it. In the 1980s and 90s, the halibut fishery was managed as a derby fishery. This means that the fishery was only opened for a limited amount of time, often between 24 and 72 hours. During that period any fisherman could participate in the fishery and catch as much fish as he or she possibly could. Herring and salmon fisheries operate under similar time or fish limit strategies. Once a certain number of salmon are caught, the fishery for that river system is then closed. These management strategies favor fishermen with greater knowledge and understanding of the local resources. With their insider knowledge, they can catch more fish at a faster rate. Those with less knowledge catch much fewer fish under the time or fish limit.

Knowledge-based structures of fish property rights were not simply spontaneous characteristics of local fisheries; they were actively created and cultivated by Old Harbor fishermen. One of the ways that Old Harbor worked to establish local property rights to fish resources was through a series of strategic secrecies.[293] Oral history accounts suggest that these kinds of ownership strategies have been in place at least since the 1940s[294].

By far the most common response when I asked Old Harbor fishermen where they went fishing was "out in the ocean."[295] Fishermen as a general rule are very secretive

[293] Interview, Old Harbor fisherman 7/29/07.; Interview, Old Harbor fisherman 9/28/08; Interview, Old Harbor fisherman 7/31/08
[294] Group Discussion Paul Kahutak and Carl Christiansen Sr. 7/9/08
[295] Interview, Old Harbor fisherman 7/29/07

and protective of their fishing spots. If the fisherman who knew the most about the location of the resource was likely to catch a greater portion of it, then knowledge about fishing locations was an important and well protected commodity. Old Harbor fishermen often lied or misled outsiders who asked them about fishing spots[296]. However, they would variously share that information with friends, other Old Harbor fishermen, other Native fishermen from other villages, family members, or young apprentices they are teaching to fish[297]. With these networks of communication about fishing spots, Old Harbor fishermen were able to work together to compile a larger community-based understanding of the fishing terrain. This gave them an advantage over outsiders who could only base their understanding of the fish resource on their individual experiences.

Naming as Claiming

In Chapter 8, I described some of the different ways that Old Harbor residents approach the fishing geography in their region. Many of these geographies are rooted in history and community relationships. They also represent the geographical world in a scale and level of detail that is much more specific then could be included on a usable nautical map. I would argue that Old Harbor processes of developing internal languages and understandings of the local geography that cannot be readily understood outside the community represent a certain kind of claiming of the ocean and resources within those areas.

[296] Interviews, Old Harbor fishermen 7/29/07, 9/28/08
[297] e.g. Interview with Old Harbor fisherman 7/29/07.; interview with Old Harbor fisherman 9/28/08.; interview with Old Harbor fisherman 7/31/08

The deep knowledge of the sea associated with Old Harbor residents' attachment and life experience with particular places certainly gives fishermen an advantage in competitive fishing activities. They are likely to more efficiently and safely navigate the waters of the area. These community-based fishing geographies also give community members a common language with which to communicate with one another (over radio, on the docks, or in passing) about the locations of various fishing spots. And, most importantly, this common language cannot be understood by outsider fishing vessels.

An example of this is the way Old Harbor fishermen used to communicate with one another during herring fishing in the 1970s. In herring fishing, vessels hire an airplane to fly above and spot the areas where the herring are located. He or she will then relay this to the boats fishing below so they can travel to that location and collect the fish. The problem is that fishermen communicate on CB radios so their message can be intercepted by any vessel. To get around this, fishermen from Old Harbor used to communicate all of their fishing activities and movements in the Sugstun language. They used the Sugstun place names to describe where the fish were located. This meant that Sugpiaq vessels, or at least those with Sugpiaq crew members, always knew what was going on and the best places to fish while outsider boats were left in the dark. An Old Harbor fisherman told me that as a result of Sugstun communication, the Native boats would always be full of fish while the outsider boats would have nothing[298].

[298] Old Harbor field notes, 8/08

Territories

Old Harbor residents have and to a lesser extent continue to use territorial practices to protect local fishing grounds for their own use. Even though Old Harbor has not formally been given authority over the fish in the region by a legal means, community members worked together to create territories that give them primary access to their fish on their own terms. Old Harbor community members express a certain fondness for the period of commercial fishing on Kodiak Island between the 1960s and 1990s where Old Harbor fishermen actively delineated and defended fishing territories in the waters near their community. Territorial practices were most common in the salmon and herring fisheries, though they established protected fishing spaces that carried over into the halibut fishery.

These territorial efforts were led by one Old Harbor man named Carl Christiansen Sr. who established an island-wide reputation[299]. According to local accounts, when Carl was growing up, he noticed "that Natives were afraid of white people".[300] Carl's father was Scandinavian and his mother was Sugpiaq. He said that whenever a white person was in town, the whole village would all "go crazy" and hide in his father's house. Carl saw this and "told himself that it's not gonna be me". He decided from a young age that he was never going to be pushed around by outsiders, especially in the fishing industry.

He came from a very large family and worked with his relatives and other community members to build up a large and intimidating fleet. This Old Harbor fleet then worked together to take control of local fishing grounds. Through processes of aggression and intimidation, Old Harbor fishermen kept outsider fishermen away from

[299] Discussions, Carl Christansen Sr; Interviews, Old Harbor fishermen 10/12/08, 7/31/08, 10/13/08
[300] Quotes are excerpts from interview with Old Harbor fisherman 7/31/08

local fishing spots and established areas on the island that were firmly Old Harbor territory. It was said of Carl, "He did get his way. I mean they had to leave when he came around. They could be fishing and they'd just see him and be like no – fishing's good but we have to leave now."[301]

There were many bays and sections of Kodiak Island that were known to be Old Harbor territory and these ideas about territory persist today. A fisherwoman recounted to me, in a tongue and cheek fashion, the way these territories played out:

> Eastside boats fish on the eastside and the north end boats better stay on the north side…We're on the Eastside – Southeast side of Kodiak Island so Eastside is what – Old Harbor is considered eastside of the island and so runs from Kiluda Bay all the way down to Kaguyak maybe beyond [little chuckle]. Nobody better go to Cape Barnabus or you're gonna get corked [laughing]. No fishing Barling Bay – it's ours.[302]

Of all the fishing spots, it is clear that Cape Barnabus, nicknamed "Barney", holds the most sway in legend and memory. One fisherman remembers the first day that the crew discovered this sweet spot saying, "we went out and we poked our head around there Cape Barnabus at the rocks and as far as you could see there were reds [salmon] jumping there"[303]. In his retelling, the place becomes animate taking on human characteristics. He said, "The Barnabus we lost a lot - seen a lot nets lost there too - the Barneys would get you. We'd seen someone just snagged all to hell and be like: 'Look Barney's got him.' You'd pull up these huge barnacles when you got snagged."

I heard a number of stories about the kinds of tactics and episodes that took place during the territorial fishing days. The Deadman's Bay herring fishing story that opened this section was a particular favorite. I also heard stories of boat ramming, cutting fishing

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301 Interview, Old Harbor fisherman 7/31/08
302 Interview, Old Harbor fisherwoman 10/26/08
303 Interview, Old Harbor fisherman 7/31/08

lines, wielding butcher knives, and intimidating screaming[304]. I think it is especially significant that most of these territorial fishing stories have taken on a legend-like quality. Nostalgia for these kinds of stories from the territorial fishing days is likely related to rapid changes in the fishery in the decades since the stories took place. Since the days described in the stories, the fleet has diminished to eight vessels that cannot hold territories in the same way.

Although memories of the territorial fishing past are shaped by experiences and senses of loss in the present, they also reveal a very particular logic and understanding of fish property rights. Old Harbor fishing territories indicate a notion that fish resources should belong to those who live adjacent to them. Old Harbor fishermen established dominance in the fishing areas near to their village. Even from a young age, Carl worked from an abiding belief that local fish resources should belong to those in the community and not to outsiders.

The fishing territories also reveal community and kinship connections to fish property rights in Old Harbor. The majority of the large territorial fleet was composed of brothers and cousins from one large family. This family fleet also worked to protect each other in rough seas, and in some cases would develop fish co-ops where they split the proceeds from fish sales.[305] The territories were meant to be a benefit to the greater Old Harbor community as well. Although not all community fishermen participated in or agreed with the territorial practices, smaller vessel owners who did not fish aggressively

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[304] Discussions, Carl Christansen Sr; Interview Old Harbor fisherman 10/12/08; Interview Old Harbor fisherman 7/31/08; Interview, Old Harbor Fisherman 10/13/08

[305] Interview elder Old Harbor fisherman 10/30/08

were protected by and could fish peacefully as a result of territories developed by the larger fleet.[306]

There were a few Old Harbor fishermen who told me they preferred to fish alone and stay away from all the territorial posturing[307]. Aggressive tactics simply were not their style. Some vessel operators preferred to keep to themselves and worked by taking turns with other boats around them. The way the Old Harbor fleet was set up, there was a group of larger fiberglass boats that worked to establish territories and dominate the fisheries. Then there was a group of smaller wooden vessels which were often referred to as the 'Mosquito Fleet'. I am told they got this name because one calm morning Carl Christiansen Sr. stood out on his large vessel, looked at all the little boats dotting the ocean and said, "I hope a strong wind will come up and blow these little mosquitoes away."[308]

Some of the smaller fishermen did not recall fondly the actions of the larger fleet saying that they acted too much like they owned the place.

> *Fisherman:* They'd always tell me where and when and how to fish. I told them it's my fish, I'll catch it when I want and how I want. You know, I'm not fishing for them, I'm fishing for myself. They're not gonna tell me what to do.
> *Laurie:* Do you think it was good that they kind of tried to keep outsider boats out of the bays here?
> *Wife:* But, it's open for everybody.
> *Fisherman:* Oh, they tried yeah. I don't know why, I mean everybody had their own rights to fish wherever they wanted to.[309]

Members of the large fishing fleet say that their actions kept outsider boats out of the local bays which gave small boats the unique opportunity to fish in peace. A

[306] Interview Old Harbor fisherman 10/12/08
[307] Interview, Old Harbor fisherman 10/12/08; Interview Old Harbor fisherman 9/13/08
[308] Interview, Old Harbor fisherman 7/24/08
[309] Interview, Old Harbor fisherman 10/12/08

fisherman who was part of the larger fleet said that the smaller boats “fished inside, they fished like Barling Bay and Three Sisters and just around in here…but you know they basically were under the protection of the bigger boats because we kept the other boats out of those spots.”[310] Also some of the smaller vessel operators recalled that while the larger fleet was unnecessarily bossy, at times they could be generous too. There was a period of time when the salmon canneries operated on a limit system when each boat could only sell a set amount of salmon per day. When the large boats would surpass the limit, they would give their extra fish to the smaller vessels.[311]

Despite this diversity in approaches to and ideas about territorial fishing, overall, Old Harbor fishing narratives reveal the development of an outsider/insider dynamic with regards to rights to fish ownership. It is important to note that this dynamic did not simply fall along racial lines. Several Caucasian fishermen who had married into or moved to the village for long periods of time were considered insiders and were not subjected to territorial exclusion. I think that the Deadman’s Bay story can best reveal this emphasis on keeping ‘outsiders’ away from local fisheries – Carl takes great pains to keep outsider fishermen from catching any herring. The fact that these stories live on and are told with such frequency today reveals a strong cultural orientation towards fish property rights that persists in the present.

