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In Hot Water: A Multi-Level Analysis of Structure, Agency, and Adaptive Governance in Chile's Lake Region

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IN HOT WATER: A MULTI-LEVEL ANALYSIS OF STRUCTURE, AGENCY, AND ADAPTIVE GOVERNANCE IN CHILE'S LAKES REGION

By

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Dissertation Advisor: Dr. Christine M. Beitl

An Abstract of the Dissertation Presented
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This dissertation uses a multi-level analysis of individuals and institutions to examine the cultural, social, and political conditions which contribute to the process of transformation to adaptive governance at the local scale. Specifically, the dissertation addresses the following questions: (1) what community-level factors affect individuals' abilities to contribute to transformations in governance that enable adaptation to socioeconomic and environmental change? (2) why do legislative structures governing marine resources play out differently in communities' abilities to transform governance in the Lakes Region? and (3) what underlying cultural factors explain conflict in institutional preferences for adaptive governance?

This dissertation builds on critiques that the literature on governance has focused too narrowly on outcomes with less attention to interactions between individuals and institutions or the overall process of transformation. Attention to these dimensions is needed to advance understanding of governance as a process, rather than an outcome, which is influenced by diverse stakeholders and the interactions between stakeholders, existing governance structures, and the biophysical system. The objective of this dissertation is to examine the social, cultural, and

political factors which may facilitate or constrain the transformation of governance at the local scale, with attention to legislative structure, shifting power dynamics, conflict, and differential access to resources. I integrate theoretical understandings of structure and agency (Giddens 1979, Radcliffe-Brown 1952, and Bourdieu 1977) and conceptualizations of friction (Tsing 2004) to situate actors and institutions in a globalized context to understand how they are affected by, interact with, and transform structures of governance in socio-ecological systems. This study addresses gaps in knowledge of how individuals may be constrained by governance structures and do not have equal opportunity to contribute to decision-making (Agrawal 2005) or how they engage with the structures to redefine power dynamics and transform governance (Cote and Nightingale 2012).

I use a case study of the Lakes Region of southern Chile which experienced an environmental crisis in 2016—a harmful algal bloom—which paralyzed the region's economy and illuminated pre-existing tensions between stakeholders. Resource users were out of work for six months and aquaculture exports of salmon were prohibited. The region depends on the globalized nature of production and export of large-scale aquaculture product, while simultaneously, many rural communities still rely on income from artisanal harvests of wild benthic resources. As this dissertation will show, the development of new ocean uses has caused conflict between stakeholder groups. But new and unpredictable environmental challenges that the Lakes Region faces, such as the harmful algal bloom in 2016, will require these diverse stakeholders to cooperate with each other to transform governance away from these separate legislative structures to collaborative, communicative adaptive governance that responds to social and ecological feedback from the system.

Through this case study, this dissertation documents the process of transforming governance, with special attention to legislative structure, power dynamics, and conflict. Using a multi-level analysis of resource users and institutions, I examined the interactions between individuals, institutions, and political structure within the context of a rapidly changing, globalized state, to demonstrate how and why individuals and institutions can or cannot transform governance. I found that individuals and institutions abilities to transform governance depended on individuals' differential access to resources, conflict which may in part be underpinned by differing ontologies and interactions with political structure, and individual and institutional collective preferences and social networks.

DEDICATION

I dedicate this dissertation to my Chilean family, the Bustamante-Toros, who opened their home to me in 2010 and changed the trajectory of my life.

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CHAPTER 1

OPPORTUNITIES AND CHALLENGES FOR TRANSFORMATIONS TO ADAPTIVE GOVERNANCE IN MARINE SOCIO-ECOLOGICAL SYSTEMS

1.1. Governance as a "wicked" problem in socio-ecological systems

It is evident that socio-ecological systems are undergoing rapid, sometimes abrupt, environmental change with unpredictable consequences. Although environmental change occurs globally—accelerated by climate change, fluctuating economic markets, declining resource abundance, and uneven development—the effects manifest differently across spatio-temporal scales. In many regions around the world, the effects of global environmental change will be shouldered at the local level (Coulthard 2008). Therefore, as futures of socio-ecological systems become more uncertain, there is a need to create adaptive governance at the local level that can manage uncertainty and conflicts through the coordination of actors and the integration of diverse knowledges into policy (Berkes et al. 2006; Folke et al. 2005; Lebel et al. 2006; Lockwood et al. 2010; Olsson et al. 2006). The responsibility to form innovative governance falls on the shared, collective effort of stakeholders—the government, private business, civic organizations, communities, political parties, universities, and the media—to make decisions, choose goals, and act to achieve those goals (Chaffin et al. 2016; Jentoft and Chuenpagdee 2009). Yet, facilitating the achievement of collective decision-making and the collective judgement of stakeholders is complicated by the constantly evolving nature of socio-ecological systems, the ever-changing linkages between globalized and local economies, and the diverse stakeholders who often have various, and sometimes divergent, objectives, needs, and desires.

Figuring out how to develop successful governance is a "wicked problem," one with no technical solution that requires structures that brings together the collective judgment of

stakeholders (Jentoft and Chuenpagdee 2009). Studies have contributed to understandings of the determinants of adaptive governance at multiple scales (Adger 2000; Tompkins and Adger 2004), including the importance of social networks within communities and across nested institutions (Tompkins and Adger 2004). Further, studies have shown what conditions management institutions need to promote good governance, such as the capacity to learn from unpredictable events (Armitage et al. 2009), the ability to accommodate stakeholder views, and the capacity to link to other institutions at different scales (Armitage et al. 2009; Olsson et al. 2004). However, studies of governance in socio-ecological systems often treat the system as static and focus on the determinants of successful governance without considering the details of the problem or the social and cultural factors that facilitate or constrain the transformation of governance (Cote and Nightingale 2012; Jentoft and Chuenpagdee 2009; Poe, Norman, and Levin 2014). To address these issues, governance can be analyzed at the local scale to illuminate the process of local adaptation and transformation, as well as the social and cultural factors that affect governance at the local scale (Coulthard 2008).

As Jentoft and Chuenpagdee (2009) suggest, studies of governance which focus solely on outcomes ignore the idea that governance is a process rooted in sociopolitical history and culture of a specific place. What might be successful governance in one place during one instance in time might become maladaptive when faced with another problem, or when implemented in another place. Furthermore, studies of adaptive governance lack understandings of how individuals are affected by existing governance structures, which may facilitate or constrain their actions related to transformations (Cote and Nightingale 2012). Building on those critiques, this dissertation contributes novel insights to understandings of governance transformations by examining governance as a process, rather than an outcome, which is influenced by diverse stakeholders and

existing governance structures. It is necessary to study governance as a process because it is the dynamic, complex interactions between stakeholders, existing governance structures, and the biophysical system which contribute to outcomes.

This dissertation asks: What factors contribute to or inhibit the transformation of current governance structures to adaptive governance in socio-ecological systems? Specifically, the dissertation addresses the following questions: (1) 1) what community-level factors affect individuals' abilities to contribute to transformations in governance that enable adaptation to socioeconomic and environmental change? (2) why do legislative structures governing marine resources play out differently in communities' abilities to transform governance in the Lakes Region? and (3) how do underlying human values shape individual and institutional frames related to policy interpretations and actions? Although socio-ecological change occurs at the global scale, studies that provide a lens into the local scale can illuminate how socio-ecological change and "processes of policymaking" are of global consequence but are "local in their manifestations" (Randeria and Grunder 2011:202). What this means is that the effects of global change and the potential solutions to problems manifest themselves locally, thus studying governance transformations at the local scale can contribute to understandings of global issues.

The objective of this dissertation is to examine the social, cultural and political factors that may facilitate or constrain the transformation of governance at the local scale, with attention to legislative structure, shifting power dynamics, conflict, and differential access to resources. To achieve this objective, I use theoretical understandings of structure and agency and conceptualizations of friction (Tsing 2004) to understand how individuals are affected by, interact with, and transform structures of governance in socio-ecological systems. Theories of structure and human agency can make significant contributions to understandings of the process of

governance transformations. Further, illuminating areas of friction (Tsing 2004; 2012) can situate individual and institutional behaviors and decision-making in global processes to show that the emergence of cultural forms and institutions may be "persistent but unpredictable effects of global encounters across difference" (Tsing 2004: 3). Tsing (2004) suggests, similar to Randeria and Grunder (2012)'s argument, that global processes manifest at the local scale, and insight into local-to-global engagement can demonstrate that individuals and institutions do not exist in a vacuum. Instead, cultural emergence and individuals' behaviors are shaped by histories of local-to-global networks, power relations, systems of oppression and opportunity, and relationships with the environment (Tsing 2004). However, few studies of socio-ecological governance have employed these theories to understand how individuals are affected by globalization and constrained or supported by governance structures. Examining these interactions can elucidate why individuals may not have equal opportunity to contribute to decision-making (Agrawal 2005; Peterson 2014) or how they engage with the structures to redefine power dynamics and transform governance (Cote and Nightingale 2012).

Historically, social theory sought to explain uneven distributions of power in rapidly changing societies (Cassell 1993). In the nineteenth century, attempts to explain power differentials and individuals' capabilities to act during a shift from an agrarian to industrialized society focused on why some societies maintain internal stability while others do not. Émile Durkheim (1900) suggested that societies that maintain internal stability have parts that are held together by the structure of "social facts." "Social facts", considered to be the shared values, common symbols, or shared systems of exchange, drew attention to the study of institutions as a way to examine individual and group behavior and the shifts of societies over time. However, it was not until more than 70 years later that a more concrete, practical understanding of structure,

which accounted for human agency and spatial and temporal factors, was offered to social theory through Giddens (1979)'s structuralist approach.

Giddens (1979) created a theory to analyze social practice through suggesting that the every-day actions of individuals and their relationships with structures are recursive in nature (Cassell 1993: 7). For individuals to enact a social practice, they must draw upon a set of rules, conceptualized as the structure (Cassell 1993: 10). Giddens' structure is internal to agents and produces human agency, yet the actors "may be incapable of offering an account for the rules that are drawn upon, even though they are known in the sense the he or she knows 'how to go on'" (Cassell 1993: 12). Contrary to Giddens' theories of internal structure, theories of structure by anthropologist Radcliffe-Brown suggest that structure is real and observable—tangible and concrete patterns of social relations. This is similar to Pierre Bourdieu's theory of practice (1977)—his "habitus"—which aimed to recognize the mutual reproduction of structure, as resources and schemas, and agency, as actors with the capacity to engage in "highly autonomous, discerning, and strategic actions" (Bourdieu [1977] in Sewell (1992)). However, these theories have fallen short, critiqued because of their inability to accommodate issues of change and agency (Embirbayer and Goodwin 1994; Sewell 1992). These critiques have created tensions between scholars who supported Giddens' abstract notion of structure, and scholars who reinforced Radcliffe-Brown's and Bourdieu's concrete notions of structure (Lizardo 2010). Despite the tensions, I suggest it is necessary to integrate these theories to ensure that actors are not seen as unconstrained, and also to ensure that structure, in its more tangible forms of policy, law, and political economy, is not viewed as impervious to individual agency or collective action. Structure, as both a set of internal rules and norms (Giddens) and as a tangible set of rules (Radcliffe-Brown

and Bourdieu) may constrain or facilitate certain behaviors. Yet, individuals may still enact their agency to transform structure, and therefore address cultural and socioeconomic change over time.

For this dissertation, I suggest that both conceptualizations of structure are useful and essential to understanding patterns of social relations and the transformation of governance in socio-ecological systems. In particular, I understand Radcliffe-Brown's and Bourdieu's posited theory of structure, as tangible and concrete, to include policy and political economy, while I understand Giddens' theory of structure, as internal to the agents, to include the tacit knowledge and informal rules individuals draw upon to enact their agency.

I further find Giddens' emphasis in the spatial and temporal aspects of social interactions and practices—particularly how these aspects affect how actors may respond to external or internal stimuli or stresses (Cassell 1993: 17)—to be useful to studies of adaptive governance. Specifically, attention to spatial and temporal factors allow for studies of adaptive governance at the local scale to account for global phenomena and policymaking at the state level. Giddens stated, "excluding time and space distorts our understanding of the way social reality is constituted" (Cassell 1993: 17) and suggested that it is a focus on space and time while examining the actor-structure relationship which can illuminate the "incremental process of change" in institutions and cultures.

Giddens', Radcliffe-Brown's, and Bourdieu's perspectives of structure and Anna Tsing's conceptualization of friction shaped my interpretation of interactions that occur across multiple levels, which informed the development of a multi-level analysis of both individuals and institutions to understand how individuals interact with formal institutions, formal policies, and informal rules to transform governance. Theories of institutional emergence or governance formation in socio-ecological systems must recognize that individuals are not just affected by

political structures, but instead are able to enact their agency to engage with the structures to create or recreate the structure or its purpose. Theories of structure and friction can be studied empirically through a multi-level analysis of individuals and institutions at the local scale to illustrate the problems individuals' face in a rapidly changing, globalized socio-ecological system, stakeholders' preferences for adaptive governance, and the cultural, social and political reasons why individuals can or cannot enact their agency to faciliate governance transformations.

Using a case study of marine governance in the Lakes Region of southern Chile, this dissertation draws upon social theories of structure, agency, and friction to examine the factors that affect the transformation in governance at the local scale. Although this research is conducted at the local scale, transformations in governance and adaptation to environmental change are influenced by regional, national, and international levels of political and social organization. Specifically, the region has been affected by globalized processes of large-scale aquaculture development by international corporations as well as global climate change, resulting in sea surface temperatures rises in the coastal zone. As I show in this study, transformations in governance do not just produce outcomes, but also provide the means by which actors create or reinforce power dynamics by interacting with political structures. It is how actors interact with political structures and informal rules in a globalized context which demand the understanding of governance as a process. For example, in Chapter 3, I examine why legislative structure, developed at the state level, has differential effects in two communities' abilities to transform to polycentric governance. I found that it was not just legislative structure that facilitated or constrained their abilities, but the ways in which individuals enacted their agency. In one community, individuals were able to act collectively to initiate the transformation of governance. However, in the other

community, individuals were unable to organize to transform governance because they were in conflict with another stakeholder group and used their agency to resist transformation.