Old Harbor Fish Property rights in Summary

Prior to the implementation of the IFQ fishery privatization program, Old Harbor fishermen possessed deeply embedded concepts of fish property rights. Some of these concepts were more ideological, such as the belief that more knowledgeable fishermen

[310] Interview, Old Harbor fisherman 7/31/08
[311] Interview, Old Harbor fisherman and wife 10/12/08

should get more fish, and some were deeply material, such as the active creation and defense of fishing territories. Although the IFQ program worked to eliminate some of these concepts of property rights in practice, stories and discourse reveal that many Old Harbor fishermen continue to possess ideas about fish property rights that differ from those in the IFQ system.

The community of Old Harbor is not monolithic in their ideas about fish property rights. In discussions about territories, some community members took pride in territorial practices, while others felt they were overstepping their bounds. Still, community members tended towards four ideas about fish use or property rights in the years 1940 to the present. (1) Community members seem to express a strong notion of adjacency, an idea that resources should belong to the people and communities who live next to them. (2) Old Harbor fishermen seem to favor a hierarchy of ownership that is rooted in increased skill and knowledge of local fish resources. (3) Old Harbor systems of fish property rights appear to be tied to relationships of kin and community. (4) Old Harbor conceptions of fish ownership appear to be more fluid than fixed, shifting based on changing personal relationships and fish landscapes.

History and Logic of NPFMC's IFQ Approach to Fish Property Rights:

The North Pacific Fishery Management Council's decision to privatize the commercial halibut fishery was influenced by a number of situational and cultural factors. The halibut fishery was not in a conservation crisis at the time of the implementation of the IFQ program. It was carefully managed under a derby system that limited the take of halibut to short 24 or 48 hour fishing periods. However, managers observed some troubling issues that suggested that the current form of management would not be sustainable. Two important factors contributed to the movement to privatize the fishery and influenced the cultural make-up of this new form of fish property rights: (1) a coalescing of schools of thought suggesting that private property systems are effective strategies for protecting environmental resources and (2) practical realities and limitations of the way the halibut fishery was being managed prior to implementation of the IFQ program.

Schools of Thought Connecting Private Property and Environmental Protection

The 1995 halibut fishery privatization emerged at a specific point in history when private property approaches to solving environmental problems had become one of the dominating ideas in natural resource management. In her examination of the privatization of fisheries in Alaska, Becky Mansfield (2004a) argues that both writings with regards to the "tragedy of the commons" and a growing trend towards finding market-based solutions to environmental problems, often referred to by scholars as "neoliberal natures", influenced decisions to privatize the region's fisheries (Mansfield 2004a; Mansfield 2004b). A closer examination of these two schools of thought can provide insights into the historical roots and cultural orientation of the NPFMC's IFQ approach to fish property rights.

IFQ programs are linked to the idea that private property rights are an essential tool to prevent the "tragedy of the commons". The problem of commonly-held resources has been theorized by many scholars dating as far back as Aristotle; however, it isn't until Garett Hardin's 1968 seminal paper "The Tragedy of the Commons" that the issue of the commons comes to be fully embedded in the environmental management imagination (Hardin 1968).

In the "tragedy of the commons", Hardin presents the idea that in open access systems (like fisheries), the depletion of commonly-held resources is inevitable. Competing individual and group interests place resource users in a trap that results in overexploitation and eventually decimation of common resources. Because there are no incentives for individual users to be protective of the common resource, rational actors will continue to deplete resources for their own gain, ultimately leading to ruin for all (Hardin 1968).

Hardin's paper spurred an entire field of commons research to explore possible systems that can prevent this dilemma of the commons (Ostrom et al. 1999). While these researchers have discovered a number of historical and current systems by which groups of people have managed to prevent decimation of the commons, the only two solutions that Hardin proposes in his paper have come to dominate the thinking about common resource protection. The two solutions Hardin proposes are socialism or privatization. By socialism, he means government ownership and control of resource use through the development of legal restrictions and incentives. With privatization, users are given ownership over a restricted part of the resource converting it from common property to private property. To Hardin, this will lead to increased stewardship of resources because rational actors will not work to degrade or deplete resources to which they have discrete ownership rights (Hardin 1968). Hardin's work solidifies the notion of privatization as a primary tool to effectively prevent the decimation of commonly held resources such as fisheries. This link between property rights and common resource conservation has been advocated by several environmental, conservation, and government groups and certainly influenced decisions to privatize the halibut fishery (Fujita & Bonzon 2005; Grafton et al. 1996; Buck 1995).

The halibut fishery privatization was also influenced by movements towards utilizing business or market-orientated tools for environmental protection. Some scholars have referred to this pairing of privatization and market-based goals with natural resource conservation as “neoliberal natures” (Castree 2008; Heynen et al. 2007; McCarthy & Prudham 2004).

Though definitions of neoliberalism are complicated and contested, most scholars agree that it is an economic and government rationality embedded in the idea of the self-regulating market and the movement of economic control away from the public to the private sector (Harvey 2000; McCarthy & Prudham 2004). Taking root in the 1980s under the Reagan administration, the neoliberal approach encompasses a notion that human well-being can be increased through the rational, profit-seeking behavior of individuals working within an institutional framework of private property rights, free markets, and free trade (Harvey 2007).

While in the beginning, environmental groups worked against neoliberal ideas about economic development and infinite growth, in the 1990s many begin taking on ideas of free trade and market rationalities in their discourse (McCarthy & Prudham 2004). In these “neoliberal natures”, managers look to harness the power of the market to achieve both environmental protection and economic efficiency (Heynen et al. 2007). Examples of neoliberal natures include resource privatization schemes in fisheries, water, and mining regulation and the development of cap and trade programs to reduce sources of environmental pollution (Heynen et al. 2007).

In addition to harnessing the power of the market to conserve fish resources, proponents believed that fisheries privatization could introduce increased economic efficiency into traditionally inefficient fishery systems. If all quota shareholders act rationally, then less economically efficient fishermen will sell their quota and more efficient fishermen will buy and successfully fish theirs (Mansfield 2004a). This will prevent overcapitalization and work to establish more economically desirable fisheries (Garrity 2009). Therefore, the privatization of fisheries tends to prioritize economic efficiency over other potential social goals of fishery management.

With increased priorities on economic efficiency and market-based decision-making, the halibut fishery privatization was clearly influenced by neoliberalism. However, despite the clear connection, the IFQ program also departed from neoliberal ideas in several significant ways. First, the program was implemented by and has remained under close control and scrutiny of the state (Mansfield 2004b). While neoliberal proponents advocate for market deregulation, the IFQ program continues to be deeply connected to and regulated by the federal government. And, second, the IFQ program includes a number of "social-engineering"[312] regulations that introduce all kinds of economic efficiencies into the fishery in favor of other social goals such as the prevention of the consolidation of quota shares into the hands of a few individuals (Hartley & Fina 2001). In addition, the program established a number of community development quota (CDQ) programs in the Bering Sea portion of the fishery. CDQs set aside community-based allocation of halibut quota as a means for economic development

[312] Interview, federal enforcement official 10/21/08

in rural, economically disenfranchised communities in the Bering Sea. As we will see, it is unfortunate that the CDQ program was not implemented in rural fishing communities beyond the Bering Sea region.

Practical Realities of the Pre-IFQ System

Proponents of the IFQ program were motivated by several practical concerns with the derby system of management that was in place in the fishery prior to the program. Namely, the NPFMC was concerned about safety and overcapitalization in the fishery (Carothers 2008).

Even fishermen who staunchly oppose the IFQ program would agree that safety was an increasing concern in the derby-style halibut fishery. Under the derby system, the fishery was opened for a limited one to three day periods where any fisherman who was interested could seek to catch as much halibut as possible. This led to an often brutal all-out race for fish which led to many safety concerns, including the deaths of several fishermen (Pautzke & Oliver 1997).

The NPFMC was also motivated by a belief that the current fishery was highly overcapitalized and economically inefficient. Under the derby system, the entire halibut product to be placed on the market was captured in a one or two day fishing period. This contributed to a significant amount of halibut waste as processers were often not able to effectively store all the caught halibut. It also impacted the quality of the halibut product. Fish was rapidly cleaned and stored and the majority of the product needed to be frozen so it could be distributed to buyers throughout the year. Under the IFQ program, individual shareholders could capture halibut at any time, leading to a wider distribution of halibut product throughout the season. This has led to decreased waste and increased quality of the product as well as allowed processors to place fresh fish in the market throughout the halibut season. These improvements have shown in the value of halibut – the price for halibut has steadily climbed to over triple the price since the implementation of the IFQ program[313].

Finally, while conservation was not the primary motivation for the halibut privatization, the IFQ program has proven effective at preventing the overharvest of halibut resources[314]. The number of pounds allocated to each share of halibut quota fluctuates depending on the status of the stock. This way it is easy for managers to limit the number of fish harvested each year and sustain the stock.

IFQ Logic of Fish Property rights

The IFQ approach signaled a shift towards the understanding of the act of fishing as a profit-seeking venture instead of as a way of life (Carothers 2008). The IFQ program was rooted in an understanding of fish property rights that was quite distinct from the means by which Old Harbor delineated systems of fish access within the local Kodiak fishery. Also, the IFQ program, like Old Harbor approaches to fish property rights, was rooted in a particular cultural orientation to fish resources that emerged at a specific time in history.

The IFQ cultural orientation towards fish property rights is driven by three primary concepts: (1) the primacy of the individual as quota is distributed to individual fishermen; (2) the idea of the fisherman as a rational, profit-seeking individual for whom

[313] NMFS Report: Annual Ex-Vessel Prices by Management Area and Statewide, from 1992
[314] Interview, IPHC staff member 4/09

economic gain is the primary goal; and (3) the prioritizing of economic efficiency and access to capital in fish ownership over other qualities such as fishing knowledge or geographical and historical claims to resources.

Impacts of IFQ Program on the Community of Old Harbor

IFQ quota shares are both historical and place-based property rights. Halibut quota shares were awarded to individual fishermen based on their catches during the qualifying years of 1984-1990. Quota was also allotted by fishery regulatory area – quota assigned to one regulatory area of the fishery could not be fished in another. There were both ideological and material consequences for the community of Old Harbor when this form of property rights was imposed on the fishery systems in the two regulatory areas surrounding Kodiak Island.

Most Old Harbor fishermen that I talked to reported being caught completely off guard by the implementation of the IFQ program on their halibut fishery. One Old Harbor fisherman told me "I didn't know about it until after it happened, you know it was just too late."[315] Others reported that while they heard about the program, they didn't realize the significance of it[316]. They thought it was one of a succession of passing fads they had observed in fisheries management over the past decades. Another fisherman said, "people didn't - weren't attentive to it and I wasn't either because I didn't realize the magnitude of it. How much of an impact. I mean I was paying attention, I was against it you know and stuff but I wasn't engaged in the process of which I should have

[315] Interview, Old Harbor fisherman 7/27/08
[316] Interview, Old Harbor fisherman 10/12/08

been."[317] It wasn't until later that fishermen began to realize the IFQ program would have significant and nearly intractable impacts on local fisheries.

Ideological Impacts

In Old Harbor, the IFQ program represented a shift from collective to individual forms of fish property rights. This contributed to economic divisions in the community where certain fishermen were awarded halibut quota, while other fishermen who did not fish halibut during the qualifying years did not receive quota. Although as many as 25 Old Harbor vessels owners participated in the commercial halibut fishery in any given year prior to privatization, only 15 individuals were awarded quota through the IFQ program (Figure 41)[318].

In addition, crew members who fished for halibut during the qualifying years were not awarded quota at all. When I asked a former halibut crew member from Old Harbor how he felt that crew members were not awarded quota he said: "it was disappointing cause skippers were hoping that their crewmen could get it and that they'd be able to catch a lot more with the boat."[319] The process of awarding shares created an immediate economic and class separation between halibut vessel owners and crew members that was not in place before. Vessel operators had ownership rights to a share of halibut while their crew members would have to work to secure financial backing to ever purchase quota and enter the fishery. This made it more difficult if not impossible for crew members to move up the ranks to become vessel operators themselves and often

[317] Interview, Old Harbor fisherman 8/27/08
[318] Source: Alaska Commercial Fisheries Entry Commission Fishery Statistics. http://www.cfec.state.ak.us/
[319] Interview, Old Harbor fisherman 9/21/08

put them in a position of subjugated labor where they were forced to continue to work for those who were awarded quota[320].

The IFQ program also signaled a shift in the basis for hierarchy of access to fish resources. Under the quota program, fishermen have unlimited time to catch their share of halibut resources, so skilled or knowledgeable fishermen no longer have an advantage. Unskilled halibut fishermen can purchase property rights to halibut resources and take all the time they need to fish it. Instead, fishermen who have access to capital or knowledge of the banking system to purchase quota shares are prioritized in fish access. With halibut quota shares priced at about $28 a pound, to purchase a reasonable entry share of 10,000 pounds, fishermen must come up with nearly $300,000 worth of financing. Some Old Harbor fishermen had been very successful in the salmon and herring fisheries and these fishermen and their families had the means to enter the halibut fishery and a few of them did purchase quota[321]. However, for most Old Harbor fishermen getting access to or securing a loan for that amount of money is not even a realistic possibility. As one Old Harbor resident put it, "unless they have a rich uncle, that's about the only way they can do it."[322]

The advent of the IFQ program also eliminated competition or the "race for fish". Quota shares are allocated to individuals and they may catch those fish at any time during the nearly seven month season. This has contributed to improved safety and increased product quality in the fishery, but has also destabilized ownership structures that prioritize more skilled, knowledgeable, and aggressive fishermen. Even less-skilled fishermen have plenty of time and space to capture and claim their share of the resource.

[320] Old Harbor field notes 2008
[321] Interview, Old Harbor fisherman 10/30/08
[322] Interview, Old Harbor fisherman 9/13/08

In an IFQ program, locals with insider knowledge about the fishery resources no longer have an advantage in being able to harvest more fish.

The IFQ program impacted Old Harbor's efforts to maintain fishing territories. Under the IFQ program, outsider fishermen were granted property rights to halibut resources within regulatory areas that included traditional Old Harbor fishing territories. Since quota shareholders can fish their halibut shares at any time during the season, Old Harbor residents are in a practical sense unable to maintain their fishing territories. They cannot be out in the water during all possible times that halibut fishermen might be fishing. One fisherman expressed his dismay having to watch outsider vessels fish in areas once considered to be Old Harbor territory:

> Um, you know we had some outside boats that had ah, their gear stretched out inside the straits [near the village of Old Harbor] and that, you know, was kind of a bummer. You know, they're all out in the deep, but you know, they're still, you know, those days it was beautiful out. He could have been on the outside.[323]

Material Impacts of Fishery Privatization on Old Harbor Livelihoods:

The shift in ownership structures did not just have ideological consequences. It also had significant material impacts on communities whose understandings of fish property rights were pushed to the periphery. The literature on allotment and other colonial forms of land privatization sheds light on the ways that this fishery privatization policy contributed to significant sources of hardship and resource loss among indigenous communities (Ruppel 2008; Meyer 1994; Peroff 2006).

[323] Interview, Old Harbor fisherman 10/7/08

Dispossession of Resources

Statistics and affidavits from local fishermen show that as a result of the IFQ program, Old Harbor residents lost significant amount of access and control over local halibut resources. Under IFQ conceptions of fish ownership, fish access became a monetarily valued, tradable commodity. This created a situation where it was possible through the sale, loss, or lack of ownership rights from the beginning, for communities to become alienated from the resources with which they have a deep historical and cultural relationship. In their research of quota share transfers, Courtney Carothers et al. (2010) observed that being Native was one of the strongest indicators for the sale or loss of quota share in the entire Alaska region of the halibut fishery. This disproportionately high loss of resource access (when compared to non-native counterparts) reveals a similarity to American Indian allotment where Indian communities lost nearly two-thirds of their lands during the years it was in effect (Ruppel 2008).

In the 10 years following the implementation of the IFQ program the number of quota share units held by Old Harbor residents declined from 640,000 in 1995 to 187,000 in 2005 – an over 70% reduction in Old Harbor quota shares (Figure 40). The number of individual shareholders declined as well. In 1995, fifteen Old Harbor residents were awarded quota shares. By 2000, there were only six shareholders residing in the community[324]. This means that from 2000 to 2005 only six Old Harbor residents had rights to commercially fish halibut. In Old Harbor, I observed several modes by which fisherman lost their access to local halibut resources.

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[324] Source: NOAA Fisheries IFQ Halibut/Sablefish Reports http://www.fakr.noaa.gov/ram/ifqreports.htm#participants

Due to certain circumstances, Old Harbor fishermen were not awarded large amounts of quota to begin with and once the program was implemented few had the means to buy into the fishery. Not many Old Harbor fishermen were fishing for halibut during the qualifying years of 1984-1990. During those years, salmon prices were at their peak, so most fishermen were busy with salmon. Those fishermen who did seek halibut did not fish it every year during the qualifying period. A chart of the number of Old Harbor registered commercial halibut permits over time, shows that the selected qualifying years included some of the periods of lowest Old Harbor participation in the halibut fishery (Figure 41). The peak period of fishing halibut in Old Harbor was between 1991 and 1994 which was after the qualifying years. Due to the choice of qualifying years, only 15 of the 25 Old Harbor residents who were fishing halibut in 1994 received any quota shares at all. Young people who only began fishing in the 1990s or salmon fishermen who switched to halibut fishing in the 1990s due to declining prices would not receive quota and unless they could gain the funds to purchase quota, would become shut out of the fishery. Also, the commercial halibut permit data does not include the numerous Old Harbor crew members who

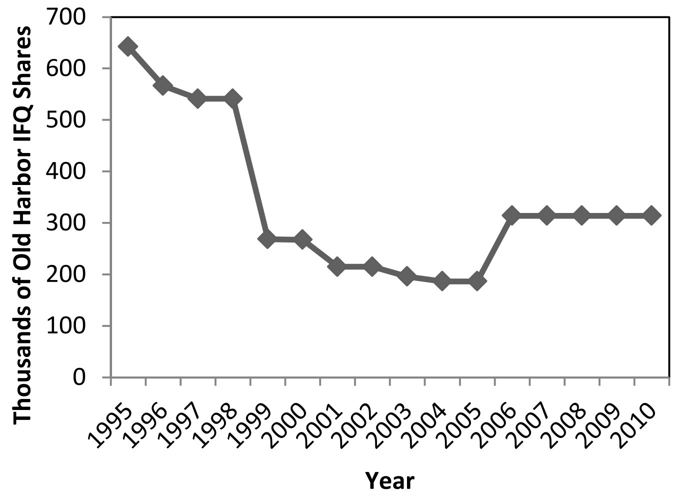

Figure 40. Number of halibut quota share units possessed by Old Harbor residents over time. The slight increase in shares after 2005 is the result of the implementation of Old Harbor's CQE program. Source: NOAA Fisheries IFQ Halibut/Sablefish Reports

worked on halibut boats and overtime likely would have become vessel operators

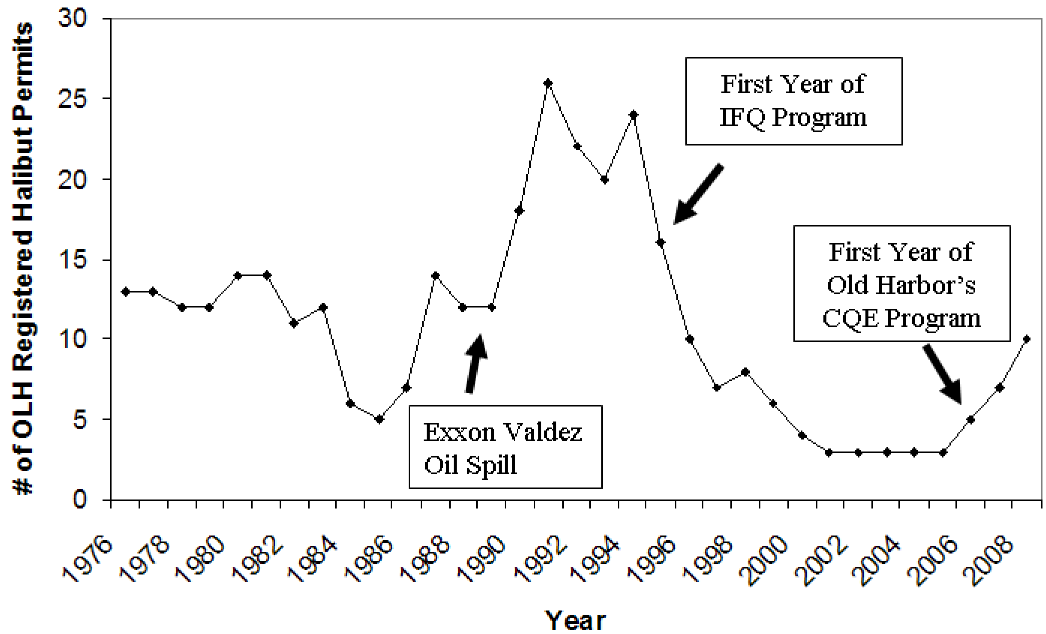

Figure 41. Commercial halibut permits registered to Old Harbor residents from 1976-2009. Source: Alaska Commercial Fisheries Entry Commission Fishery Statistics. http://www.cfec.state.ak.us/

themselves. Crew members did not receive any quota shares and became similarly shut out of the fishery.