In Chapter 4, I sought to understand conflict in one community by studying the values of individuals and institutions which underpinned their frames related to policy action to illustrate why individuals enacted or resisted transformation in governance. Examining this conflict at the individual and institutional levels demonstrated that two groups in the community had different value frames rooted in divergent ontologies as well as varying interpretations of, and interactions with, political structure. The knowledge that this conflict may in part be underpinned by conflicting ontologies and interpretations and interactions with political structure illuminates the challenges in facilitating the transformation of governance at the local scale. It also points to the need for anthropology in understanding governance transformations, conflict, and adaptation (Crate et al. 2008). It is this zone of cultural friction and awkward engagement (Tsing 2004) where anthropologists can problematize collaboration and connect the local scale to the global (Crate et al. 2008).

The Lakes Region of Chile is an ideal site to study socio-ecological governance to understand how the interactions between individuals and political structures affect the process of adaptive governance formation. In 2016, the Lakes Region experienced a high magnitude harmful algal bloom caused by increasing sea surface temperatures, high chlorophyll levels, and poor practices in large-scale aquaculture (Buschmann et al 2016; Daughters 2018). The harmful algal bloom caused the widespread death of marine species, closed wild fisheries to harvesting, and prohibited the export of aquaculture product, devastating the region's economy. The crisis brought to the surface underlying tensions between artisanal fishers, government officials, aquaculture companies, and Indigenous communities in the region who have divergent visions for the

oceanscape, along with varying levels of power to influence marine resource governance. Harmful algal blooms are predicted to occur more frequently (Buschmann et al. 2016), posing challenges for the stakeholder groups in the region to adapt marine resource governance under the context of environmental change.

National level governance in the Lakes Region began with the creation and implementation of Chile's fisheries co-management policy, Territorial User Rights in Fisheries (TURFs) Policy. Chile's TURFs policy was implemented in 1991 under the Fisheries and Aquaculture Law (FAL) in response to overexploitation of inshore marine resources. TURFs have had significant success since the policy's implementation, improving inshore abundance and diversity of species, and empowering local communities to become stewards of the resources on which they depend (Gelcich et al. 2010; Moreno and Revenga 2014). Although the TURFs policy has facilitated fishers' acquisition of knowledge and the restoration of species abundance and biodiversity (Gelcich et al. 2010), this dissertation suggests that the TURFs system was designed to respond to a specific problem—the overexploitation of marine resources—and treated populations in coastal communities as homogenous. The creation of TURFs in large part followed the design principles of classic common pool resource theory put forth by Elinor Ostrom in 1990, where small, homogenous groups of individuals can act collectively to form institutions for resource management. Assumptions of common pool resource theory suggest that the decentralization of power and participation of resource users in institutions create benefits for those who participate (Ostrom 1990). However, applications of these assumptions to the TURFs policy ignored the diversity of stakeholders at the local scale who complicate natural resource governance. It was not until 2013 that the legislation regarding TURFs was amended to incentivize the formation of

management committees which is a platform to incorporate more diversity through multi-stakeholder collaboration.

My dissertation demonstrates that, until a legislative amendment in 2013, which created space for the integration of diverse stakeholders into management committees (see Chapter 3), the TURFs policy implemented in 1991 did not consider the level of heterogeneity in stakeholders at the local scale or evolve to adapt to new legislation which promotes new ocean uses. New legislative structures have shift power away from fishers to aquaculture companies and Indigenous communities and have change the stakeholders in environmental governance. The TURFs policy likely did not recognize these new ocean users because when the policy was formed, Indigenous groups were still heavily persecuted, and were only allowed to legally organize themselves in the mid-1990s. In 2008, 17 years after the implementations of the TURFs policy, new legislation; the Lafkenche Law, recognize the diversity of coastal communities and granted Indigenous communities ancestral rights to the ocean which allows them the opportunities to create Indigenous protected areas (see Chapter 3 and 4). In addition to new Indigenous ancestral rights to the ocean space, aquaculture, which was largely experimental in 1991, now drives the region's economy. The law to govern aquaculture was not implemented until 2003, 12 years after the implementation of the TURFs policy. In the early 1990s when the TURFs policy was formed, marine governance at that time likely could not have predicted its proliferation.

Currently, marine governance is separated into three avenues under the Fisheries and Aquaculture Law: The TURFs co-management system; the management of aquaculture; and the Lafkenche Law, which allows the development of indigenous protected areas, Marine Coastal Spaces for the Original Peoples (ECMPOs). As this dissertation will show, the development of new ocean uses has caused conflict between stakeholder groups. But new and unpredictable

environmental challenges that the Lakes Region faces, such as the harmful algal bloom in 2016, will require these diverse stakeholders to cooperate with each other to transform governance away from these separate avenues to collaborative, communicative adaptive governance that responds to social and ecological feedback from the system.

Studies of new policy changes are needed to transform the fishery-focused TURFs co-management system to a polycentric governance structure that is more oriented to whole socio-ecological systems and relies on multi-level institutional arrangements "that are nested, quasi-autonomous decision-making units operating at multiple scales" (Olsson et al. 2007: 2). Increasingly, polycentric governance is recognized as a key strategy in overcoming complex socio-ecological dilemmas (Gelcich 2014; Ostrom 2010) because of its structure of multiple levels of decision-making centers within a governing structure which may be independent of one another but collaborative where institutions are nested, related, held accountable, and must cooperate (Ostrom, Tiebout, and Warren 1961, read in Ostrom 2010). Despite this recognition that polycentric governance can help overcome dilemmas, few empirical studies have addressed how co-management structures can transform to polycentricism. Thus, my dissertation addresses this gap by exploring the individual and institutional factors at the local scale which facilitate or constrain this transformation.

1.2 Situating my research

To situate my research, I first came to the Lakes Region in 2010 as a Thomas J. Watson Fellow. I had been a volunteer for the National Confederation of Artisanal Fishers when I met my best friend (now research assistant to this project) and her family. They are a fishing family—the father was a member of a fishing union and spent his life diving in open-access areas and TURFs with his wife as his tender. The mother of the family is a tender, a *recolectora* (shore harvester),

and a small-scale farmer who raises sheep and cows. When the father passed away in 2012, his son assumed his position in the fishing union. The three daughters went to trade school for high school to work in the maritime industry. Currently, one is a diver on an aquaculture farm, one was a diver but is now in school for gastronomy, and the other is a *recolectora*, a seaweed harvester who is raising her son at home with her mother. The family opened their home to me, and since spensding six months in Chile in 2010, I have maintained close relationships with the family for nine years. My relationships with them are what inspire my interest in socio-ecological systems' governance and adaptation as well as my future objectives to study social well-being as part of coastal resilience.

I was 22 when I first went to southern Chile, and my experience with my Chilean family on their small farm in the Lakes Region was one of my first observations of how closely people interact with, and depend upon, the environment. Furthermore, it was one of my first experiences where I observed people living in and on the edge of poverty. At the time, the family struggled financially. The father was in a wheelchair because of illness and could no longer dive, and the mother had to take care of three high school age students and her husband while making money as a *recolectora* and small-scale farmer. The father's healthcare costs were too high for the family to actively continue his care. My friend, who worked outside of the region at the time, sent money home to help her family. These observations sparked my interests in the complexities of poverty and fishers' cultural identities and ways of life. It was these experiences which began my academic interests in envisioning marine resource management and governance as a way to ameliorate poverty.

After traveling to several more countries as a Watson Fellow after my experience in Chile, I returned to the USA with a strong interest in marine fisheries management. To learn more about

fisheries management and coastal communities, I worked for Maine Center for Coastal Fisheries (Stonington, ME) and gained experience working with fishers and fishery managers, facilitating meetings, and conducting focus groups. Although this work was valuable, I wanted to gain experience working as a resource user first hand, so I left the desk and went to work as a stern-man on a commercial fishing vessel (Stonington, ME) for three seasons where my livelihood depended solely on fishing. Through on-the-ground experience with fishers and fishery managers in diverse cultural contexts and working as a fisher in Maine, I saw how policy manifests itself in fishers' everyday lives and how policy is both enacted and contested by those whose livelihoods it governs. I had always wanted to return to Chile to conduct research because fishers' participation in the TURFs system and my family's interconnectedness with the environment continued to fascinate me. I am grateful I had the opportunity to pursue my dissertation work in the Lakes Region where this journey began.

My experiences with my Chilean family and in the Lakes Region have shown me how resource users' abilities to enact agency or transform governance cannot be reduced to traditional measurements of perceptions, values, and attitudes. Human behavior is far too complex for us to think that we can gather exact understandings of the variables we seek to measure. Thus, in this dissertation, I tried to capture some of these complexities by integrating theories of agency and structure with ethnography and measurements of human values to illuminate why some resource users can act to transform their well-being, institutions, and governance, while others may be limited. It is the complexity of human behavior, political economy, and socio-ecological systems that demands an examination of process, not just outcomes.

1.3 Methods

For this dissertation, I first went to the Lakes Region between July and September of 2016, several months after the harmful algal bloom closed wild fisheries to harvesting. Fishers were out of work, and many of them did not have an income for four months. I came to the region to identify research participants, select field sites, and gather a better understanding of the ethnographic context so I traveled across the region to several different communities, including Estaquilla, Calbuco, Carelmapu, Anahuac, and Ancud [Figure 1]. I lived as a participant observer and conducted nine in-depth semi-structured interviews, of which 13 hours are recorded and transcribed, where I asked fishers how they were coping with unemployment and adapting to the harmful algal bloom. My experiences revealed that fishers and their families were struggling—many said they relied upon their neighbors or children who worked in other sectors to help pay their costs. Others were dependent upon subsistence agriculture. The effects of fishers' unemployment was felt throughout each community. Many store owners had fewer customers and seafood processing plants had no product. I learned that few opportunities existed outside of fishing in these communities and that many fishers' children were seeking work in other sectors, such as the aquaculture industry. It was evident to me that the communities not only needed other work opportunities, but that governance of the marine socio-ecological system had to transform to address both socioeconomic and ecological change.

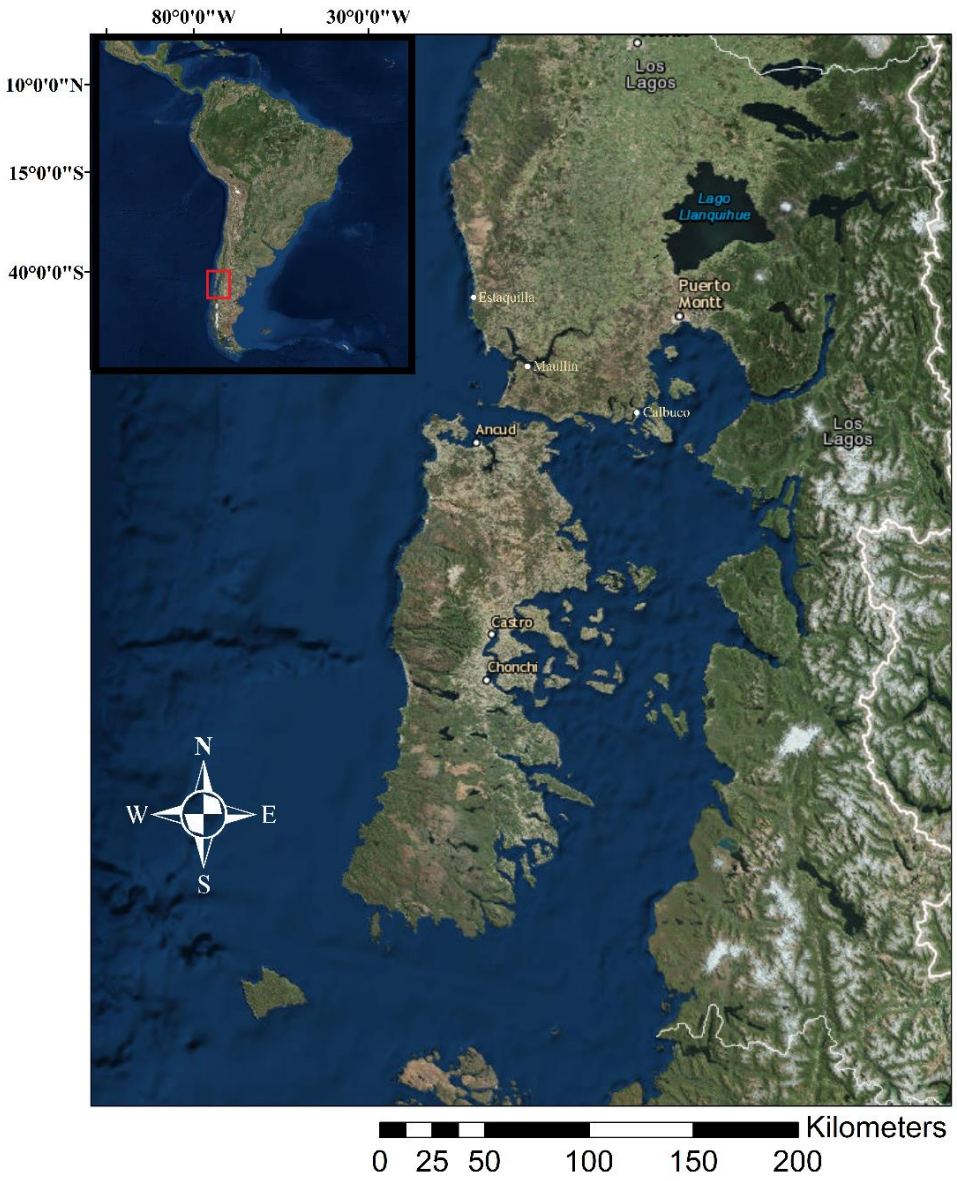

Figure 1.1 The coastal Lakes Region which shows the communities of Estaquilla, Calbuco, the comuna of Maullín which includes Carelmapu, and Ancud on Chiloé Island.

I returned to Maine knowing that I needed to further explore theories related to governance transformations in socio-ecological systems. Many scholars have explored the relationship between existing political structure, agency, and outcomes in governance (Peterson 2014; Tsing 2004). Particularly relevant understandings of structure, agency, and environmental governance to my research comes from Anna Tsing's conceptualizations of friction (2011; 2012) and discussions of how community is represented in natural resource management when there are diverse actors involved in conservation and governance (Brosius, Tsing, and Zerner 1998). These ideas, as well as the knowledge that studies must not conceive of actors as rational, but as acting within structure with their own agency (Doane 2014; Peterson 2014), informed my resesarch plan to examine individuals' varying levels of ability to enact their agency to collectively transform their own livelihoods and the institutions. I integrated these theories into an analytical framework which would contribute to understanding governance as a constantly evolving process—one which is influenced by the objectives, needs, and desires of diverse actors at the local scale.