In addition, many Old Harbor fishermen fished halibut on a small-scale and they did not fish it every year during the qualifying years. This meant that when the calculations for distribution of quota came down, Old Harbor fishermen were who granted quota received a small number of shares. When I asked one fisherman how much quota he received, he told me, "Not enough. 600 [pounds]."[325] When I then asked him how he felt about that award he said, "I catch triple that what they gave me. They gave me at least, like I say, they should have gave me at least 10,000 pounds and be done with

[325] Interview, Old Harbor fisherman 10/12/08

it."[326] Although this fisherman did not sell his quota, the allocation of too small a share of quota to reasonably fish was a common reason for fishermen to sell their quota. Carothers (2008) found that 44% of halibut quota sellers sold their quota for that reason.

I encountered two Old Harbor fishermen who lost their quota because of tax-related debts[327]. Once halibut access became a valued commodity, the US government was able to seize it to assist in the payment of back taxes. Since fishing is an individual business and the tax codes and regulations for fishing income are quite complicated, it was not uncommon for Old Harbor fishermen to have tax-related issues and debts. An Old Harbor fisherman told me this about his quota: "I got - I think I had like 10,000 pounds or something. And I owed Uncle Sam money, so Uncle Sam took them. They didn't give me the time of day to pay them; they just, like, grabbed them and auctioned them off to some place in California."[328]

The decline in Old Harbor quota shares owned by Old Harbor residents can also be attributed to outmigration from the village. Some quota share-holders moved out of Old Harbor to live in Kodiak or Anchorage and fished their quota while based out of those cities. This pattern means that the economic benefit from commercial halibut fishing no longer stays within the Old Harbor village. Additionally, once they move out of the village, fishermen are less likely to hire crew members who live in the village.

Not many Old Harbor fishermen willingly sold their quota once it was issued. There seemed to be a pervasive belief that quota and fish permits should be actively protected and maintained in the family. The few examples of quota sales that I heard

[326] Interview, Old Harbor fisherman 10/12/08
[327] Old Harbor field notes 2008
[328] Interview Old Harbor fisherman 7/29/08

about involved fishermen who planned to retire[329]. But, these fishermen sold their quota shares to buyers who could pay the highest price, which meant that ultimately quota shares left the hands of village members and were sold to outsiders. These kinds of processes can contribute to the continued erosion of community resource access over time as well as the increased level of outsider access to local fish resources. The loss of ownership rights to resources in the regulatory areas surrounding the community have led to a sort of "checker-boarding" of Old Harbor fish ownership in the regulatory areas surrounding the community. Because fish are mysterious, mobile, and underwater, the loss of resource is not as easily to visualize as the loss of lands that led to the checker-boarding of Indian reservations following allotment; however, the impact has been the startlingly similar.

Dispossession of Labor

This loss of halibut quota has contributed directly to losses in labor or job opportunities in the village – including both jobs as vessel operators and crew members on fishing expeditions. A socio-economic study found that as a result of halibut privatization along with a decline in prices in the salmon fishery, the community of Old Harbor has experienced a 75% decrease in fishing participation over just one generation (Carothers 2008). The Old Harbor commercial fishing fleet, as large as 32 vessels in 1993, is now down to eight working vessels.[330] Residents refer to these remaining

[329] Interview, Old Harbor fisherman 9/13/08

[330] Alaska Commercial Fisheries Entry Commission (CFEC) Vessel Statistics for Old Harbor 1978-2008. Vessels over 20 feet registered to Old Harbor residents and registered for commercial fishing in at least one fishery. http://www.cfec.state.ak.us/fishery_statistics/vessels.htm

vessels as “the last of the Mohicans”[331] which suggests a conflation of the loss of fishing livelihoods with the loss of a particular indigenous identity.

It is important to note that the decline in fishing participation is not solely linked to the development of the halibut IFQ program. Decline in salmon prices after the Exxon Valdez oil spill and the loss of financial relationships with the local canneries probably contributed much to these losses. However, when salmon prices dropped, vessel operators might have been saved if they could have switched to fishing halibut. The IFQ program made this nearly impossible.

The village of Old Harbor has experienced a significant trend of population decline over the past decades. The population has shifted from a peak of approximately 350 in 1980 to a present number of about 200. There is compelling evidence that this process of outmigration is linked to losses in fishing opportunities. Courtney Carothers found that 57% of Old Harbor households reported a sibling or family member moving out of the village because of a lack of fishing opportunities (Carothers 2008). The connections between the decline of fishing and outmigration suggest that limited access to fishing opportunities can threaten the persistence of small rural communities such as Old Harbor.

When I asked community members what their thoughts were on the future of fishing in Old Harbor, their answers tended to be pessimistic. When asked about possibilities for the younger generation of fishermen, one resident replied, “think that’s about zero.”[332] Most fishermen reported, with some regret, that they now encourage their

[331] Old Harbor field notes 2008
[332] Interview, Old Harbor fisherman 9/13/08

children to get an education and consider alternative sources of employment. A middle-aged fisherman describes his feelings on the future for his children in this way:

> *Fisherman:* This guy [pointing to his two year old son] will never be a halibut fisherman - will you? Maybe if you're smart you'll go to college.
> *Laurie:* Is that kind of what hopes you have for all your kids?
> *Fisherman:* Yeah. Yeah there's a big push in this house for their educations. They're I've been telling [my daughters] since they were that old that they were going to college one way or the other you're going to college. You know. I wish they could live the way I did, you know and stuff I saw. It was just - it's hard to put into words just the amazing stuff I've lived through just in the 20 some odd years I fished was and the way the Old Harbor fleet used to be was that - 14 boats controlled the entire east side of Kodiak Island.[333]

Gender and Masculinity

Impacts and losses from the halibut fishery privatization were received disproportionately by gender. The majority of individuals involved in the act of commercial fishing in Old Harbor fishing were male. Women were sometimes hired or worked as crew, and in both the present and past, men would sometimes bring their wives and children to assist with fishing labor. However, males tended to dominate the industry and act as vessel owners. This has meant that the loss of fishing opportunities has been particularly hard on men. One fishermen told me that when growing up he and his male friends would always develop play activities surrounding little boats and fishing because "to become skippers…was always our goal and our dream when we were little kids"[334].

Several community members reported to me a notion that they felt young men in the village were having a particularly difficult time because they were born fishermen who could no longer fish. The connection between masculinity and labor has been

[333] Interview, Old Harbor fisherman 7/31/08
[334] Interview, Old Harbor fisherman 8/27/08

theorized and explored by a number of scholars (Ferguson 1999; Ferguson 2001). This connection is reflected in comments from Old Harbor residents that the decline in fishing participation has contributed to a new, rudderless male generation[335].

Old Harbor as a community has also struggled with issues of substance abuse. The anecdote from the story *That Morning* at the beginning of this section describes just one in a number of untimely alcohol-related deaths experienced by Old Harbor residents. Several community members that I talked to expressed a belief that there was a connection between the decline of fishing and an increase in substance abuse, particularly in males[336]. They felt that without the feeling of worth and hope that comes from fishing labor, community members and men in particular became more likely to utilize harmful substances. One middle-aged village fisherman talked to me about the trajectory of himself and nine other boys that he grew up with in Old Harbor. He said that each of them had dreams of becoming a fisherman but that due to limited entry in the salmon fishery, he was the only one of the group that ever became a skipper. As for the rest of them:

> By the time I was 30 years old four or five, four of em were dead and I really attribute to the limited entry program that was implemented, I, I believe that they lost their hopes and dreams of being somebody…chances are there probably would have been a, you know a few of em that would have died from substance abuse but I think every single one of em was substance abuse related everyone of em. I know they were. And so, I believe that you know, the percentage wouldn't have been 100% of em, you know, being substance abuse but maybe 20 or something you know number that's more acceptable, not 100%.[337]

[335] Interview, Old Harbor resident 9/11/08; Interview Old Harbor fisherman 8/1/07; Old Harbor field notes 2008
[336] Interview, Old Harbor fisherman 9/21/08; Interview, Old Harbor fisherman 8/27/08
[337] Interview, Old Harbor fisherman 8/27/08

In this passage, the fisherman expresses his strong belief that the substance-use related deaths of his childhood friends were at least partially linked to the losses of fishing opportunities in the salmon fishery. Although he refers to privatization processes that took place in the salmon fishery in the 1970s, the halibut IFQ program has continued and exacerbated the losses of fishing livelihoods that he so clearly links with male substance abuse.

Opportunities and Strategies for Renewal

Old Harbor has worked in many creative and strategic ways to reassert their ideas of fish property rights within this newly privatized fishery. Old Harbor-based movements to make political and language interventions in the fishery management apparatus show that NPFMC management of halibut is not necessarily exclusive to multiple understandings of resources. Policy-makers and communities can work together to develop policies that better accommodate local and indigenous conceptions of fish use.

Old Harbor community members helped found and have been actively involved in a non-profit organization called the Gulf of Alaska Coastal Communities Coalition (GOAC3)[338]. The GOAC3 actively lobbies for community interests during NPFMC council meetings and other management forums. The organization has introduced the concept of "adjacency" to the management dialogue. In one Council session, a GOAC3 representative testified, "We ask the Council to remember that Alaska's remote fishing communities must have maximum sustainable flexibility and utilization of local

[338] www.goac3.org

resources." [339] This kind of testimony serves to bring attention to communities living next to "local resources". Continued lobbying has served to shape the discourse surrounding NPFMC meetings in favor of Old Harbor orientations towards fish property rights. Words such as "fishing communities" and "adjacency" have become central parts of discussions regarding fishery policy.

One of GOAC3's central mottos is, "Protecting Fisheries Access to Small GOA Coastal Communities"[340]. In order to achieve this mission, the GOAC3 along with representatives from coastal communities throughout Alaska, and community members from Old Harbor worked for many years to envision and get passed the Community Quota Entity (CQE) program in the halibut fishery. The CQE program is a policy that allows a community-based entity, which would be a non-profit organization designed for this purpose, to purchase a large share of halibut quota. This entity would then be able to lease the purchased quota to residents of the small community in a manner that they see fit. Community members pay a portion of their proceeds back to the entity which could use that money to pay back the purchasing costs of the quota over time. Before the CQE program, any kind of leasing halibut quota was strictly forbidden.

Old Harbor is the first and to date only community to purchase halibut quota and establish a CQE program. The community named their leasing entity Cape Barnabus Inc. Cape Barnabus is the fishing spot once dominated by territorial Old Harbor fishermen that I described above. This name links the CQE program to a specific place that symbolizes a strong and important fishing history for the community. In 2006, Old

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[339] Gale Vick, GOAC3 public testimony at North Pacific Fishery Management Council meeting 10/4/08
[340] GOAC3 website: http://www.goac3.org/

Harbor's CQE program purchased 151,234 quota shares increasing the number of Old Harbor shares by nearly 50%.

It is possible to see parallels between the CQE program and the process by which indigenous communities worked to reclaim access and ownership of lands they lost during allotment through the development of land trusts (Ruppel 2008; Meyer 1994). Although the CQE program is not strictly an Alaska Native program (Native and non-native residents can apply for CQE quota), a large part of the funding for the purchase of Old Harbor's quota came from the Old Harbor Native Corporation which was established as a part of ANSCA[341]. This means the community is utilizing funds that are linked to their Alaska Native heritage and rights to land to purchase back fishing access in traditional fishing grounds.

What is most exciting about the CQE program is that it provides a new space of resource control where the community can articulate their own priorities and rationalities of resource ownership. Under the CQE program, residents from Old Harbor apply to receive shares of the community halibut quota. A group of community-based board members then establishes a system to rank the applications and distribute the quota. Instead of the IFQ values of economic efficiency and access to capital, the Old Harbor ranking criteria includes a number of criteria that are linked to historically embedded community conceptions of fish ownership. "Age of applicant"[342] is a criteria where younger applicants receive a higher ranking to encourage younger generations to enter the fishery. They give preference to applicants who "employ one or more resident crewmen to fish halibut IFQ" to articulate an emphasis on community-connected forms

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[341] Interview, CQE board member 10/11/08

[342] All criteria are taken from the "Cape Barnabas, Inc.'s Criteria for Quota Distribution Entry Level Quota Pool" 2009

of fishing. The board is also able to give higher ranking to applicants based on "board's assessment of economic need and program goal of broad community participation". This final criterion represents a break from the IFQ program's preference towards more economically advanced fishermen.

While the CQE program offers exciting potentiality for solutions to some of the damaging practices of the halibut fishery, it has important limitations. Due to the high cost of purchasing halibut quota shares, the program is currently not large enough to achieve goals of bringing commercial fishing participation and livelihoods back to the community. In order to pay back loans to purchase the quota, fishermen must return 45% of their earnings to the CQE. This cuts significantly into their profits. Some have referred to the CQE program as providing fishermen and their families with "a little bit extra"[343]. But, at this stage it cannot constitute a large share of a fisherman's needed yearly earnings.

Reflections:

The impacts of halibut fishery privatization on the community of Old Harbor exhibit several important parallels with American Indian allotment. Both forms of allotment contributed to the disruption of indigenous ideas about resource ownership or tenure, the dispossession of indigenous natural resources and sources of labor, and the development of indigenous strategies to reclaim ownership of lost resources. Comparisons of the IFQ program to private property systems implanted on land can help to highlight the disenfranchising impacts of fisheries privatization, many of which go

[343] Field Notes, Old Harbor CQE meeting January 2009

unnoticed due to the elusive nature of fish populations. For example, indigenous losses or checker-boarding of fish access cannot readily been seen in an underwater fishery.

Experiences with both of these privatization measures highlight the potential alienating quality of private property. Once a resource such as land or fish becomes a valued commodity it can be taken away or sold. In studies of fish and land privatization, we observe that individually held resources or lands are easier to loose than those that are communally held. When community resources become allotted to individuals, they become more subject to the complex financial pressures and whims of those individuals and subsequently more likely to be lost over time. The alienating potential of private property is not a unique idea; Marx referred to it in many of his works[344]. But, this fisheries example highlights that alienation by privatization can occur in resources beside land. As Sven Haakason Sr. highlights in the opening quota, for coastal communities, alienation from marine resources can be just as devastating.

This example of privatization in a fishery also helps to highlight the deep connections between property rights and labor rights. In the halibut fishery, fish quota shares are as much labor rights as they are property rights. Quota shares offer access to commercial halibut fishing as a source of labor. Without shares, fishermen are not permitted to work within the confines of that fishery. This connection between labor rights and property rights can be transferred to considerations surrounding allotment. Parcels of land can provide access to important sources of labor such as forestry, grazing, farming, or the location of businesses. In this way, losses of land can also be deeply

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[344] Marx K, and Engels F. 1978. The Marx-Engels Reader. Second Edition (R.C. Tucker ed.). New York, NY: W.W. Norton & Co.

connected with losses of rights to sources of labor. This might allow us to consider land losses in policies such as allotment as breaches of community labor rights.

Finally, it is important for us to consider the unique and finite nature of fish resources. Due to increased technology and economic pressure, halibut stocks could easily be fished to depletion without regulation. Increased access to indigenous fishing communities would be meaningless if the fisheries were depleted. Much research shows that protection of commonly held resources requires tools both to limit and allocate harvest of halibut. This concept is not lost on fishermen from Old Harbor. One fisherman told me the following during an interview:

> *Interviewer:* Do you think it is important that the fisheries are regulated?
> *Fisherman:* Well yeah. It's OK that they are regulated. But they're not being regulated right for some reason. Doesn't seem right to me anyway.[345]

I think that this quote hints at a possible starting place or common ground as we move forward to consider fishing management practices and policies into the future. He suggests that his understandings of fish and fish ownership are not incompatible with all forms of external regulation, it is just that the current form of regulation, which has had such a damaging impact on his community, "doesn't seem right".

Managers of the halibut fishery are charged with making difficult decisions in the face a number of complicated biological, social, and economic factors. They are in a no-win position because decisions they make on a limited resource are going to lead to benefits for some and losses for others. In many ways, the IFQ program was a step forward. It achieved important biological and social goals for the fishery. It contributed to increased fish conservation, economic efficiency, and safety in the fishery. However,

[345] Interview, Old Harbor fisherman 10/12/08

the IFQ approach to management also led to divisive and devastating impacts on more marginal communities throughout the fishery. These concerns of social justice and inequity lead, no *impel*, us to revisit, rethink, and revise current approaches to management in order to find more just and sustainable modes of regulation.

The Old Harbor case demonstrates that the IFQ program was so devastating to local fishermen in large part because it eroded pre-existing authority and ideas about fish property rights. This leads us to try to imagine forms of fisheries regulation that can do a better job of accommodating local and indigenous forms of resource property rights and regulation. The Community Quota Entity program offers a space for hope in this regard. With the CQE program, Old Harbor was able to create a space, albeit a limited one, that was governed by different, community-specific cultural and economic fishing rationalities. The CQE program shows that a fishery system has potential to accommodate multiple ideas about fish property rights. We can draw from the potential of this program as we move forward to try to make fisheries that are "regulated right".

REFLECTIONS

When I was discussing my analytical approach to this dissertation with a colleague he told me that I needed to make sure I had a clear direction; my story needed an arc. He said, "You can't start with a mystery and end with a mystery too."[346] At first I was pretty frustrated with and defiant towards this statement. I thought to myself, of course I have to end with a mystery – that is the whole point. Fish populations can never be fully known. They will always produce a multiplicity of ideas about their biology and ideas about their uses. Whatever happens, this dissertation will end with a mystery.

As I further wrestled with this question, I began to see what he meant. There wouldn't be much point to a dissertation that started out saying that fish populations are difficult to understand and then simply ended with the same conclusion. But, while fish populations remain inherently unknowable, we *can* gain some insights about the kind of politics that this uncertainty produces. While this dissertation might not get us much further in developing a definitive understanding of elusive halibut stocks, it does shed light on the mystery of the mystery itself – on the often unseen politics and implications of attempts to regulate an entity for which no singular and complete understanding is ever possible. Learning more about the politics of mystery can help us to more wisely and more justly make decisions in the face of that uncertainty.

In this dissertation, I attempted to show that the inherent mystery of fish resources makes it possible for different groups to have different interpretations of a common resource – they can each fill the canvas of the mystery with ideas from their

[346] Govind Nayak, 2009

particular worldviews. In the case of a resource that extends over a large geographic range and is shared by a diversity of communities, there can persist a variety of ideas about what that resource is and how it should be used. The mystery of halibut does not just mean uncertainty, it also signals multiplicity.

This multiplicity of perspectives means that an attempt to regulate a shared resource through a centralized system invites a political process about which vision of the resource will be used in decision making processes. In these processes some approaches to the resource dominate and other will be pushed to the side. The problem is that these politics can often go unnoticed because the end result of these political debates (if the debates ever openly took place) are now taken for granted. Of course Western fisheries science will play a large role in informing Pacific halibut management, of course management strategies will be enacted through pre-defined regulatory areas, of course a centralized system of governance involving the US and Canada is the most effective way protect halibut – we almost can't imagine management being conducted in any other way.

I used a historical perspective to show that alternative visions for halibut persisted when halibut regulatory structures began and that alternative visions for halibut continue to persist in the practices, stories, and ideas of halibut fishermen from communities such as Old Harbor. As a result, halibut regulatory practices continue to be mired in this subtle politics over differing visions for the same resource. In bringing these political debates over ideas about halibut to the forefront, I also hoped to show just what was at stake for communities whose ideas about halibut have become marginalized over the course of history. Being on the losing end of an abstract battle that no one sees or thinks about can have very real and material consequences for users of commonly-held resources. For fishermen from Old Harbor it has meant intervention by outside management agencies into their seasonal and cultural cycle of resource use. It has meant needing to invest large amounts of time and energy into learning an entirely new natural resource language and politics – time that takes them away from the fishing practices and grounds that they love. It has meant loss of access to local fish resources.

By examining the historical context of halibut management, this dissertation reveals that Western ideas about environmental management are not the only, nor necessarily the best ideas about natural resource governance and sustainability. The reason why these Western ideas about fishery management end up dominating natural resource regulation is not because they are inevitable or inherently better (this is also not to say that indigenous approaches to natural resource management are inherently better either). Instead, their dominance in management is the result of a colonial history during which authority over natural resources was wrested from indigenous groups and placed into the hands of colonial nations and their government agencies. This history put Western management agencies in a position of power to dictate how these resources are to be managed and understood.

This colonial history continues to be lived by Old Harbor fishermen who must interact with the Western-oriented fishery system on a daily basis. The dissertation shows that this colonial history is present in not just one, but in many aspects of resource management. It is present in the way that Old Harbor's halibut populations are biologically assessed, in the way that fishery regulation is enacted through space, and in the way that resource access is distributed among different users.

The very notion of the commons, by implying that there is a common understanding or interest in a particular resource, serves to cover up the colonial legacy of environmental management. With the notion of the commons, we cannot see the multiple approaches to halibut that have been marginalized in the pursuit of one common system to govern the use of shared natural resources. This dissertation shows how the historically rich perspective that Old Harbor fishermen have with regards to halibut resources has been largely cast aside in international halibut regulation. A centralized halibut commons has enabled a singular Western approach to fish resources to apply to all users of the fishery, regardless of whether or not they agree with that approach. This has impacted all participants in the fishery, including Old Harbor.