I returned to the Lakes Region in December of 2017 to conduct six months of field research, including semi-structured interviews and participant observation. I sought to observe how the environmental crisis and fishers' responses had changed since 2016. I used several of the same questions in my semi-structured interviews that I had used in 2016 to see if the components of the problem had changed. The nature of the problem had changed, shifting from fishers coping with the environmental crisis to self-organization of fishers and conflict between stakeholders at the local scale. I decided to select Ancud and Carelmapu as my two field sites to develop the theoretical tools to study the opportunities and barriers to the formation of adaptive and polycentric governance. The two communities were similar in their dependence on nearshore fishing, the diversity of their stakeholders (fishers, Indigenous communities, aquaculture employees), and

conversations I had with fishers, which suggested their different responses to the harmful algal bloom. However, their responses to the 2016 harmful algal bloom differed—fishers in Ancud discussed the need for new governance while fishers in Carelmapu focused on the need to restore fishing in TURFs.

During this phase of the study, I used snowball sampling, building from relationships formed in 2016, to interview 26 individuals across six fishing unions and five Indigenous communities. Of 26 individuals, I interviewed 15 individuals in Carelmapu across 3 fishing unions and five Indigenous communities, and 11 fishers in 3 fishing unions in Ancud. No individual I interviewed in Ancud belonged to an Indigenous Community, however 4 individuals self-identified as Indigenous. Of 26 individuals, 14 were Indigenous: 10 individuals in Carelmapu and 4 individuals in Ancud. Of those 14 individuals, 9 belonged to an Indigenous Community in Carelmapu, 1 self-identified as Indigenous in Carelmapu but did not belong to an Indigenous Community, and 4 self-identified as Indigenous but did not belong to an Indigenous Community in Ancud. When I designed my methodology, I chose to ensure Indigenous participation to recognize the heterogeneity of individuals at the local scale. This heterogeneity becomes important in understanding conflict in preferences for adaptive governance within communities (Chapter 4).

In Chapters 3 of this dissertation, I will be making comparisons of semi-structured interview responses between two communities, Carelmapu and Ancud, to examine why legislative structure plays out differently at the local scale (Chapter 3). I will also examine the interview responses between two groups in Carelmapu: fishing unions and Indigenous Communities, to better understand how underlying values may be linked to certain policy actions and conflict at the local scale (Chapter 4). Because fishing unions are nested within regional federations and national confederations, I asked questions about individual fishers' participation in these multi-level

institutions to gather data on multiple levels of governance. The semi-structured interviews also collected ethnographic data on several factors including demographics, attitudes toward management, perceptions of collective action, human agency, social capital, infrastructure, and preferences for management. The interviews were transcribed, analyzed, and coded for themes manually before compiling into a database.

When I analyzed my ethnographic data, the theme of conflict between fishing unions and the Indigenous communities in Carelmapu was salient, arising five or more times in 14 of 15 interviews. It was also the sole topic discussed in three of 15 interviews. The conflict related to fishing unions' and the Indigenous communities' preferences for adaptive governance—they had different objectives and desires for governance which seemed to foster the conflict. I wanted to understand the drivers for the conflict in more depth, so I turned to the literature to see what cultural and social factors may contribute to preferences and objectives for adaptation and governance. Human values were discussed as significant contributors to individuals' preferences for adaptation and factors which underlie individual and institutional frames related to policy action (Somorin et al. 2012). Thus, I created a structured survey to measure human values based on Schwartz et al. (2012)'s framework for universal human values. I decided to measure both individuals' and institutions' values to account for the complexity of stakeholders, because fishing unions and the Indigenous Communities were not mutually exclusive as some fishing union members also belonged to the Indigenous Communities.. I measured other factors as well that have been hypothesized to underlie adaptation and transformations in governance including: (1) demographics including sex, age, income, belonging and participation in institutions, (2) perceptions of collective action and its efficacy, (4) social capital, and (5) social learning. My

objective was to see if there were any cultural or social variables that could explain the two communities' varying abilities to transform governance and the conflict in Carelmapu.

I designed and conducted structured surveys (n=68) in both Ancud (n=24) and Carelmapu (n=44). Each survey was administered orally where I read the survey to each participant to account for issues in literacy. Also, each survey lasted around 25 minutes. To recruit participants, I spent time at the main fishing docks and approached fishers at the end of their fishing day to ask them if they would be willing to take a survey. I conducted the survey at the dock. All surveys were carried out with the individual fisher and away from large groups of people. I found this form of sampling to be successful. Although I randomly approached individuals, only 3 out of 71 individuals declined to take the survey. I think many individuals felt comfortable with taking the survey with me because they had seen me around in both Carelmapu and Ancud for four months prior to conducting the survey. I found reading the survey to the participant was an effective way to conduct the survey. Individuals appeared to take the survey seriously and think about each question I asked them, which increased my trust in the validity of my results. I was also able to ask clarifying questions and to take field notes during the survey, which aided in the interpretation of my quantitative results.

During analysis and write-up of my results in the following chapters, I verified my interpretation of interviews with my Chilean research assistant as well as three research participants: a fishing union leader from Carelmapu, a fishing leader from Ancud, and an Indigenous Community leader from Carelmapu. I spoke to each of these individuals at least once per month since leaving Chile in June 2018 until February 2019. Verifying my interpretation with these individuals increased my trust in the validity of my analysis and my results. Furthermore, it

built trust between myself and these individuals and provided them the opportunity to participate in the research process and inform me of their ideas for future research.

In the aggregation of this study's three phases between 2016-2018 [Figure 2], my research draws upon eight months of participant observation, 35 in-depth semi-structured interviews of which 32 hours are recorded and transcribed, and 68 structured surveys. In addition, I have over 700 hours of informal conversations with fishers at docks, union meetings, and in their homes where I took extensive field notes. Lastly, I have had and continue to have monthly conversations since October 2016 with three research participants. My research employed an ad hoc, adaptive research approach which drew on socio-ecological feedbacks in response to the harmful algal bloom (henceforth referred to as the environmental crisis) in the Lakes Region in 2016. Furthermore, it integrated consistent and frequent communication with research participants over three years. The environmental crisis in 2016 provided an ideal opportunity to study the process of governance transformation because it acted as a catalyst to conversations about marine and coastal governance.

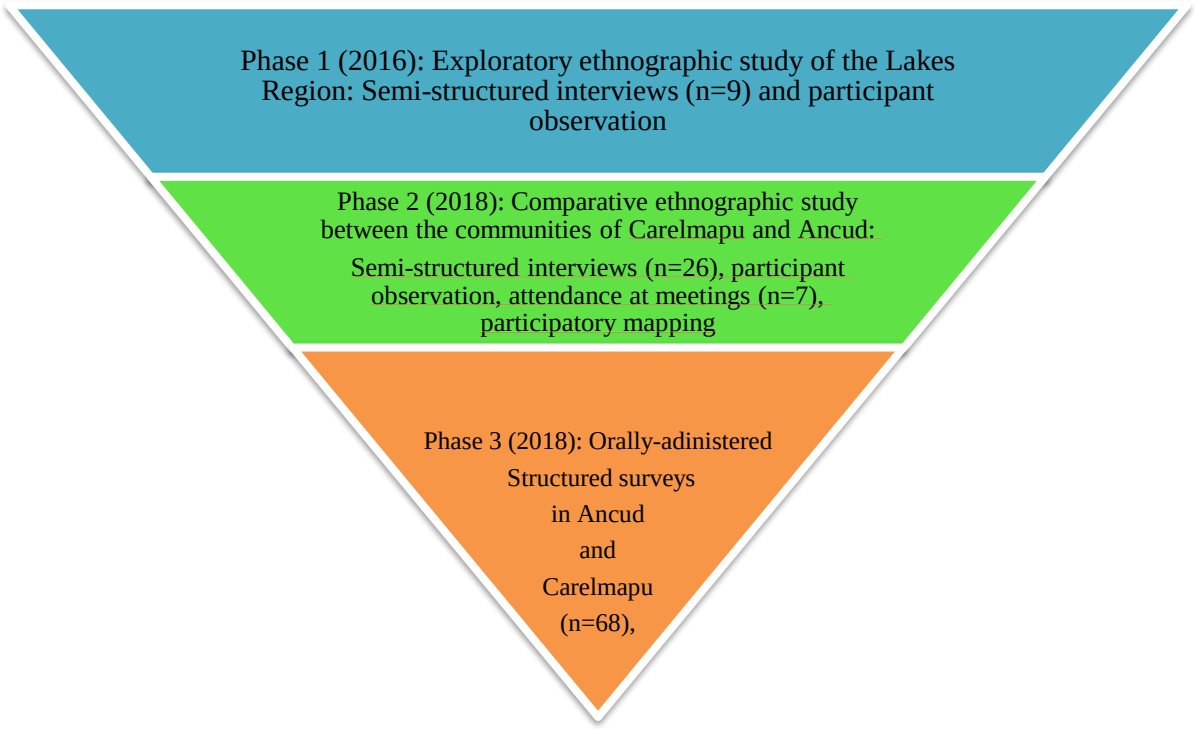

Figure 1.2. Research phases, starting out with the exploratory examination of the Lakes Region, narrowing to a comparative study between Ancud and Carelmapu, and then conducting structured surveys in both communities, but with a focus on examining the factors which contribute to conflict in Carelmapu. I learned during the exploratory phase that although Ancud and Carelmapu were similar in fishery-dependence and demographics, they responded differently to the harmful algal bloom in 2016.

1.4 Dissertation 0utline

To remind the reader, this dissertation is concerned with examining governance transformation as a process which is influenced by legislative structure, power dynamics, conflict, and resource access. I ask: what factors contribute to or inhibit the transformation of current governance structures to adaptive governance in socio-ecological systems? Specifically,

the dissertation addresses the following questions: (1) what community-level factors affect individuals' abilities to contribute to transformations in governance that enable adaptation to socioeconomic and environmental change? (2) why do legislative structures governing marine resources play out differently in communities' abilities to transform governance in the Lakes Region? and (3) how do underlying human values shape individuals' and institutional frames related to policy interpretations and actions?

Chapter 2- Livelihood Diversification as a Form of Resilience? An Ethnographic Account of Artisanal Fishers in Chile's Lakes Region

This chapter presents an ethnographic and empirical analysis of artisanal fishers' livelihoods, their perceptions of social and ecological change, and the importance, but limitations of, diversified livelihood strategies within the context of resilience and the transformation of governance. For many artisanal fishers, the act of fishing goes beyond the need for income and is essential to their ways of life, their ability to manage risk, and their likelihood of reducing poverty. To manage risk, reduce their poverty, and maintain their social and cultural ties to fishing, many fishers diversify their livelihood strategies. Following the environmental crisis in 2016, artisanal fishers in the Lakes Region were left without their livelihood and income from fishing for up to six months. Across the region, I found that fishers relied on livelihood diversification to cope without their main source of income. Other fishers stated that had to rely on their children or neighbors who worked in other sectors.

Reacting to stresses or relying on seasonal work, as did the fishers in the Lakes Region, may only ameliorate an individual's situation for a brief time, and can leave the individual vulnerable to future stresses or long-term change. Fishers often lack the resources that are needed to foster moves toward adaptive governance or sustain long-term resilience, such as formal education, financial capital, healthcare, and transportation, which are vital in maintaining the resilience of

social, economic, and ecological systems (Fabricius *et al.* 2007; Goulden *et al.* 2013). Such findings are vital to understandings of environmental governance because the findings suggest that fishers lack the support that they need to create resilient and viable futures. Studies of environmental governance which disregard the individual-level and structural factors which affect individuals' behaviors and abilities to act ignore essential information that can explain why some individuals cannot transform their situations. Furthermore, the studies overlook that individuals may need stronger political structures outside of the realm of environmental governance as well, such as better access to education or healthcare structures. Lastly, a theoretical focus on livelihood diversification as a form of resilience can essentialize communities as resource-dependent. This may ignore power relations between groups (Mclean 2015) and overlook individuals' desires for transformative adaptation. This study offers a more holistic explanation of what conditions may foster the leadership and well-being resource users need to be active participants and managers in environmental governance.

Chapter 3- Moving beyond co-management: Opportunities and limitations for enabling transformations to polycentric governance in Chile's Territorial User Rights in Fisheries policy

This paper offers a comparative ethnographic study of two coastal communities, Carelmapu and Ancud, to examine why legislative structure has differential effects in two communities' abilities to transform governance. Both communities are home to multiple fishing unions which are governed by Chile's co-management policy, Territorial User Rights in Fisheries (TURFs), and home to diverse stakeholders including Indigenous individuals and aquaculture farm employees. The individuals in the communities are bound by the same political structures which govern marine resource governance. Through analysis of ethnographic interviews, it was evident that each community had experienced a different outcome in their abilities to transform to polycentric governance at the local scale in the Lakes Region of southern Chile. Polycentric

governance requires multi-level institutions at different scales to facilitate face-to-face discussions between stakeholders (Ostrom 2010). One way to begin the development of polycentric governance is through the emergence of institutions which bring together stakeholders at the local scale (Ostrom 2010). My central research question asks, how do existing political structures affect the transformation from co-management of fisheries to polycentric governance of marine spaces at the local scale? Polycentric governance would move away from the binary structure of joint governance between fishing unions and the government to a structure which brings together more stakeholders, including Indigenous Communities, aquaculture companies, and processors, in multiple nested and cross-scale institutions to communicate and collaborate. Further, polycentric governance would require the emergence of new institutions which brings stakeholders together to collaborate and overcome dilemmas, Specifically, my objective is to examine why legislative structures, which govern marine resources, play out differently in two communities' abilities to transform governance.

I suggest that the legislative structures which govern new ocean uses have brought new stakeholders to the table of environmental governance and have shifted power dynamics, creating both opportunities and limitations for the transformation of polycentric governance. In both communities, fishers felt threatened by the proliferation of aquaculture. The state has created policy to support aquaculture development, but in doing so has created a structure which does not include fishers in decision-making and thus facilitated the situation of accumulation by dispossession. The proliferation of aquaculture and the red tide in 2016 elucidated different responses from the communities. In Ancud, new stakeholders have spurred conversations about preferences for management and individuals have initiated a collective action which united five fishing unions and government officials from Subpesca to form a management committee.

However, in Carelmapu, the Indigenous communities have proposed the development of an ECMPO, an Indigenous protected area, to protect themselves from the expanding industry. However, non-Indigenous fishers have not organized themselves to initiate the makings of polycentric governance because they refuse to work with the Indigenous communities. The fishers feel threatened by the creation of an ECMPO by the Indigenous communities and have resisted change, resulting in an area of friction. I call this accumulation by resistance—where a salient conflict between the two groups prevented the community from moving forward with environmental governance, thus allowing the Indigenous community to accumulate ocean space for conservation.

These findings have both theoretical and methodological significance for understanding transformations in governance. Through analyzing how individuals are affected by legislative structure, I illuminate how it is not just legislative structure which may affect outcomes in individuals and institutions' abilities to transform governance, but instead it is how individuals respond to, and interact with, legislative structures—thus how individuals enact their agency—which affect their abilities. In Ancud, individuals transformed governance by using their agency to draw upon their social networks with government agencies and universities to form a local polycentric institution, a management committee. However, in Carelmapu, non-Indigenous fishers resisted transformation, and would not cooperate with the Indigenous Communities to create new institutions to transform governance. Lastly, I employed ethnography to gather data on social change and conflict. Ethnography is a method lacking in studies of socio-ecological governance, but this study shows that it is essential in illuminating the complexities for transforming governance at the local scale.

Chapter 4- Values underlying preferences for adaptive governance in a small-scale fishing community in Chile

The environmental crisis in 2016 illuminated pre-existing tensions between stakeholder groups in the region, causing conflict between groups. Conflict between stakeholder groups can inhibit the transformation to polycentric governance because polycentric governance requires collaboration and communication across multiple governing authorities. To understand transformations toward polycentric governance, scholarship must understand the social and cultural factors from which conflict arises. Individuals' perceptions of desirable ways of life vary, and these perceptions influence the decisions they make with regards to their preferences for adaptive governance and short-term and long-term adaptation.

In resource-dependent regions, conflict between individuals or groups may be influenced by how individuals' subjectively and differentially value their experiences, their work, and their connections to their communities and environment. This chapter examines individual and institutional values which may underpin individual and institutional frames related to policy interpretation and action in the coastal community of Carelmapu in southern Chile. We examined both individuals and institutions because of the diversity of individuals surveyed. For example, some individuals interviewed identified as Indigenous, and belonged to a fishing union but not to the formal institution of the Indigenous Community. Also, some individuals interviewed were members of both fishing unions and the Indigenous Community. Therefore, to account for the multiple affiliations of stakeholders, we investigated the values underlying preferences for adaptation projects.

Drawing upon participant observation, semi-structured interviews, and quantitative surveys, we use a multi-level approach and Schwartz et al. (2012)'s universal human values theory to

evaluate institutional and individual values underpinning different policy frames related to adaptive governance. At both the individual and institutional level, the Lafkenche Indigenous Community and Indigenous individuals diverged on their policy actions with non-Indigenous fishers and fishing unions in Carelmapu which caused a rift between the two groups. Our findings suggest that the institutions in Carelmapu have different values which elucidate different frames: a non-Indigenous resource-focused frame and an Indigenous conservation frame. These differing frames are rooted in distinct ontologies, sociopolitical histories, and relationships with the environment, which are at the heart of this conflict in adaptation. Within the context of polycentric governance, conflict such as this must be overcome before trust can be developed to create new, collaborative institutions.

Chapter 5- Structure, Agency, and Wicked Problems: Theoretical, Methodological, and Policy Contributions to Studies of Socio-Ecological Governance

This dissertation offers a novel theoretical and methodological approach to studies of environmental governance in marine socio-ecological systems by integrating anthropological theories of structure, agency, and friction with ethnographic methods into studies of wicked problems in a multi-level analysis of individuals and institutions at the local scale. In doing so, I examine how existing governance structures may facilitate or constrain individuals' and communities' abilities to transform governance from co-management of fisheries to polycentric governance, which integrates the diversity of stakeholders in marine governance into decision-making.

The case study of the Lakes Region illuminates how global processes, such as climate change and socioeconomic change, and state political structure play out at the local scale to create areas of friction, but also areas for transformation. This study demonstrates that ontologies,

individuals' relationships with the environment, sociopolitical history, and legislative structure create these spaces of friction or transformation. These insights from anthropology help to situate the "wicked" problem of governance, as one with no technical solution that requires governance that brings together the collective judgment of stakeholders (Jentoft and Chuenpagdee 2009). This study moves away from a focus on the outcomes of governance to problematize governance as a process, influenced by the socio-ecological system's shifting components and the diversity of stakeholders. The Lakes Region of Chile is experiencing a "wicked problem" where new legislative structures which govern other aspects of marine resources challenge fisheries policy by shifting power away from unions to aquaculture companies and Indigenous communities.

These findings suggest that studies of environmental governance should move away from solely examining outcomes of successful governance to seeing governance as a process and incorporating understandings of structure and agency to elucidate the social, cultural, and political reasons why governance transformations occur. Further, I suggest that ethnography should be an essential method in studies of environmental governance because of the method's ability to illuminate processes of social and political change at the community level which can explain outcomes in governance transformations.

CHAPTER 2

LIVELIHOOD DIVERSIFICATION AS A FORM OF RESILIENCE? AN ETHNOGRAPHIC ACCOUNT OF ARTISANAL FSHERS IN CHILE'S LAKES REGION[1]

2.1 Abstract

This chapter presents an ethnographic and empirical analysis of artisanal fishers' livelihoods, their perceptions of social and ecological change, and the importance, but limitations of, diversified livelihood strategies within the context of resilience and the transformation of governance. For many artisanal fishers, the act of fishing goes beyond the need for income and is essential to their ways of life, their ability to manage risk, and their likelihood of reducing poverty. To manage risk, reduce their poverty, and maintain their social and cultural ties to fishing, many fishers diversify their livelihood strategies. Following the crisis in 2016, artisanal fishers in the Lakes Region were left without their livelihood and income from fishing for up to six months. Across the region, fishers relied on livelihood diversification to cope without their main source of income. Other fishers stated that had to rely on their children or neighbors who worked in other sectors. Reacting to stresses or relying on seasonal work, as did the fishers in the Lakes Region, may only ameliorate an individual's situation for a brief time, and can leave the individual vulnerable to future stresses or long-term change. Fishers often lack the resources that are needed to foster moves toward adaptive governance or sustain long-term resilience, such as formal

[1] This chapter was published in Daughters, A., & Pitchon, A. (Eds.). (2018). *Chiloé: The Ethnobiology of an Island Culture*. Springer. The chapter was written in the summer of 2017. The addendum was added to the chapter in April 2019 drawing upon new insights from fieldwork in 2018.

education, financial capital, healthcare, and transportation, which are vital in maintaining the resilience of social, economic, and ecological systems.

2.2 Introduction

For many artisanal fishers worldwide, fishing is necessary to their economic income as well as vital to social and cultural well-being, contributing to their abilities to manage risk and overcome poverty (Marschke and Berkes 2006; Peterson 2014; Urquhart and Acott 2013). Artisanal fishers—individuals who use small boats with little technology[2] to fish areas near shore—face many challenges and threats to their way of life, including declining fish populations, poor resource governance, and climatic and ecological change (Beddington *et al.* 2007). To manage this risk while still maintaining their social and cultural ties to fishing, many fishers diversify their livelihood strategies (Allison and Ellis 2001; Ellis 2000). Livelihood diversification is "the process by which households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living" (Ellis 2000:14). The diversification of livelihood strategies offers fishers ways to spread the risk of fishing and other opportunities for sustenance over multiple sources. This can sometimes increase their resilience, an individual's or socio-ecological system's ability to cope with, and adjust to, disturbances in the marine economic, political, or ecological systems (Allison and Ellis 2000; Goulden *et al.* 2013; Gunderson and Holling 2002; Walker *et al.* 2004). Under uncertain futures facing rapid, and often abrupt, climate change and new socioeconomic development, understandings of individuals' livelihood diversification as a form of resilience can illuminate barriers and opportunities for individuals to transform governance.

[2] Artisanal fishing boats range in size from 15 to 30 feet.

This chapter presents an ethnographic and empirical analysis of the livelihoods of artisanal fishers in Chiloé and the broader Lakes Region after the crisis of 2016 (see Chapter 1). The crisis dealt a significant blow to artisanal fishers' economic and social well-being, bringing to the surface pre-existing tensions between fishers, aquaculture companies, and the government (Barrett and Caniggia 2002; Barton and Fløysand 2010). I emphasize fishers' perceptions of social and ecological change, and the importance, but limitations of, a strategy of diversified livelihoods. The research is based on thirteen hours of recorded interview data, three months of field work in the Lakes Region as a participant observer in 2016, and five months of experience as a volunteer for Chile's National Confederation of Artisanal Fishers in 2010. Through the fishers' own words, I show the importance of fishing to their identities and their social, cultural, and economic well-being. I then demonstrate how individuals were only able to cope during the environmental crisis, instead of adapting to transform their livelihoods. In doing so, I stress the risks of relying on livelihood diversification as a form of social and economic resilience in a dynamic, globalized world, particularly in marine socio-ecological systems.

2.2.1 Chiloé's and the broader Lake Region's artisanal fisheries

Chile is home to over 90,000 artisanal fishers who live in diverse social and ecological systems from the Atacama Desert in Chile's north to the fjords and windswept fields of Patagonia in the south. Many are economically dependent upon marine resources and have strong social and cultural ties to fishing. Every year since 2008, artisanal fishers have harvested more fisheries product than Chile's industrial fishing fleet, making a substantial contribution to Chile's economy (Moreno and Revenga 2014).

On the Archipelago of Chiloé and the broader Lakes Region, approximately 24,000 fishers are members of community-based fishing unions, formed under Chile's fisheries and aquaculture

law, *La Ley de Pesca y Acuicultura* (INE 2008). Passed in 1991, the law established geographical areas where a union's members are legally allowed to fish. The majority of fishers within these designated areas use diving as a harvesting method to extract the economically and culturally important *loco* (abalone *Concholepas conchoelpas*), sea urchin, crab, and octopus, among other species. Along the shoreline, others gather seaweed. A diver uses a mask and a *chinguillo*, which is a bag that attaches to his or her waist where the diver places the harvest. While under water, the diver breathes through a tube called a *hooka*. The *hooka* runs up through the water to the boat, where it is attached to an air compressor. The fishers dive off small open-boats, usually made of wood and powered by a small out-board motor, or human-powered by rowing. One or two individuals accompany the diver, and stay in the boat to maintain boat control, regulate the air compressor for the diver, and sort the harvested product. These individuals are known as tenders. The boat and its occupants bring back their harvests to their fishing unions, and sell their product to local, regional, and national markets.

The Lakes Region is the most fisheries-dependent region in Chile (Moreno and Revenga 2014), and a majority of the communities in the region are rural and poor (Latta and Aguyayo 2012). Many of these rural households have adopted diversified livelihood strategies rooted in longstanding relationships with the natural environment. Individuals work as artisanal fishers during the *loco*, sea urchin, crab, and clam seasons and simultaneously engage in subsistence agriculture to feed their families and their neighbors (Latta and Aguyayo 2012).

Artisanal fishers launch their fishing vessels from ports in coves, called *caletas*. The *caletas* discussed in this chapter are located in the mainland communities of Estaquilla, Carelmapu and Maullín, Calbuco, and the community of Ancud, on the big island of Chiloé (see Figure 1). These communities are situated one to two-and-a-half hours from Puerto Montt, the region's capital and

the province's only major city. Rolling green hills, ideal for sheep and cow pasture, run down to dramatic, steep bluffs lined by sandy beaches. Intense winds and heavy rainfall, especially in the winter during the *loco* season, make launching and navigating fishing vessels a challenging task. Increasingly, fishers are caught in interactions between local and global forces, primarily because of the expansion of aquaculture farming and global aquaculture exports.

Many fishers today struggle to make a profit due to increases in vessel costs, low prices for product, and vulnerability from stresses in the environment. Increasingly, aquaculture farms are encroaching upon fishing areas. As a consequence, fishing families often find that they have to transition from artisanal fishing to work as divers or processors for aquaculture companies (Pitchon 2015). They recognize the irony of being forced out of fishing to work for the companies that they perceive are killing their livelihood, and many of them are hesitant to leave their professions because fishing allows them to maintain their social connections and feed their families (Pitchon 2015).