In her book, *Do Glaciers Listen?,* Julie Cruikshank introduces the concept of *converging* narratives to describe the different ways that indigenous groups and Western scientists approach glaciers in Arctic Canada (Cruikshank 2005). The concept of convergence might be useful for thinking about the multiple kinds of histories, places, and approaches are brought together in issues surrounding commonly-held resources. When we examine the Pacific halibut fishery, we can see that different communities connected to the resource converge in both time and space and it is the halibut resource itself that brings about this convergence. Figure 42 and Figure 43 summarize some of the findings in the dissertation to highlight the way that the Pacific halibut fishery has brought about a convergence of histories in time and has enabled a convergence of ideas about place – in this case Kodiak Island.

The notion of converging as opposed to competing approaches to natural resources leaves open the possibility for reconciliation. Indigenous and Western

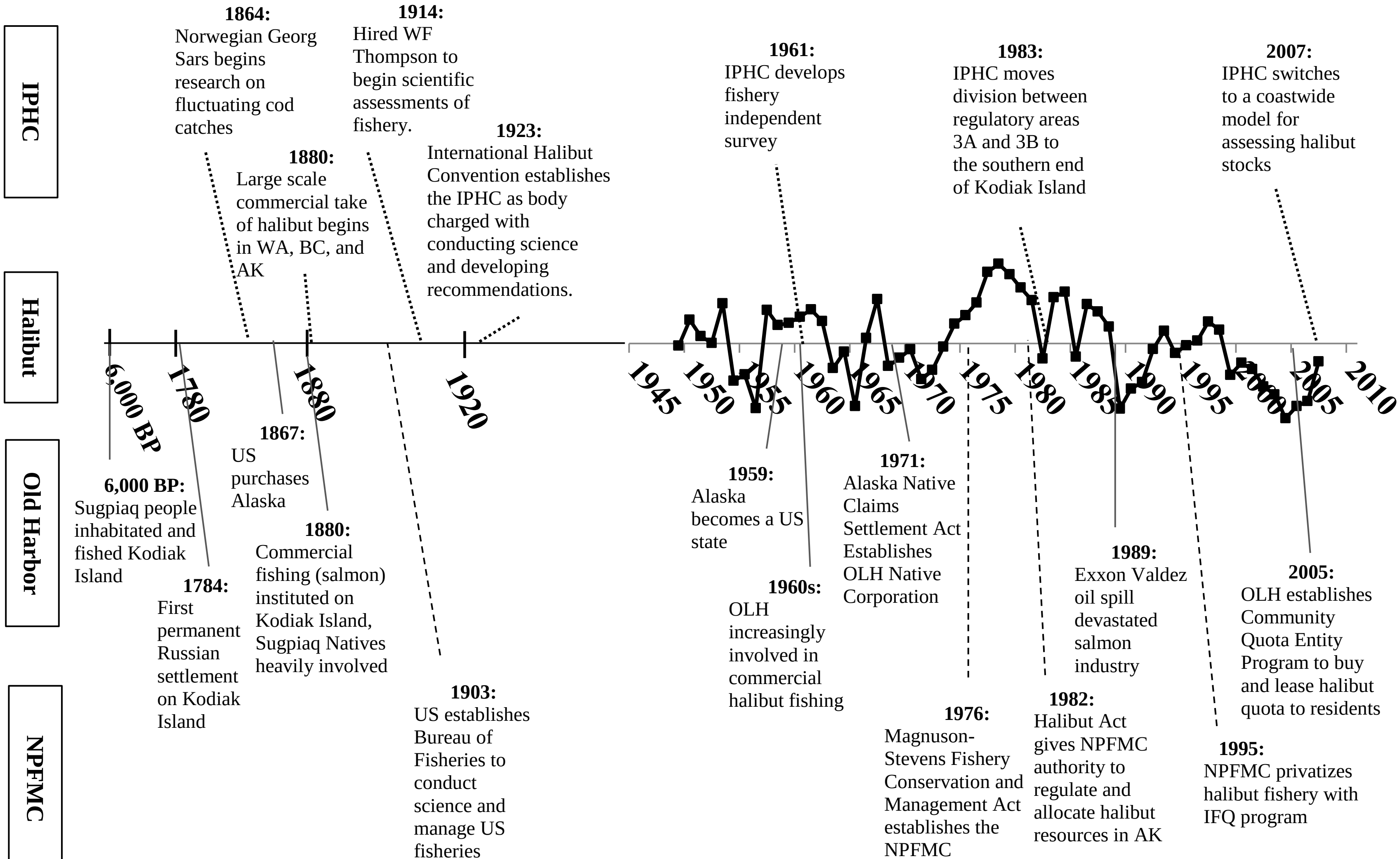

Figure 42. Converging chronologies of communities of study: International Pacific Halibut Commission, halibut, Old Harbor, and the North Pacific Fishery Management Council. Halibut graph represents change in halibut otolith growth over time.

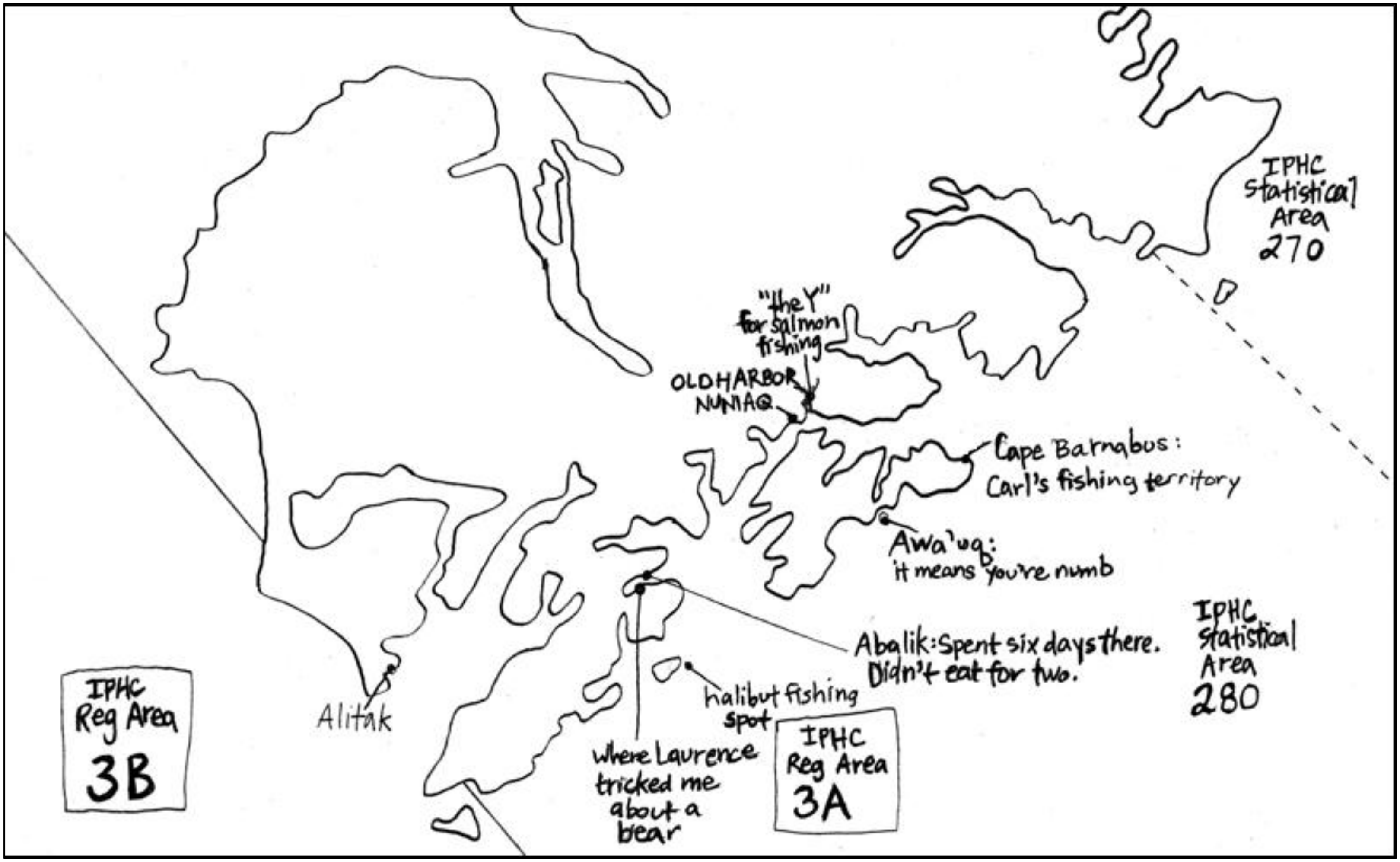

Figure 43. Converging maps of the seascape surrounding Old Harbor

approaches to nature need not always oppose one another. They can sometimes overlap, reiterate, and even defer to one another – all of which happened at different points in the halibut fishery. Within the framework of convergence, there is no set of expectations about how indigenous groups and Western regulatory agencies will relate to natural resources and enter negotiations about management. While I don't advocate that we completely abandon the term commons to describe shared natural resources, I do suggest that we move toward a framework of convergence when approaching the commons. Thinking about convergence through the commons can bring increased attention to the multiple perspectives and viewpoints that are brought together by a shared resource, as well as increased attention to the politics that multiplicity can produce.

Opportunity of the Commons

The concept of the commons has been consistently connected with the negative concept of tragedy. It might be time to move away from the narrative of the tragedy of the commons. We can shift our focus towards the opportunity of the commons. While the commons signals the potential for decimation of resources and for marginalization of ideas, it also creates a unique opportunity for many different communities and histories to come together to make decisions about a shared resource. This provides the forum for diverse groups to jointly participate in processes that shape their worlds and environments. In this situation there is the potential for new and better ideas to emerge.

In the processes guiding Pacific halibut fishery management, Western ideas about biology, place, and economy tended to dominate the regulatory process pushing alternative ideas about the resource to the side and leading to devastating effects for Alaska Native fishermen. However, these fishermen and fishing communities did not simply sit back as their ideas about resource management were pushed to the margins. They continuously critiqued and resisted the Western ideas about management that they found troubling and inappropriate. In addition, they often lobbied tirelessly to ensure that their ideas about management were heard and incorporated into regulatory practices.

Through these processes, fishermen from some of the more marginal places and histories in the fishery began to turn fisheries management into something new. They developed entirely new ideas and innovations for how fish can be understood, managed, and allocated. Their ideas are not simply interesting in the context of a fishery. Through their efforts fishermen have developed new visions for the Western ideas about nature and society that have so far failed to meet their promise.

Since the field emerged in the 1880s, Western fisheries science has still failed to achieve its goal of dominating and understanding the dynamics in fish stocks. Modernist initiatives in the 1950s to predict and manage fisheries to a perfect maximum sustainable yield where maximum harvest and profit could be obtained from fish stocks contributed to declines and even collapses in many fish stocks who resisted being so fully ordered by these statistical processes. Through constant and thoughtful participation in biological negotiations about the status of stocks, fishermen from the halibut fishery have continued to engage with fisheries science. Through this engagement, fishermen have reminded fisheries scientists about the limitations of their analyses and approaches to the mystery of the natural world. Fishermen have adamantly argued for their experiential assessments of the fisheries surrounding them, even in the face of the impressive and expensive technical ideas from halibut scientists. In at least one case, these fishermen's assessments have served to correct scientists' overestimation of fish populations and have guided management in a more sustainable direction.

In a globalized world, the scale at which we grapple with and understand the world continues to increase. Small, out of the way places become even smaller in the global context. In the context of the halibut fishery, international agreements to protect halibut resources have contributed to a broad scale understanding and management regime for the fishery. Fish population processes are modeled on a coastwide scale, localized depletions are deemed insignificant, management decisions are made in large urban centers. However, fishermen from communities like Old Harbor have advocated against this broad scale vision of place, against the sole representation of place in cold, meaningless regulatory boxes. By banding together with other small communities throughout the fishery, fishermen have shown that rural areas, small places, fine scales, local interests matter. They have developed a powerful political voice for the small and the rural, and in doing so worked to continue the persistence of these small fishing villages and their unique, lived relationship with the halibut-fished sea.

Finally, Old Harbor fishermen have poked considerable holes in the failed promises of capitalism, free trade, and privatization. These economic visions have been accompanied by promises of growth and economic opportunity for all, including the less developed world. But for the most part these economic rationalities have only served to increase divisions and further marginalize less developed places. Old Harbor fishermen experienced these failed promises first hand as the fishery surrounding them became divided into private property guided by free market rationalities. They witnessed the alienating quality of private property as privately-owned quota shares and fishing jobs began to leave the hands of community members. They witnessed as the "free" trading of market shares of fish access privileged wealthier and better-connected fishermen and increasingly left them and their rural fishing communities without options and without fishing careers.

But, in their fight against the damaging impacts of this privatized fishery, community members from Old Harbor innovated and came up with an entirely new kind of property; they invented their own unique economic rationality. They developed the Community Quota Entity program where fish property was not individually but communally held and where the purpose behind property accumulation was community and cultural protection. Furthermore, they guided the distribution of these property rights among community members based not on a rationality of economic efficiency but rather on their own economic values of fishing – greater access to those who fish in a way that is connected to the community and higher priority to those with greater economic need.

These kinds of innovations are the product of the commons. They are the product of the natural resource context that connected a community of Western halibut scientists with a community of Western halibut managers with a Sugpiaq community of fishermen. While many of these innovations have a far way to go and many obstacles to overcome before they reach their potential, they offer a starting place for thinking about better ways to handle the politics of regulating fishery resources.

Finally, although Western approaches to natural resources have failed to meet many of their promises, they still have important ideas and information to contribute to fishery management. Fisheries scientists have uncovered aspects of halibut populations that were not previously known and these insights have increased our ability to protect the resource. In addition, Western managers have a long history developing political structures that can contribute to the protection of fish resources under a large amount of fishing pressure. The persistent and innovative efforts of Alaska Native fishermen combined with the perspectives of managers and biologists who are concerned with protecting the resource can all provide a path towards confronting the colonial legacy of fishery management and imagining a form of regulation that is both ecologically sustainable and socially just.

25 September 2008

It is that point in my research. I am starting to put on weight. Hives have broken out all over my body. The sun hasn't been around and I am pale all over. I am worried that I may have worn out my welcome here in the village. I miss home. I am lost and confused.

So I went out for a little walk along the beach. After strolling the shore I climbed up on the dock and walked out. When I looked behind on the beach where I had been walking, I saw one, then two, then three, then four, slick heads pop up in the water. I looked more closely and saw that they were a pack of land otters and they had been following me my entire walk. They stopped in water shallow enough to stand and shook their heads. They were lined up in two rows of two. I was immediately reminded of a story that Papa George, an elder who had recently passed away, told me about how land otters always travel in rows of two, like a little army. The otters then went back underwater and swam right under me as I stood on the dock. The water was so clear. I could see their little paws dancing back and forth, their dense fur swaying in the current. They passed under the dock and then just feet in front of me popped their heads up to breathe. One turned *its head, looked me in the eye and snorted. I don't know, for whatever reason, it felt like a little gift just for me. I had an overwhelming feeling that I wished I could give something back to the otters, some food, or something as a thanks. I silently mouthed the words thank you and soon they were scurrying out of the water and up the shore. As I watched them disappear behind the fish-cleaning shack I entered into a moment of distant contemplation. How did these otters, this memory of Papa George, and I all come to converge upon this dock? What is the meaning of all this? I sighed and began to quietly release these thoughts because the truth is I'm not really sure. It is a mystery.*

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Appendix A: Stories From Map of Abalik

"I had so much close call in the sea you know. I told my partner Papa George I don't think I'm gonna die in the sea. I'm gonna die on the land."

(1) Place: Barling Bay
Story:
Carl: Yeah, he [Abalik] ran his own boat for them. He was a crew member with George. Barling Bay George. You guys lived in Barling Bay with George. How many years did you fish with him?
Abalik: Four years.
Carl: On the Cape Trinity.
Abalik: Um-hum.

(2) Place: Larsen Bay Cannery
Story:
Abalik: Yeah I worked there 19…before I went fishing, 1976.
Laurie: It's still running?
Abalik: Yeah, it's pretty whatyoucallum pretty. The whole things shakes, huh?
Interviewer 2: The whole thing shakes [laughing]
Abalik: Yeah. The whole dock. The guys out here. They hired 40 some womans from outside. All kinds. Yeah they worked in two shifts in Larsen Bay. I was with em. They came all from outside ah. They had to hire me. You know. There was a lot of fish.

(3) Place: Port Bailey
Story:
Laurie: Where's Port Bailey?
Abalik: Hum, well you go in here. Yeah, about right here.
Laurie: Right there?
Abalik: About some place. Does it say?
Laurie: No.
Abalik: It was Shearwater's partner. They had the same company.
Laurie: And that's where you got your boat?
Abalik: Well, that's where I was getting my boat, every spring.
Laurie: You - how'd you get up here?
Abalik: Well I gotta go on a plane then. Had to come all the way around here.
Laurie: Holy cats.
Abalik: Every summer.
Laurie: Did you go fishing while you came down?
Abalik: Well, yeah. I steer 12 hours one time. From here to Port Bailey.
Laurie: In one day?
Abalik: I was on - I was on the wheel. Just my wife was with me. My crew was drunk. I had to leave em here…And my wife went with - she make me sandwich cause ah I was on the wheel 12 hours. I was pretty tired. My arms were. Cause we hit them tide rips.

This one is a bad place here. That's Whale Island. You see this. People lived there. I know them guys. They gotta house here. Whale Island.

(4) Place: Marmot Island

Story:

1991 was Abalik's last commercial fishing trip before retiring

Abalik: Oh there was well, there was, it was June month. There was lot of we would have loaded up…All big halibut. They were coming like you know we would have load up. But ah boat sprung a leak. We would have load up with halibut. We - first we stop in the Cape Chiniak. You know where it is?

Laurie: Um-hum.

Abalik: We had the skates there then we didn't - we moved em by Marmot. All big - no small ones. All big halibut.

Laurie: How did you know where to go?

Abalik: Well, them guys - the guy in Kodiak. He knows, told [the skipper], yeah he fished and how he said well - the further you go out, the more halibut you get.

Laurie: Really?

Abalik: People want to know why. You go out deeper, if there's more. He was right. I see him in Anchorage. He live in there. His name is ----. I thought he died one time. He didn't, he's still alive. I seen him in a social security office he recognized me, came up. 'Somebody told me you died.' He just laughed. Cause I heard - he said no, he's alive…There was four of us aboard well - they were all halibut fishermen. So [a friend], he was my skipper, you know. He was running the boat. So, whatchucallum, there were a lot of halibut but this guy you know he forgot to close the valve. All this time the water must be coming. Till just about sunk. The boat was going like this and we had a break then I looked what's water coming out the floor, you know. That's when I run up and I told [the skipper]. I think we're sinking cause a lot of water down there. And he came down and he said. Well, good thing the coast guard you know this one. If it wasn't for coast guard man we would have been long gone. Cause water so cold, you'd never survive.

(5) Place: Straits Near Old Harbor

Story:

Abalik: Well, it was small you know - first boat and they gave me ah second one was bigger, third one was bigger [laughing]. Yeah, every year I got an even bigger boat but that boss in Port Bailey told me he liked the way I fished you know I was getting a lot of fish. Cause ah there's 19 you know 1966 I think so. There's it was after the tidal 1960 - I got 38,000 fish.

Laurie: Wow.

Abalik: One summer.

Laurie: Holy cow.

Abalik: Yeah. That's how come then he gave me - next year an even bigger boat. Another boat and ah I was gonna... The last one I name of the boat was West Cape. So ah this guy haywired my crew. That I was gonna buy that boat. That boss told me. You

get over 30,000 fish you could, you know you could buy the boat and I did. But my crew member fouled me up.
Laurie: What he do?
Abalik: He ran the boat in the beach with the drums, fuel. And ah you know the prop and the shafts, he bent it
Laurie: Oh no.
Abalik: And I got the blame. So the boss in Port Bailey that guy I told him, that wasn't me that run the boat. That guy was drunk when he ran it, my crew member it must have went down, they had drum, he ran up the beach full speed. So he told me, no, he said I wasn't gonna give you that boat now. But ah. I don't know he told me I told him I said it wasn't me. It's somebody else that run the boat. So that fouled me up.
Laurie: West Cape. Did you have another boat after that?
Abalik: No, I couldn't cause ah.
Laurie: Cause of the crash?
Abalik: Cause I try to get my boat you know, um, I went to Kodiak then I try to get a loan, I couldn't. See the company wouldn't help me. So. Ah. I tried to tell em I want to you know, but, I even tried ah a loan from the VA. You know. I couldn't get it. I wanted to put down payment on a boat. $20,000 or something but he wouldn't - I couldn't get it. They told me they run out of funds.

(6) Place: Red River
Story:
Abalik: Did he tell you about I fished with him one time?
Laurie: No. Did you?
Abalik: I did. I fished with him one time. We went ah his boy was younger. So ah. I - we went to Red River and there was no fish. And ah. And we made a haul you know and we got one herring [laughing].
Laurie: [laughing]
Abalik: He remembers that. Yeah. We got one herring. And that was it. We went back to Alitak. There was nothing.