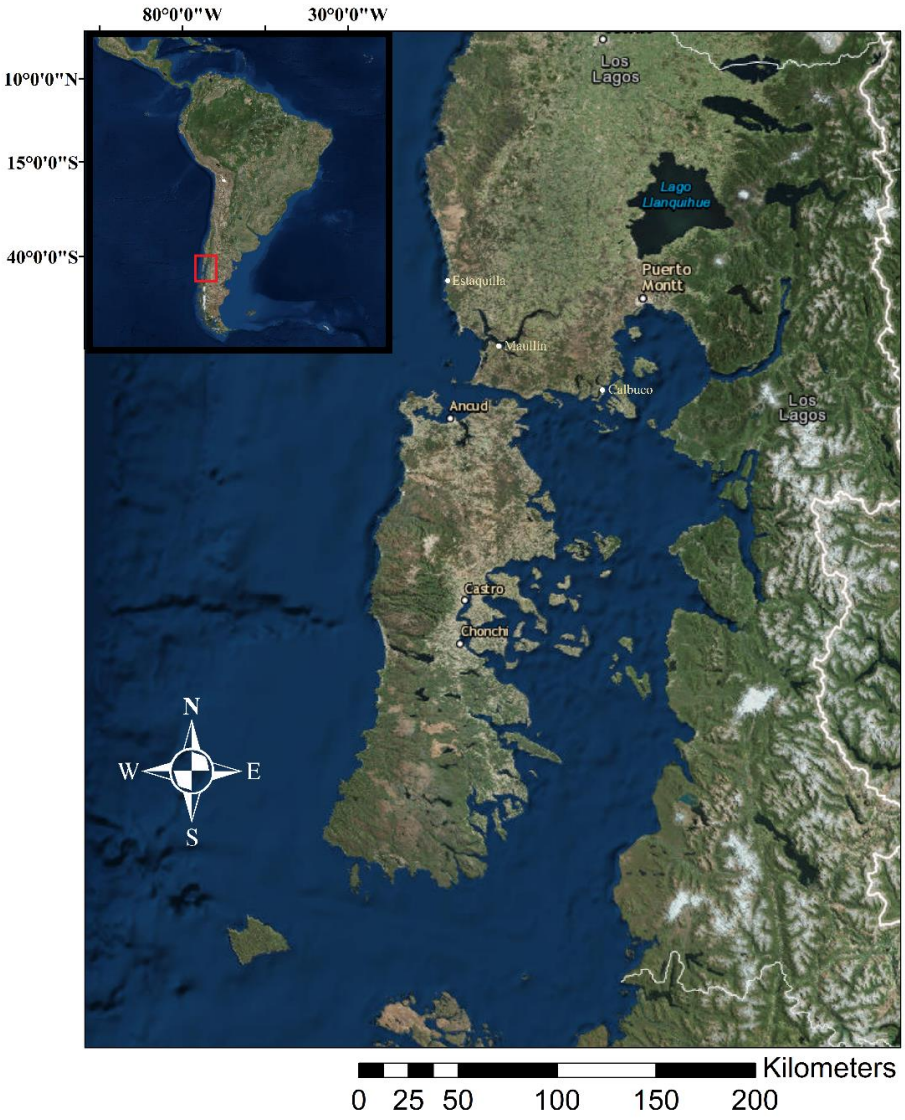

Figure 2.1. Map of the coastal Lakes region and the communities of Estaquilla, Carelmapu and Maullín, Calbuco, and Ancud.

2.2.2 Fishing: A way of life

In the Lakes Region, fishers are not only economically dependent upon fishing. They also identify with the occupation, and their social and cultural lives are inextricably tied to the craft.

When I asked fishers why they chose fishing as an occupation, many said fishing gave them a sense of freedom and a connection to their communities. They also fished out of necessity, and for some, the craft became their passion.

In 2016 I visited Don Simon Dias, a fisher in Calbuco, a community close to the city of Puerto Montt on the mainland. There are around thirty thousand inhabitants in the town and its surrounding areas. Hills gently descend to inlets and coves, and off Calbuco's shore are several islands which add geographical complexity to the area, making it ideal for salmon aquaculture. Aquaculture firms have set up many salmon pens in the area, with large enclosed nets for salmon. These pens encroach on fishers' harvesting areas, causing tension and creating a contested space. Despite the impinging farms and availability of work outside of commercial fishing, ties to fishing remain strong, particularly for older fishers.

When I asked Don Simon why he fished, he said,

> That's a good question, very good question. Why do I fish? Fishing, it's part of our psychology, our social lives, our sustenance. We are free, fishers are free. You leave for the sea, and if you want to return, you return; if you want to work, you work. You have liberty in your decisions…there is a social aspect of working as a shellfish diver. We work in distinct places, and in the evening, the whole *caleta* gets together to share food, converse, and joke with each other. The life of a fisher is very beautiful.

Doña Rosa Toro, a fisher from Estaquilla, a town to the northwest of Calbuco, shared a similar sentiment.

> Our whole family is dedicated to the sea, in different forms, but it is what we do: to go fishing with nets, diving, working along the sea. In a way, everything we do is there. I fish

because I like to fish, it is also out of necessity—diving is the source of my livelihood, and I fish for my family.

Estaquilla is a rural community with a population of around five hundred people, located two hours from Puerto Montt. The last few kilometers of the road into the town were paved in 2014, but the pavement still does not reach the *caleta*. The road winds down hills of lush, green trees towards the ocean. As the road approaches the *caleta*, there is a small cemetery on a hill, and a couple of small stores, called *negocios.* A few churches and small houses dot the hillsides, with cattle grazing among them. There is no industry in Estaquilla outside of artisanal fishing, and it is common to see pick-up trucks parked outside the town hall or a church, indicating a fishing union meeting.

During the fishing season, small wooden open-boats line the beach. Some individuals move from their houses above the *caleta* to small shacks on the beach in the summer for easy access to their boats during the sea urchin, crab, barnacle, and seaweed harvesting season, depending on environmental conditions. The shacks have one room, a small woodstove, and a camp stove for cooking. One fisher said he loves living along the *caleta* during the fishing season; it makes him feel close to his work and he can rely on the sea for his family's sustenance. At the end of the summer fishing season, they move back to their homes in town and fish for *loco* from May to August, and work in subsistence vegetable farming and raise livestock. Fishing, they maintain, is the most important of all to their well-being. He said they depend on their marine harvest, not only for their income, but their diets, family ties, and social lives.

Seasons for *loco* were instituted as part of the fisheries and aquaculture law, *La Ley de Pesca y Acuicultura* for small-scale fishing. The policy was formed after overexploitation of the species during a time of open markets and increased globalization in the 1970s and 1980s (see

Chapter 1). After extensive studies on the *loco's* natural life history and human-*loco* interactions in central Chile (Castilla *et al.* 1998; Castilla and Gelcich 2008), the policy gave fishers exclusive, non-transferable access rights to specific territories, which were to be managed by local fishing unions. The law tied fishers to specific areas for diving, while the studies of marine animals' natural life histories determined the season in which they now fish. Outside of the *loco* season, fishers harvest other benthic resources such as sea urchin, clams, crab, and barnacles, in open-access areas outside of their defined territories. Clearly defined fishing seasons helped stabilize the market for the selling and export of fishery products, which increased profit for many fishers (Rosas *et al.* 2014). Furthermore, it allowed fishers to maintain diverse seasonal livelihood strategies while simultaneously developing their specialized and intimate knowledge of the inshore marine environment close to their *caletas*.

Figure 2.2. Fishing vessels in the *caleta* of Estaquilla.

Just south of Estaquilla, across the Maullín River, are the communities of Maullín and Carelmapu. The town of Maullín and its surrounding areas are home to around fifteen thousand people. There is one small supermarket, a small bus station, a hospital, and tight clusters of houses. Maullín has a small tourist economy, in part because of its proximity to Puerto Montt by a main road, its transportation infrastructure, and its location on the Maullín River, a tourist destination for trout fishing. Despite Maullín's slightly more diverse economy, it remains a port town and reliant on fishing. Don Roberto Molina, a fisher from Maullín explained,

> It [fishing] is a job for the people, it is an economic well-being for people, and it is very strong here. It is very profitable for people, but of course the risk is very great. The risk is very big, but you get used to it, you learn to know nature. Fishing, therefore, is done as a kind of family bond. It is the way of the sea, that you know when it is bad on the sea, you recognize when it is not good to go to work, or when you can work by the tide. Then you gain confidence, and as you continue, then, it's like any job. Then you realize it's normal work, like anything, like when you're working in the office…you become accustomed to it. They taught me this [fishing] since I learned to walk, and continued to teach me until I was 23 years old. At first, I was afraid of the sea, to go out so many kilometers in the ocean. Then, I got used to it, except for the dizziness, I have not yet overcome that. But all of that is the work of a fisher, who works all day on the sea and does so out of necessity, for his labor, for his chosen lifestyle.

The community of Carelmapu is a short drive from Maullín. Home to only three thousand people, it is accessed by a narrow road that ends at the tip of a peninsula. The roads are unpaved, and there are a few small *negocios* and a small shellfish processing plant. There are few opportunities for work in Carelmapu outside of fishing, and many people who do not want to or cannot work on the sea move away. Don Cristian Auenante, a fisher from Carelmapu acknowledged that he started fishing because he had no other option, but that what began as a necessity morphed into a passion.

> When I began diving, I had no other option. After I started, I was captivated by the sea. It's like, I have two grand passions in my life outside of being a father: to live and preach a Christian life, and to dive for shellfish.

However, Don Jamie Gonzales, a fisher from Ancud, a larger community on the rural island of Chiloé, stated that he believed most fishers fish out of necessity,

> Most of the fishers, and in my case- we are fishers out of necessity, not out of conviction, not because we want to be fishers, but because we were born near the sea, we grew up there, and we have no other option than to fish. We do not have the means to continue studying, others did not have the means from their parents for a good education, then there was nothing else to do than to go to sea.

Ancud is home to more than thirty thousand people, and its economy was once based in artisanal fishing. Now, the economy is more diversified because of aquaculture farms and the large number of tourists who visit during the summer months. A ferry and several bus companies service the big island of Chiloé, picking up individuals in the bus station in Puerto Montt and dropping them off at the bus station in Ancud. Similar to Calbuco, large aquaculture farms take up significant sections of the ocean area surrounding Chiloé. Declines in marine harvests and competition for ocean space from the farms have forced many fishers in the Ancud area to leave the craft of artisanal fishing and pursue work with the aquaculture companies as divers or processors (Pitchon 2011). Nevertheless, artisanal fishers persist, still contributing significantly to the island's economy and workforce.

The craft of artisanal fishing in the Lakes Region holds economic, cultural, and social value for fishers, their families, and their communities. However, impending and possibly irrevocable changes in the ocean's ecosystem and climate, as well as the proliferation of aquaculture, loom over fishers' livelihood security.

2.2.3 A way of life threatened

There are many challenges to making a living as a fisher. Globalized markets, declining fish populations, poor governance of marine resources, and habitat and climatic changes threaten fishers' ways of life and the source of their livelihoods (Beddington *et al.* 2007; Béné 2003; Béné and Friend 2011). For fishers in Chiloé and the Lakes Region, these threats are becoming increasingly severe, altering fishers' relationships with the marine environment. Despite fishers' love for the craft and fishing's role in their economic and social well-being, there was a palpable sadness in how they spoke about the present and the future of fishing. Fishers said that the biggest threat to their livelihoods is the salmon-farm industry, explaining that they must fight for ocean space. They also shared their perceptions of ecological change, which fishers believed were compounded by poor practices in salmon farming and the complicity of the government. They were suspicious of the government's and biologists' declaration of red tide, and said they did not trust the government or the aquaculture companies. They suggested that the crisis of 2016 (see Chapter 1) was just the beginning of things to come, and they were urging their children and grandchildren to pursue other types of work.

Don Simon Dias from Calbuco said,

> I think the salmon industry in this moment is the problem. They knew it [red tide] was going to happen, but not so quickly. Imagine the mortality of the salmon. They should not get to produce so much fish if they do not have an emergency mechanism in place in case the salmon die. Then, imagine the reaction of the sea. The state and the salmon industry are complicit. They say it is a red tide, but it never was a red tide. They wanted people not

> to eat contaminated seafood, they shut down our fisheries. But then, some people tried eating the seafood, and nothing happened. They were fine.

In this statement, he explained that a red tide would contaminate seafood so it would be poisonous to human consumption. However, a few individuals in Calbuco ate shellfish and showed no immediate or obvious health consequences. It made the fisher skeptical of the government's and biologists' declarations of a red tide, and he said he lost trust in the government. I heard of similar experiences from fishers in Estaquilla, Carelmapu, and Ancud. This, among other anecdotal evidence from fishers, including stories of individuals who saw the aquaculture companies dump infected fish near the shore of Chiloé, led fishers to believe that the alleged red tide was a farce. Instead, they said it was an infection from the salmon farms that caused the marine die-offs. This remains unproven, but fishers' perceptions that the government is untrustworthy may have repercussions for any future relationships between the government and the fishers.

This ecological devastation, and its subsequent social impact, brought into question future opportunities for artisanal fishers in the Lakes Region. Many fishers I spoke with said they came from several generations of fishing families, and when I asked them if their children fished, most fishers said no. Don Simon said sadly,

> We grew up with the sea, but there is no future in fishing. My children still study topics related to the ocean in university, but they do not fish.

Don Gonzales from Ancud explained his hopes for his children,

> My son, he just finished school last year. Then I tell him, study, try to study something, I'm economically a little better, I can give him the opportunity to study right now, and I tell him that he could continue studying, but I can't tell him what to do. He does not understand yet - 17 years old - I said, I hope he studies something, for example: something about the sea, marine biology, try to protect our product, to keep looking after this beautiful island, but it will depend what he wants to do.

He added,

> We did not want the salmon farms to enter our area. We had a great fight with the salmon farms and told them that we do not want them to come and pollute our waters. Now the "red tide" has arrived, that was what hurt me the most. I thought that someday, at least, what I said would be recognized because I have been a strong advocate of taking care of our waters. The people come here, tourists or someone who wants to come to eat the product of Ancud and the products of Chiloé, the products are now contaminated. If you go to Castro, Chonchi, Queilen, there, forget it, all products are contaminated, because the salmon farms throw away excess antibiotics and all that is below the pens are contaminated, dead…I believe that in fifteen years, artisanal fishing will not exist to such an extent. We are already old, I have about 50 years, and in ten years more I will have 60. In ten years more, I will no longer work on the sea. And if there are no more people who really care for the sea…" his voice drifted, "today people don't care- our water touches the big companies, and now- I do not know how we are going to live. People are going to be all workers of the companies.

Don Molina from Maullín reiterated others' concerns, and suggested that the government was not interested in caring for the marine environment,

> I would really like people from outside to do research, to visit this country and save these unique environments that remain in this world - look at it - they are killing it, aquaculture is killing it - look here, this was a sanctuary, a place of nature. It was a whale sanctuary. Nowadays, krill is being threatened by all these salmon companies, that food, they are taking possession of all this inner water that exists in the Southern Cone, they are killing all these mammals that exist in the bottom of the sea. It is something incredible daughter, but it is the pure holy truth. Chile is killing its sanctuary. And that is the reality. There is no other explanation more about this subject.

The reality of environmental change and the influx and proliferation of aquaculture farms is a poignant one for fishers in the Lakes Region. Fishers' abilities to cope with, or adapt to, uncertainty and the ramifications of abrupt changes are of upmost importance in maintaining their ways of life.

2.2.4 Livelihood diversification as resilience to abrupt environmental change

It is well known that artisanal fishers around the world engage in a range of livelihood strategies to cope with uncertainty or abrupt economic, ecological, or political change (Allison and Ellis 2001; Goulden *et al.* 2013). Fishers in the Lakes Region diversify their fishing livelihoods by working in other businesses, including subsistence vegetable and livestock agriculture, and the

peddling of shellfish, firewood, and excess vegetable produce. Such diversification has allowed some individuals to stay in their communities despite the hardships of fishing. Others, including many young people, are unable to find or create work, and have either become divers for aquaculture companies or have left their rural communities to seek wage labor elsewhere.