(7) Place: Woody Island
Story:
Abalik: My parents you know my a my mom was Russian, half Russian, my dad was full Aluet. They're both gone now.
Laurie: Were they from Old Harbor?
Abalik: My mom was from Carmel Alaska and my, um, we were originally from Woody Island, Kodiak. You know the house burned down, I was four. You know Papa George, her mom was my dad's sister. So she had extra house, see, so after our house burned on Woody Island she called him to come down here [to Old Harbor] that's her, she had a log cabin. So I grew up in there, you know. And then my dad build another house. Later on. Watchyoucallum, I lived in, I've been here ever since. You know rest, most of my life. Ever since I moved from Woody Island so…

(8) Place: Herring Lagoon
Story:
Abalik: Well, he didn't name it. He just ah the company named it by number. The name was K-1. That was the name, you know. So that was the last boat that my brother, three of us, we went fall fishing and we got wrecked on where you was…
Interviewer: Right - the lagoon.
Abalik: We spent six days there then I didn't eat for two days. We had a lot of water but we had rifles. That's when I told my brother, I figured well - I know they eat the seagulls, so I went down by the crick and we shot two of em. So we skinned em, put em in a pot we had camp stove, you know. Boiled em, boy they tasted pretty good. We were getting weak. We were not eating for two days you know. We didn't even want to walk around. I was thinking in my mind, well, we still got shells. I had shells. I know I gotta get something so I went by the crick and I shot two seagulls, skinned them out. Boy, it was good. And I find out how it feels to be hungry. So. I figure you know anybody ah like this I live if anybody hungry, I'll feed em - anybody, because I know how it feels to be hungry. So. So ah, the plane found us and it brought us home to Old Harbor. We didn't have no more boat. The plane looked for it. My dad was alive then. But somebody get in a plane. He was pretty happy when we got home. I told my dad. We lost the boat. He didn't you know, he said, he didn't care about the boat, he just mentioned like we was still alive. That was what he was worried about. He thought we were all gone, you know. Six days. He figured well, he was pretty happy when he seen us. And he said - well don't worry about the boat. Said he'll get another one. So, that's the way.

Place: Rolling Bay
Story:
Laurie: Did you pick these out? Your land?
Abalik: You mean…you know ah. They had that. That 39 acres I got.
Laurie: Yeah?
Abalik: They had a like lottery or something. Yeah, they had like they fix your number, put your name. I got that 39.
Laurie: So you just drew it out of a hat basically?
Abalik: Yeah. They. And that 119 acres. I you know I bid that. Fish and game took me, I mean BLM took me. Well, yeah. I trying to get my dad's. Where's Rolling Bay at?
Laurie: It's down here.
Abalik: Yeah, my dad had a cabin here. You know before and he [the BLM official] didn't want to give it to me. You know ah whatyoucallum. Rolling Bay. My dad had a cabin you know. But, they went over there but you know but the cabin was collapsed. You know they told me they didn't find no evidence, nothing. So they said go pick you. You could come with us and that's where you know they took me. Natalia Bay.
Laurie: So you wanted to get land where your dad's cabin was in Rolling Bay, but they didn't let you?
Abalik: I mean this one here the Rolling Bay. They say they couldn't find nothing, no evidence. You know. I told em well, that they were, they were I don't know my dad built it maybe 1930, you know. It was. I used to go there and BLM says no and they said you got another 119 acres so they took me in the helicopter. BLM. Land there, then he

said. That's one at Natalia Bay. Yeah here. It's ah. It's in the lagoon. And it's kind of near this. I tried. I keep talking to them guys. You know what they told me?
Abalik: What?
Laurie: Around there they had army post, World War II all over. They called it Black point, you know down here. He said something about it that it was government land or something so they had the - they had army post all over - all over MacDonald. You know, during World War II. That's what they told me. They's in the government land or something.

Place: Old Harbor dock
Story:
Abalik: His wife wasn't even here when he drowned she was outside. He used to come up here then he used to go ah. Go after clams, go get crab. So, my daughter was that big. My wife came, they went to church. I was home. Take him out to the church and my wife said. They found [my friend] in the beach. 'What?...You mean [friend's name]?' 'Yeah. They found him'. I couldn't believe, I had to get out and he told me no, the priest said they found a body down there. Kind of, you know I couldn't believe it. So I put my coat, run out. I met his boy. He was on his truck. I said: 'what happened?' he must have fell off the dock. I know he was drinking that day. I tried to tell him in the store you gotta go up to school, go watch those high school wrasslers. He just told me no. He just told me I got a whole bottle at home. You want a drink? I said no. He got a whole quart of whiskey. Told me. I told him no. So…he was alone down there, then he went out. Must have went down the dock, fell off. He didn't know how to swim, nothing. You could tell he must have been holding onto the pilings, the tar. We took his coat.

Place: Newman Bay
Story:
Abalik: Hum. I told Papa George two hundred and two hundred and fifty king crab took me. I told you, huh? Upside down. The block busted. I was inside the light box. I came up upside down on my boots. I know I was in. You know I was unloading the king crab, throwing them up the boat. Alongside the way. They call it the lightbox. You got wire. I heard something snap – ooh. I figured yeah, I got the rope. I figured I got to get out of here, I know I'm gonna. If I don't get out of here, I'm gonna drown. But I came up like this to my boots. You know the hip boots?
Interviewer: Yeah.
Abalik: Took me up. That's when ah Papa George grabbed it.
Laurie: Grabbed your leg?
Abalik: Yeah, then he grabbed it. I know how to swim. I was wondering how come - what's wrong with my foot? He was holding me upside down. He said he wouldn't it go. He figured I was out. He was holding me and I felt the boat, finally he grab my hand…I wasn't cold or nothing. It was December month.

Appendix B: Sugstun Place Name Process Details

English Name:	Sugstun (Phonetic):	Sugstun (Official):	Translation or Process Description:
1. Santa Flavia	U/N	unknown	*R1:*I mean 31 is Siyahik. Yeah, it's Santa Flavia. *R2:* I can't think of it. *R1:* It's gotta be, no maybe it aint. *I1:* Question mark ? *R1:* Question mark.
2. Dog Bay	Mechluguk	unknown	*R1:* They used to round haul dogs [a kind of salmon] in there.'
3. Pivot Piot	Pak-wik *nickname:* Ching-he-wuk (Sugstun word for penis)	Parwik	*Carl:* Maybe. What they call that piv – ah that pinnacle by ah Kiluda? *Abalik:* Pivot point? *Carl:* Yeah. Was there a name for it: ching-he-wuk [laughing] *Interviewer 2:* Is that what it look like? *Carl:* Yeah, that's what it look like. *Laurie:* What does that mean? *Interviewer 2:* It's the man part. *Laurie:* That's what they call those pinnacle [laughing].
4. Ghost Rocks	Ew-wi-yuk	Nagaayut	*I2*: Does that mean anything? That word. *R1:* Ew-wi-yuk what does Ew-wi-yuk mean there was an ah. Seemed like there was a meaning for it. I forgot it…What did Ew-wi-yuk mean? *R2:* Well. People that used to ah come out and kayak before. They used to stop there was a big cave, there's a bit cave in there, so. The weather bad, they stay overnight. George's mom when he was alive was telling me that. Ew-wi-yuk. Ghost Rocks.
5. Refuge Rock	Auwouk	Awa'uq	Refuge Rock is the location where the Russians slaughtered and entire community of Natives who were hiding out. It is believed that some jumped from the rocks to their death to avoid slaughter or slavery. *R3:* Like Auwouk, they always say that refuge rock is Auwouk, Auwouk means you're numb. People they probably after the massacre they had, were numb.

6. Ocean Beach	?	Itngaq	*I1:* It says ask Carl, though they weren't sure. *Carl:* Carl don't know the name of this. Never heard. Nobody ever. *I1:* You never went out there? *Carl:* No, un-huh. What? Never hear nothing. *I2*: Did you guys used to go out there before? *R1 Carl:* No. Couldn't access it you know it was just I don't know if. They only you know the people from Rolling Bay would probably walk over, that lived there. That was the only. There was a big settlement, there had to be a name for it.
7. Amee Bay	San-o-houk	Sanruk	*I1:* Did you guys used to fish in there? *R1:* Yeah, these guys stole all the fish out of there, packed em out with lines. Almost killed all the fish out. *R2:* Where? *R1:* San-o-houk. You guys used to pack em out in lines poor dogs. *R2:* Fall fishing
8. Big Crick	Idowick	Ituwiq	*R3:* Eduwik in Alutiiq means you're kind of like going in parallel. I think the crick that go in parallel, maybe that's why they named it Eduwiik. So those, and that's my interpretation because I you know, I heard those names and I know how that word is used.
9. Old Harbor		Nuniaq	*R3:* Like Nuniaq is um, um, it's newer, derived from a word Nuniq, new, kind of like a new village.
10. Barling Bay	Nunagak	Nunaqaq	
11. Three Saints Bay	Soonatluk	Sun'alleq	Means 'Old Kodiak' or 'was Kodiak before' used to contain the main township of the island which moved to Kodiak's current location northeast of Old Harbor.
12. Natalia Bay	Siyahik	Mairllukaq	*R1:* How about number 40 might be Siyahik. *R2:* What did you call Natalia Bay? *R1:* Siyahik. *R2:* Yeah, that's. *R1:* Is that it? *I1:* I don't know all I have is ouiduks (clams) written down there. *R2:* Siyahik is Natalia Bay. *R1:* Siyahik, yeah.

13. Rolling Bay	Suctuc	Sat'aq	
14. Herring Lagoon	Inisuk		
15. Eagle Harbor		Irak	*Respondent 1:* Oh yeah, that's where Old Harbor come from. Some guy went crazy and scared everybody out of there. That's what mom said. Some guy went wild there and people just packed up and moved. *Respondent 2*: Well…they had it pretty rough in winter, it was open. No. No shelter. *R1:* Yeah but the…whoever pick Nuniaq [Old Harbor] picked a good spot. Funny. I wonder why they lived in Eagle Harbor. It gets rough…there was nothing there. Little bit of reds [salmon]. *Interviewer 1:* Is there a crick over there? Is it by a crick or something? *R1:* Yeah, there was a cri - reds went up the crick, huh? I think I mean what else? *R2:* You know across the bay where… *R1:* I mean they had access to the sea lions out there too. Yeah the sea lions, maybe that's why.

Material for Sugstun Place name process obtained from talking sessions with Paul Kahutak, George Inga Sr., and Carl Christiansen Sr. on 7/9/08, 7/17/08, and 7/23/08. Translation of place names for Refuge Rock, Old Harbor, Big Crick, Stella Krumery, pers com. Sugstun (Phonetic) represents the spelling that another interviewer and I derived phonetically from conversations. The official Sugstun spelling of the Alutiiq Museum (Sven Haakanson Jr, pers comm, Jeff Leer pers comm.)