Don Molina from Maullín diversified his livelihood by working with his father-in-law to operate a boat company. The boat brings tourists and individuals who need to commute between Maullín and the community of La Pasada across the Maullín River. He said that this type of work earns his family extra money, and makes him and his family more resilient to uncertainty in fishing:

> The other alternative that I have is that I work for a ship company. I have that privilege, you see, I take people from one bank to the other. It helps us to generate new income for us in bad weather because the sea is not always good. Others are not so fortunate as we.

Across the strait from Maullín on the island of Chiloé, Don Gonzales spoke with me about the environmental devastation of 2016 and his worries about being the sole income earner for his family of four. With a teenage son and a new born baby, he said his need to support his family weighed upon him. He expressed gratitude that he had the opportunity to study, but that although he studied at a trade school in Santiago, he returned home to go fishing. In our conversation, his gratitude for the opportunity to study conveyed a sincere relief that if fishing were no longer an option, he would have another way to provide for his family, even if it was not a lot of money.

> I studied - thank God, I studied. I had the option to study but I did not like it - that is, I did not have the opportunity to work in it either, because the salaries are so low. I am a mechanical technician, I studied in Santiago, and later I could not study engineering

> because I did not have the money to pay for school. From there [engineering] I would have had a higher salary, but the mechanical technician is very poorly paid, so I returned to fishing.

He then looked at his newborn son and said, "He will never know fishing."

South of Puerto Montt, the community of Calbuco is dependent upon fishing and subsistence agriculture. Don Simon and his wife showed me their extensive vegetable gardens and their greenhouse, built to produce more food during the winter months. Although the region near the coast does not typically have frosts in the winter, the heavy rains and wind can harm growing plants. Initially, the gardens and the greenhouse were a way for them to grow food for their family. More and more, they sell produce for supplemental income. However, the household's ties to agriculture were not as strong as their ties to fishing. When I asked them about their greenhouse and farming, they said it contributed to security for their family and neighbors, and could help make a small amount of income if they needed. Fishing, they said, provided nearly all of their income. Moreover, their social life in Calbuco was inextricably linked to fishing. He said he and his wife would gather with other fishers and their families to share food and company many nights during the week. Outside of fishing, they were involved in the church.

Don Simon and his wife raised five children in their small home, and their children now work as engineers, teachers, or are studying in university. While their children were growing up, their family depended on fishing, but he said times have changed. He said it is "no longer profitable for his children to dedicate their lives to the profession of the fisher," and that it is getting harder and harder to make ends meet while they are reliant on subsistence agriculture while the fisheries are closed.

Figure 2.3. Sheep grazing near a fisher's home in Estaquilla.

In Estaquilla, Doña Rosa Toro lives in a small, bright red and blue house, two hours from Puerto Montt. Green pastures surround her house and sheep graze among the grasses. She and her husband, both fishers, raised four children, all of whom now make their living on the ocean. Her husband passed away in 2012, and her son took his place in his fishing union and dives for *loco*

during the open season. He also works as a merchant marine for a large industrial marine logistics and shipping company. The three other children, all young women, work as merchant marines and as commercial divers for aquaculture companies. They are independent and hardworking, and are not new to hardship or to coping with changes in the ecosystem, economy, or politics. When fisheries were closed in the late 1980s because of overharvesting, she and her family experienced extreme poverty. Rooted in their relationships with the environment, they coped by cutting and selling firewood and raising livestock. Two of the daughters hope to attend university in Puerto Montt, but the expense of higher education proves to be a significant barrier to furthering their education.

To supplement their income during the red tide crisis, Doña Rosa would drive the two hours to the city of Puerto Montt with cut and bagged firewood many times a week. I went on several of these deliveries with her and one of her daughters. When we returned home from one trip, the mother hopped out of the truck and disappeared over a hillside. Within moments, she was driving her four cattle back to the small barn for the night. She planned to sell the cattle and lambs at Christmas time. Her knowledge of small-scale farming and livestock-raising was impressive; she was the only fisher I spoke with who raised livestock other than chickens, and who had such an intimate relationship with farming. She said she enjoyed farming, but that it was hard work. Moreover, cutting wood and raising lambs to sell during the Christmas season helped her financially, but was not enough to live on:

> With the firewood, you cannot maintain your life. But if you go fishing, you can sell the fish and buy things you need for your house, or your vehicle. The wood is not enough to

pay the expenses. Nothing but fishing brings in enough for that. Selling the lambs also brings in too little, but they help. Apart from being fishers, we have to be small farmers.

Although Doña Rosa was a farmer out of necessity, she said her ties to the sea remained strongest. Her day-to-day finances depended on their harvests from the sea, and her preferences for her and her family's diets were also rooted in the sea. On most nights, one found *mariscos* (shellfish) or finfish with potatoes or bread on the dinner table in their household.

During the crisis of 2016, the family could not dive for subsistence. My conversations with them at dinner during the winter of 2016 often revolved around the lack of *mariscos* in their meals, and they relied on neighbors who harvested finfish. Compounding the problem of no subsistence fishing was the difficultly they encountered in paying for food and other household costs. One of the daughters moved home for the winter to help her mother with the farming, while the other children contributed financially from their jobs away from Estaquilla.

Fishers in the Lakes Region used their diversified livelihood strategies to cope with the fishery closures during the abrupt environmental crisis of 2016. However, coping—conceptualized as reactive adaptations used for short-term survival (Fabricius *et al.* 2007; Smit and Wandel 2006)—may not be enough to foster individuals' resilience to ecological, economic, or political stresses in the long term (Fabricius *et al*. 2007; Marschke and Berkes 2006), leaving fishers in the Lakes Region vulnerable.

2.2.5 Limitations of livelihood diversification

"I am one of those who claimed, many years ago, that the salmon companies sooner or later would kill our resources. What's more, this [environmental event] is a warning, a

> beginning of a mortality that has come in time, because this is not going to stop, daughter, it will not go away. It will not stop, unless the government awakens and knows how to understand that sooner or later, these companies are going to kill our ecosystem, they are going to kill us."- Don Roberto Molina from Maullín, 2016

Strategies to supplement income are practiced by many fishers around the world. These strategies are sometimes considered coping mechanisms, when the individual reacts to some form of stress that has impacted the social, economic, or ecological system (Fabricius *et al.* 2007). In Chiloé and the Lakes Region, fishers relied on their seasonal livelihood strategies to cope during the abrupt crisis of 2016. Yet, livelihood diversification was not enough for fishers to maintain their ways of life. Fishing provides the majority of people's income in this part of the region. With the closure of wild fisheries during the crisis, many fishers struggled to feed their families despite engaging closely with small-scale agriculture. Moreover, they felt that they lost their social and cultural connections to their neighbors and to their history. Without fishing, individuals organized fewer social gatherings outside of church activities. Fishers' children also had to move away to find work, ending a generations-long tradition of fishing for many families in the region. These repercussions from the 2016 crisis illuminate the limitations of livelihood diversification as a form of resilience for individuals whose well-being is embedded in the natural environment.

Reacting to stresses or relying on seasonal work, as did the fishers in the Lakes Region, may only ameliorate an individual's situation for a brief time, and can leave the individual vulnerable to future stresses or long-term change (Fabricius *et al.* 2007). Artisanal fishers who live in rural and impoverished areas, like the fishers in the Lakes Region, often lack the resources that are needed to foster adaptation or sustain long-term resilience. These resources, which include

formal education, financial capital, healthcare, and transportation, are vital in maintaining the resilience of social, economic, and ecological systems (Fabricius *et al.* 2007; Goulden *et al.* 2013). It is only with resources such as these that individuals can adapt effectively to maintain their livelihoods over the long term (Fabricius *et al.* 2007).

Future analyses of individual's resilience must move beyond questions of livelihood diversification to address larger questions of ocean governance, accountability, and adaptive management of natural resources. In 2016, fishers called upon the government for accountability and for change to policy, and they have yet to receive a clear answer. Don Molina from Maullín said sadly,

> This is unfortunate for us as artisanal fishermen, I see Chile as one of the - you could say, as a power in the subject of what is fishing, because there is still natural fishing, artisanal fishing. We want to try to save it in time, but we need the support of the government, the government that will help us save these wild fisheries, so that it can survive for many more years if we want, if the government or this country would like to keep this fishery for many years. The problem is that there is no interest in doing so.

2.2.6 Addendum: Moving from coping to adapting in the Lakes Region

In 2016, fishers in the Lakes Region coped with the environmental crisis by using their diversified livelihood strategies, such as subsistence agriculture, cutting and selling of firewood, and raising livestock to sell. However, the red tide and the subsequent paralyzed economy tested the strength of their livelihood diversification strategies, and many individuals realized that without fishing, they could not maintain many of their social connections or cultural ties to their environment. This shift in their social well-being affected their ability to maintain their social

resilience, raising questions about what people perceive as desirable ways of life and what forms of adaptation need to be developed and negotiated (Coulthard 2012). Many fishers perceived that there was no future in fishing and that their children needed to seek work outside of the local fishing industry. However, they wanted to develop opportunities which would allow their children to stay in the area, maintain their connections with the sea, and revitalize their communities. This realization spurred individuals in the Lakes Region to discuss adaptive strategies that go beyond livelihood diversification.

I suggest that the difference between livelihood diversification and adaptive strategies in this context is that in a post-crisis scenario, livelihood diversification connotes the strategies associated with coping and waiting to return to their former livelihood sources, while adaptive strategies implies overcoming coping with transformative, long-term adaptation of livelihoods and governance. As McLean (2015) states, a focus on livelihood diversification ignores the salience of power relations between actors and overlooks the need for governance structures which promote transformative adaptation. To further her argument, I suggest that discussions of livelihood diversification which refer to coping mechanisms as beneficial or as a desired form of resilience may essentialize individuals and communities as resource-dependent, and therefore reproduce their vulnerability to environmental change. Individuals and communities need the opportunity to transform their livelihoods through new adaptive strategies and transformations in governance structures. As I suggested in the chapter above, which was written in 2017, some individuals' abilities to transform their livelihoods are not realized because of their lack of access to certain resources, such as formal education, transportation, and healthcare. While this may be true and is a continued problem, some individuals and groups in the Lakes Region have been able to reimagine

their livelihood trajectories and begin the process of implementing new adaptive strategies which are rooted in their visions for the future, which I learned by returning to the region in 2018.

2.2.7 Transformative adaptive strategies in the Lakes Region

When I returned to the Lakes Region in January of 2018, my research in two of the communities mentioned above, Ancud and Carelmapu, illustrated that both individuals and institutions were developing long term strategies to adapt to uncertain future environmental change. These strategies included the formation of a new institution which was creating a larger management area to include TURFs as well as develop protected areas for conservation and zones for small-scale aquaculture. Other strategies discussed between stakeholders was the formation of Indigenous protected areas, known as Marine Coastal Spaces for the Original Peoples (ECMPOs), the development of infrastructure for tourism, and the potential for divers to use spearfishing for finfish. Although these adaptive strategies can be referred to as a form of diversifying their livelihoods, as I may later refer to in this dissertation, the strategies are different from the coping mechanisms discussed above. The adaptive strategies discussed here are long term strategies that have the potential to transform livelihoods and governance of marine resources.

In the community of Ancud on Chiloé, members of fishing unions were acting collectively to form a new institution to bring together multiple stakeholder groups to create an adaptive management plan for Ancud Bay. This management plan incorporated new stakeholders into governance and planning development, moving away from the binary co-management structure of local fishing unions and the government to a new institution which integrates fishing union members, seafood processors, government officials, and independent fishers—those who fish in open-access areas and are not members of fishing unions. The group sought to create long term strategies to diversify their livelihoods through changes in legislative governance and resource

management. This included maintaining TURFs and creating both new spaces within the management area for conservation and other zones to seed mussels and seaweed for aquaculture harvests (see Chapter 3). The formation of this new institution, called a management committee, was made possible through an amendment to Chile's Fisheries and Aquaculture Law in 2013 which created legislation to created new institutions which bring together multiple stakeholder groups for nearshore marine resource management. It is this legislation that developed the platform for cooperation and collaboration across fishing unions, independent fishers, processors, and government officials.

Across the channel in the mainland community of Carelmapu, individuals had divergent visions for adaptation (see Chapter 4) but were looking to form adaptive strategies through creating protected areas for conservation and tourism or through changing harvesting mechanisms to allow for the harvest of finfish species using spearfishing. The Indigenous Community in Carelmapu envisioned the creation of an ECMPO to protect the coastal zone and its waters from the development of aquaculture and mining industries. They were able to pursue this option because of legislation, implemented in 2008, which gave Indigenous Communities ancestral rights to marine spaces. They saw the development of an Indigenous protected area as an opportunity maintain their cultural ties to the sea, and also as a strategy to attract tourism to the area. Further, the Indigenous Community had applied to state grants to fund the development of projects to build infrastructure, such as a new dock, a boat and tour company to view wildlife, and workshops to train community members to be guides.

Non-Indigenous fishers in Carelmapu did not want the protected area, perceiving that it would shift power away from fishing unions and their historical fishing rights in open-access areas. When the Indigenous Community invited non-Indigenous fishers to work with them on the

creation of the ECMPO, fishers refused because the ECMPO would require fishers to request access to marine spaces from the Indigenous Community (see Chapter 4). Because fishers did not want to see this shift in power, they resisted collaboration and instead envisioned changes to harvesting controls on marine resources. In 2016 when the red tide closed benthic resources to harvesting because of the resources' toxicity, non-Indigenous fishers thought the opportunity to harvest finfish with spears while diving would help them become more adaptive to red tides and transform their livelihoods in the long term. However, changing this type of harvesting control would require changes to Chile's national Fisheries and Aquaculture Law, which currently limits artisanal divers to hand-harvesting of benthic resources.

Examining the process of a during-crisis to post-crisis scenario in Chile's Lakes Region after the red tide in 2016 illuminates how discussing livelihood diversification as a form of resilience may essentialize communities, reinforce power structures, and reproduce social vulnerability. If the definition of resilience is the ability for the system to maintain its function, structure, and relationships, perhaps we should move beyond using that term for examining individuals' livelihoods and their capacities to adapt, because returning to the same function, structure, and relationship to the ecological environment may reproduce resource users' vulnerability. I suggest that forms of livelihood diversification where individuals must wait to return to work and which disrupts their social networks and cultural ties to their environment does not make a resilient system. Individuals at the local scale are affected by changes in national and international economic markets. They also live under and interact with legislative structures which may constrain or facilitate certain adaptive strategies and influence their visions for, and ability to achieve, their desirable ways of life.

The ways in which individuals and institutions are responding to environmental change in the Lakes Region suggest that there are opportunities for transformative adaptation through new strategies which address issues of power and legislative flexibility while allowing for collaboration and cooperation across groups, as seen in Ancud. However, there are also challenges in realizing these new adaptive strategies because of legislation which does not allow for adaptive changes or because of legislative structure which supports specific groups, and shifts power which causes areas of friction and conflict between stakeholder groups, as seen in Carelmapu. As Cutter (2016) suggests, attention to geographic dimensions of scale, effects of globalization and climate change, and equity, fairness, and access to resources is necessary to make sure that some groups not privileged over others and that power differentials are not reinforced through legislation or institutions. We must examine for what and for whom resilience is being created and understand that coping mechanisms upon which individuals rely during crises do not necessarily make a resilient system. We must determine the root causes of vulnerability before understanding and enhancing resilience or the transformative adaptation of a system.

CHAPTER 3

MOVING BEYOND CO-MANAGEMENT: OPPORTUNITIES AND LIMITATIONS FOR ENABLING TRANSFORMATIONS TO POLYCENTRIC GOVERNANCE IN CHILE'S TERRITORIAL USER RIGHTS IN FISHERIES POLICY[3]

3.1 Abstract

This chapter contributes anthropological insights to discussions of adaptive governance in marine socio-ecological systems by elucidating the conditions which limit or enable the transformation from co-management to polycentric governance at the local scale. I offer a comparative study of two coastal communities, Carelmapu and Ancud, which are both bound by the same political structures governing marine resources and are home to multiple fishing unions governed by Chile's co-management policy, Territorial User Rights in Fisheries (TURFs). However, each community has experienced different outcomes in their abilities to transform to polycentric governance at the local scale in the Lakes Region of southern Chile. I suggest that the legislative structures which govern new ocean uses have brought new stakeholders to the table of environmental governance and have shifted power dynamics, creating both opportunities and limitations for the transformation of polycentric governance. In Carelmapu, fishing unions have been unable to organize to transform environmental governance because they refuse to work with the Indigenous Communities, who are seeking to form a marine protected area, a Marine Coastal Space for the Original Peoples (ECMPOs). In Ancud on the island of Chiloé, fishing unions have initiated the beginnings of polycentric governance by uniting and collaborating with government officials to form a new institution to govern resources. I first examine the conditions under which fishing unions in Ancud facilitated the beginnings of polycentric governance through new

[3] This chapter was authored by Sarah A. Ebel and written as an independent manuscript for submission to a journal. It will be submitted to a journal in May 2019.

management plans. I then explore how the legislative structures which govern new ocean uses have caused conflict in Carelmapu between fishers and the Indigenous Community, with attention to how conflict and exclusion constrain the formation of polycentric governance.

3.2 Introduction

For society to adapt to increasing uncertainty in complex marine socio-ecological systems, scholarship calls for a paradigm shift from top-down to decentralized governance (Armitage *et al.* 2009; Berkes 2007). Decentralized governance allows for the incorporation of multi-level institutions with decision-making processes which match the ecological scale and empower communities through participatory approaches (Armitage *et al.* 2009; Berkes 2007; Folke *et al.* 2002; Jentoft 2005; Lebel *et al.* 2006; Ostrom 2010). Co-management, defined as joint governance of a resource between resource users and the state (Jentoft *et al.* 1998), has been widely proposed as a decentralized, multi-level governance structure that can address uncertainty and complexity to foster resilient socio-ecological systems and create more efficient and more equitable management outcomes (Jentoft *et al.* 1998; Pinkerton 2011; Pomeroy *et al.* 2001; Pomeroy, Cinner, and Nielsen 2011). It is suggested that co-management systems are designed to address changing environments (Pomeroy, Cinner, and Nielsen 2011; Weeks 2013), and in many cases, co-management has improved adaptive capacity in socio-ecological systems because resource users can identify local threats and respond quickly. However, some studies of co-management suggest that institutions may be limited in their ability to adapt to socioeconomic and socio-ecological change (Brewer 2010; Davis and Ruddle 2012). For example, Davis and Ruddle (2012) suggest that co-management systems often shift the burden of responsibility onto resource users' local institutions to overcome dilemmas, such as environmental change. This shift in responsibility often neglects a nuanced understanding of the realities of many resource-dependent communities,

including the disparity in users' access to resources and the social inequality and poverty they face which affect their ability to adapt (Béné and Friend 2011; Davis and Ruddle 2012).

To address these limitations, other researchers have suggested a move away from co-management towards a polycentric approach (Gelcich 2014; Ros-Tonen, Derkyi, and Insaidoo 2014; Ostrom, 2010). The specific difference between the two governance structures is that co-management is a binary sharing of power between resource user institutions and the government, while polycentric governance incorporates more stakeholders into multi-level institutions with many centers of decision-making to facilitate face-to-face discussion between the stakeholders and monitoring of the ecological system at different scales (Ostrom 1961; Ostrom 2010). Polycentric governance requires both horizontal and vertical linkages at multiple scales which facilitate cooperation and collaboration between groups while allowing each group the independence to develop their own rules and social norms based on their specific social, cultural, and economic needs (Ostrom et al. 1961; Ostrom, 2010). Research has shown that polycentric governance may be more adaptable to external change than co-management because it allows for cooperative monitoring of socio-ecological systems, social learning, and innovation (Galaz et al. 2012; Ostrom, 2010; Toonen, 2010). Furthermore, polycentric governance has been found to foster more effective, equitable, and sustainable socio-ecological outcomes (Ostrom 2010). In many ways, polycentric governance seeks to integrate the heterogeneity of stakeholders at the local scale to potentially the global scale to create multiple governing authorities which are not just nested, but also horizontally linked.

To navigate transformations from co-management to polycentric governance, reform must build upon the existing strengths of co-management systems, their social structures, and the knowledge which actors have gained over time (Gelcich et al. 2010). Furthermore, the

transformation requires collaboration across stakeholder groups, necessitating understandings of how other political structures which govern ocean uses interact with the co-management system. Thus, transformation from co-management to polycentric governance requires the identification of dysfunctional states (Gelcich et al. 2010) and an empirical understanding of how political structures facilitate or constrain the formation of polycentric governance.

This paper contributes novel insights to discussions of adaptive governance in marine socio-ecological systems by elucidating the conditions which may limit or enable transformations from co-management to polycentric governance at the local scale. I examine the local scale because it provides a lens into how individuals interact with governance structures on the ground and how individuals at the local scale can act collectively to initiate the transformation of governance by moving away from local fishing unions to the creation of new institutions which incorporate stakeholders from multiple governing authorities, bridging the local to the national level. Specifically, I focus on how, under new legislation in Chile, local fishing unions can cooperate to establish a new management committee with government officials, seafood processors, and independent resource users to regulate numerous species at multiple scales, such as within a bay, an administrative region, a larger geographic region, or multiple administrative or geographic regions (Gelcich 2014). I offer a comparative study of two coastal communities, Carelmapu and Ancud [Figure 3.1], which are both bound by the same political structures that govern marine resource governance and are home to multiple fishing unions governed by Chile's co-management policy, Territorial User Rights in Fisheries (TURFs). Although the two communities are governed by the same legislative structure, the communities have interacted with the structures differently, resulting in varying outcomes in communities' opportunities to transform from co-management to polycentric governance in the Lakes Region of southern Chile.

Both communities have similar ethnic and socioeconomic diversity as well as similar resource dependence. However. one community has initiated the process of polycentric governance by drawing upon fishing unions' collective management preferences to act collectively to collaborate with government officials to form a new management institution. The other community is riddled with conflict and resistance, which has posed a significant barrier to successful collective action. This comparative design of these two communities allows us to identify specific conditions that facilitate the transformation toward polycentric governance in one case, but not the other.

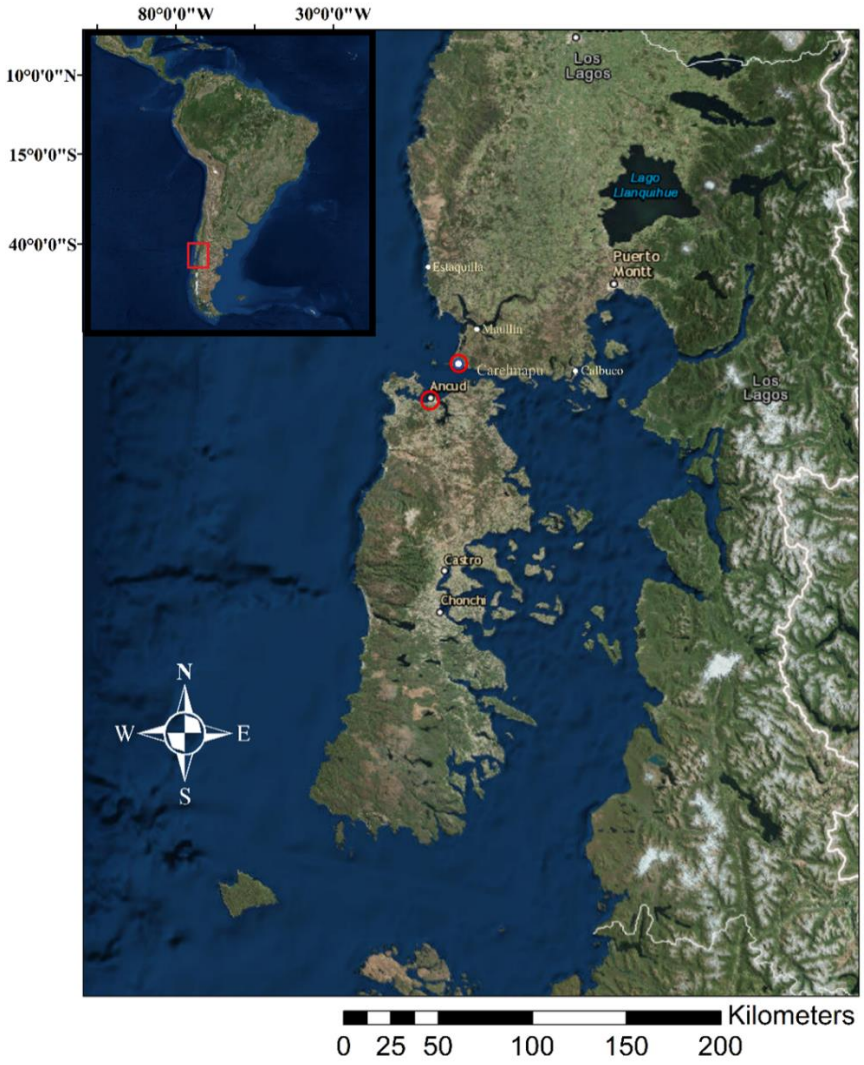

Figure 3.1. A map of the Lakes Region with field sites Ancud and Carelmapu circled in red.

3.2.1 Chile's co-management system: Territorial Use Rights in Fisheries

Inshore benthic marine resources have been co-managed under Chile's Fisheries and Aquaculture Law (FAL) since 1991, regulated by a policy called "Management and Exploitation Areas for Benthic Resources" (MEABR), better known internationally as Territorial User Rights

in Fisheries (TURFs) (Castilla and Gelcich 2008). Co-management allows for joint management and governance of a resource between resource users and state agencies (Carlsson and Berkes 2005) and can also be conceptualized as a problem-solving process to help overcome social dilemmas through communication, collective action, and cooperation (Berkes 2003; Carlsson and Berkes 2005; Ostrom et al. 1999). This form of decentralized governance has been shown to be successful across a variety of contexts when certain conditions occur at multiple levels: social, political, geographical, and institutional (Jentoft 2013; Pomeroy *et al.* 2001; Wilson *et al.* 2006). At the political and institutional levels, the state government must enable legislation that fosters shared power and decision-making, creates supportive institutions that empower communities and individuals (Addun and Muzones 1997; Pomeroy *et al.* 2001), and understand resource users' objectives (Pomeroy *et al.* 2001). At the community scale, success often depends on a defined number of members in institutions, a defined physical space that is managed, group homogeneity, and individuals' capacity for collective action (Ostrom 1990; Pomeroy *et al*. 2001).

Chile's TURFs co-management system was developed after 17 years of dictatorship under Pinochet in the 1970s and 1980s. Under Pinochet's regime, fisheries were quickly overexploited due to open access conditions combined with high export demands, which contributed to fisheries collapses and conditions of poverty throughout the coast (Jarvis and Wilen 2016). Species most affected included the *loco*, a gastropod (*Concholepas concholepas*), which is both economically and culturally valuable in Chile (Castilla and Gelcich 2008). These declines precipitated Chile's first governance transformation from open-access to the co-management system (Gelcich et al. 2010). Before Chile implemented the TURFs policy, research scientists worked with fishers to develop two experimental no-take zones in the 1980s in central and southern Chile (Gelcich et al. 2010). These experiments showed that humans have a significant effect on determining the

ecological structure and composition of the nearshore environment (Castilla 1999). The experiments were not only beneficial to understandings of intertidal ecological dynamics but set the groundwork for collaboration between fishers, researchers, and government officials for the formation of nested co-management institutions (Gelcich et al. 2010). These stakeholders engaged in the co-production of knowledge, suggested by many scholars to be a tenant of resilient and adaptive socio-ecological systems (Armitage et al. 2009; Folke et al. 2005; Linkov et al. 2006). Most resource users are part of the co-management system and are members of local fishing unions, regional fishing federations, and national confederation of fishers, which work actively to hold discussions with the state. However, not all resource users are part of this system, and those independent fishers harvest in open-access areas, which are often overexploited (Gelcich et al. 2005a).

The initial objective of the TURFs policy was to restore fisheries by incentivizing resource users to form local unions to have access rights to specific exploitation areas (Jarvis and Wilen 2016). Once a local union formed, the unions' members were required to design and submit a management plan to the state (Castilla and Gelcich 2008). If the state approved the plan, union members were leased rights to harvest more than 60 different benthic species from specific areas with the prerequisite that stock assessments in the areas would be conducted every year and that continued use of the area would be determined by an overall sustainability assessment of each area every four years (Gelcich et al. 2010; Jarvis and Wilen 2016). Allocating rights to resource users for harvesting species in specific areas had both ecological and social benefits for Chile's coast (Castilla 2010; Moreno and Revenga 2014). As the objectives of co-management systems suggest (Berkes 2009; Ostrom 2005; Pomeroy et al. 2011), the TURFs system brought together fishers in sharing power and responsibility of resource governance, fostering trust, promoting collaboration

and cooperation, and resolving some conflicts (Moreno and Revenga 2014). However, the initial implementation of the TURFs policy in 1991 overlooked the diversity of stakeholders at the local scale, including Indigenous peoples and aquaculture employees. This is likely because aquaculture was in large part still experimental in the early 1990s. Moreover, Indigenous peoples in Chile had been heavily persecuted through decades of dictatorship (Holton 2004) and were only allowed by law to organize and form their own institutions, referred to as Indigenous Communities, after 1995. Therefore, the national government may not have considered these two groups to be active stakeholders in marine governance during the inception of the TURFs policy.

Despite the initial achievement of these goals and ecological restoration of inshore fisheries, the co-management system has had differential outcomes across Chile's ecologically and culturally diverse coastline (Fernández et al. 2011). Criticisms of the TURFs policy suggest that the policy has imposed constraints on fishers' decision-making and has failed to integrate fishers' sociocultural norms and patterns of behavior into institutions and policy (Fernández *et al.* 2011; Gelcich *et al.* 2013). This is a common critique of decentralized governance—even where avenues for power sharing and equitable allocation of decision-making responsibility exist (Nursey-Bray and Rist 2009), individuals' actions and their behaviors often remain constrained by the political structures under which they live (Béné and Friend 2011; Cleaver 2007).

Finally, the co-management system was viewed as an end goal in fisheries management (Gelcich et al. 2010) without considerations for the development of salmon aquaculture or new Indigenous protected areas which have contributed to this rapidly changing oceanscape. Given the growing recognition that TURFs co-management was not enough to achieve sustainable marine socio-ecological systems (Gelcich 2014), the government amended the FAL in 2013—the first time since its inception in 1991. In the legislation, policymakers developed the framework to allow

management plans the ability to integrate more stakeholders into governance, including national and local fisheries agencies along with the fishing industry, to create locally specific and locally-agreed upon management plans which may be operational at various geographical scales for a multitude of species (Gelcich et 2014; Subpesca 2014). It is this critique of Chile's co-management system which I address in this paper while I examine how legislative structures may facilitate or constrain a transformation to polycentric governance.

3.2.2 Opportunities for polycentric governance in Chile

New legislation, an amendment to Chile's Fisheries and Aquaculture Law (FAL) in 2013, moves away from solely having individual fishing unions as management institutions, paving the platform for the development of polycentric institutions. Instead of the binary co-management governance between the state and fishing unions, the new legislation promotes cooperation across fishing unions to establish management committees with government officials and other stakeholders to regulate a multitude of species at multiple scales such as within a bay, an administrative region, part of a larger region, or multiple regions (Gelcich 2014). To achieve this, any individuals or groups who have an interest or stake in the marine environment must contact the Undersecretariat of Fisheries (Subpesca). Subpesca must then arrange a meeting where all registered fishers and other interested parties attend. Within this group, participation criteria, such as target species, fisher categories, gear type, and landings history, are defined. With consensus reached among interested stakeholders, the management committee designs a management proposal which would later be open for comments by the public. The process aims to exclude no one, so the management committee must include two to seven artisanal fisher representatives, one processing plant representative, a representative of the national directorate of maritime territories, and a representative from the national fisheries service (Gelcich 2014: 577). The public comments

are considered, revisions are made, and the fishers who are under this management plan must comply with the new regulations (Gelcich 2014). Every three years, participating fishers are reviewed, and every five years, the management plan must be assessed (Gelcich 2014). These key aspects of the legal structure may allow for a shift towards polycentric governance.

The legislation attempts to foster the inclusion of all stakeholders, the integration of knowledge systems, and increased monitoring of socio-ecological systems' feedback to offer a more appropriate platform to enable the formation and adaptation of institutions (Gelcich 2014). Such arrangements could increase opportunities for knowledge co-production in institutions and the creation of the social networks necessary to enabling polycentric governance (Andersson and Ostrom 2008; Gelcich 2014). To achieve polycentric governance in the Chilean marine socio-ecological system, Gelcich (2014) states that the main challenge will be to ensure that all local actors are represented, that they have the independence and capabilities to develop and enforce rules, and that the national agencies aid with enforcement and funding for implementation. I suggest that the legislative framework still may not recognize the diversity of stakeholders in local communities which may affect the communities' abilities to transform from co-management toward polycentric governance.

Outcomes in transformations to polycentric governance are often contextually dependent, and the structure of policy as well as the history of a specific area and its institutions may facilitate or hinder the formation of polycentrism (Gelcich 2014). The transition to polycentric governance requires reform which builds upon existing institutions (Gelcich et al. 2010) and thus requires an understanding of how existing legislative structure creates limitations or opportunities which may facilitate this transition. Further, power dynamics between actors must be understood to avoid competitive interactions and foster collaborative ones.

3.2.3 Navigating change in the Lakes Region

The Lakes Region has undergone significant socioeconomic change since the inception of the TURFs co-management system in 1991, which has re-embedded the local scale of resource management in the globalized production and markets of large-scale aquaculture. Finfish aquaculture has expanded dramatically in the region since the 1980s as the industry moved from experimental production in the late 1980s to 1990s to a major global industry that is now second to Norway in its farmed salmon production (Barton and Fløysand 2010; FAO 2018). In 1995, Chile produced 157 thousand tons of aquaculture product (FAO 2018). Just 21 years later in 2016, Chile was producing 1,035 thousand tons in aquaculture product, almost seven times the amount produced in 1995 (FAO 2018). In 2005, the export value of finfish aquaculture in Chile amounted to US$2,207 million (Olson et al. 2008), compared to TURFs benthic resources' economic value of US$250 million between 2005-2008 (Gelcich et al. 2010). Plans for aquaculture production in Chile are not slowing, as aquaculture production projections show a 26.4% increase from 2016 to 2030 (FAO 2018). These shifts in aquaculture production are primarily seen in southern Chile in the Lakes, Aysén, and Magallanes Regions and are made possible by regulatory processes couched under the Aquaculture sector of the FAL. Aquaculture is regulated separately from the TURFs co-management policy in a legislative structure under the FAL which was incorporated in 2003 (Subpesca 2019). Under this legislative structure, only the applicant for the aquaculture farm and Subpesca are involved in decision-making (Subpesca 2019). As I will later describe, the proliferation of aquaculture has encroached upon fishers' TURFs and the new legislative structure has shifted control of environmental governance and now exclude fishing unions from the decision-making process.

As aquaculture proliferates, Indigenous communities are responding by creating Indigenous protected areas, called Marine Coastal Spaces for the Original Peoples (ECMPOs). The state granted ancestral rights to marine spaces to Indigenous peoples in Chile in 2008 through the Lafkenche Law which provides the opportunity for Indigenous Communities to create ECMPOs to protect coastal and near shore zones to maintain their culture traditions and ties to the sea. Indigenous communities can include other stakeholders, such as fishers, in the development and planning of ECMPOS, but it is at their discretion. This legislative structure has resulted in a redistribution of power in marine and coastal governance but potentially creates the space for the creation of a local multi-stakeholder institution if cooperation and collaboration results between Indigenous Communities and fishers.

The redistribution of power across these three legislative structures: TURFs policy, Aquaculture Law, and Lafkenche Law, which govern marine resources, has played out differently in the communities of Ancud and Carelmapu regarding their ability to transform to polycentric governance. Fishing unions in Ancud have acted collectively to form a management committee which brought together fishing union members, independent fishers, government officials, and seafood processors, to create a management plan for Ancud Bay. However, across the Chacao Channel, fishing unions in Carelmapu feel that the legislative structures have created an uneven playing field where fishing unions feel threatened by the creation of an ECMPO by the Indigenous Communities in Carelmapu. Given that trust, collaboration, and feelings of equity in decision-making are cornerstones of polycentric governance, a meaningful shift toward polycentric governance in Carelmapu seems unlikely.

3.3 Methods

Description of the study area:

Rolling green hills used for agriculture, a coastline with rocky bluffs peppered with sandy and pebble beaches, and rural communities with small harbors, called *caletas*, characterize the coastal region. The inhabitants of the Lakes Region are economically, culturally, and socially dependent on the sea (Ebel 2018; Daughters 2018; Pitchon 2015), subsisting for generations on the harvests of shellfish and seaweed and engaging in economies of barter and reciprocity (Daughters 2018). Furthermore, the stakeholders of the Lakes Region are diverse, and include non-Indigenous fishers, Indigenous fishers, Indigenous peoples, and aquaculture farm employees. 28% of the population in the Lakes Region identify as Original Peoples, or Indigenous. In the two communities examined here, 29% of Ancud's population and 22% of Carelmapu's population identify as Indigenous. Increasingly, these stakeholders in the coastal zone must navigate change as new ocean uses have brought new stakeholders to the table of environmental governance.

People in the Lakes Region of southern Chile are increasingly dependent on large-scale salmon aquaculture, which has become the region's largest employer. The aquaculture industry employs over 50,000 individuals in the Lakes Region (United Nations 2006), while nearly 24,000 artisanal fishers are registered under TURF unions in the Lakes Region (INE 2008). Many communities in the Lakes Region are rural and poor (Latta and Aguyayo 2012) with 33.9% of the population in the Lakes Region living below the poverty line compared to 24.6% of the population nationwide (see OECD.stat). Cultural identities are shifting in the region as some artisanal fishers and many fishers' children pursue work as wage laborers on aquaculture farms for more stable work and better pay (Daughters 2016; Pitchon 2011; 2015).

To examine how and why legislative structures governing marine resources play out differently at the local scale, ethnographic research was conducted in two communities in the Lakes Region. Ancud is an urban center on the north end of Chiloé Island, home to a population of around 40,000 people. It is located around two hours from Puerto Montt and is only accessible by ferry between the town of Pargua on the mainland and Chacao on Chiloé. There are seven active unions in and around Ancud's main dock, *El Muelle de Ancud* and there are between 25-50 men in each union, totaling between 175-250 union members. Carelmapu is located on the mainland to the north of Ancud across the bay at the western end of the Chacao Canal. It is a small community of around 2,800 people. Both communities are dependent upon fishing, although they are both invested in diversifying their livelihoods through increasing infrastructure for tourism. Demographics in both communities are changing as young people leave to seek work in other sectors, mainly the aquaculture industry.

Data collection methods and analysis:

I gathered ethnographic data in Ancud and Carelmapu, including six months of participant observation from January through June 2018 and 26 semi-structured interviews (n=15 in Carelmapu and n=11 in Ancud), of which 22 hours are recorded and transcribed. Interview participants were recruited using snowball sampling where I built off my pre-existing relationships formed during fieldwork in 2016 to ask individuals for their participation. I also attended five fishing union meetings and two Indigenous community meetings between February and May 2018 and spent time with fishers and members of the Indigenous communities in their homes and at the fishing docks, during which I documented individuals' perceptions of socioeconomic change, their perceptions of marine resource governance, and their visions for the future of their communities. I also took comprehensive field notes from over 400 hours of observations and informal

conversations with fishers, documenting topics discussed at meetings and fishers' interactions with Subpesca during meetings which Subpesca officials were present. Semi-structured interviews and field notes were manually coded for themes [Table 1]. Themes were verified by two union leaders from each of the two communities and one Indigenous community leader from Carelmapu.

3.4 RESULTS

3.4.1 The effect of legislative structure on communities' abilities to transform governance

Three salient themes emerged from my semi-structured interviews and informal conversations with fishers and members of the Indigenous Communities during January through June 2018 related to why legislative structure may have different outcomes in fishing unions' abilities to transform environmental governance (Table 1). The themes are: the encroachment of other ocean uses on fishing unions' TURF management areas, conflict between stakeholders, and preferences for management. In Ancud, I found that the most prevalent theme was fishers' preferences in management, arising five or more times in 10 out of 11 interviews. I found a different salient theme in Carelmapu where conflict between stakeholders was the most prevalent, arising in all 15 interviews with fishers and members of the Indigenous communities. Encroachment of new ocean uses on fishing unions TURFs was pervasive through interviews with fishers and Indigenous Communities in both Ancud and Carelmapu which initiated the ethnographic study of stakeholders' interactions with legislative structures. The themes suggest that new stakeholders entered the picture of environmental governance after the inception of the Fisheries and Aquaculture Law (FAL) in 1991 and have created ocean uses through new legislative structures which have shifted power dynamics in environmental governance.

Theme	Theme Description	Ancud (n=11 interviews)	Carelmapu (n=15 interviews)	Examples of Quotes Coded with Theme
New ocean uses encroachment on TURFs	Fishers stated aquaculture farms and ECMPOs encroached upon their TURF management areas and constrained their ability to dive in open-access areas and form new TURFs.	9	15	Fisher from Ancud: "The fact is that when an [aquaculture or ECMPO] concession of that type is given, nobody can do anything more. If I wanted to ask for a management area, they [government] would forbid me because there is already something else there. Where there are already aquaculture concessions or Indigenous territories, we cannot do anything."
Conflict	Conflict includes mentions of conflict with other stakeholder groups	2	15	Fisher from Carelmapu: "The Lafkenche Law would have been good if it said that the artisanal fishers from unions who carried out harvesting in these zones within the proposed protected area did not lose their rights to harvest. But the fact is this law makes us lose our rights, there will be no more free entry. I have had the opportunity to be in several conversations with respect to the Lafkenche Law and losing our rights is the main conflict we have with the indigenous communities."
Preferences for management	I asked fishers if they had preferences for future marine resource management. I found that fishers in Ancud had similar preferences to create more inclusive, larger management areas. In Carelmapu, fishers varied in their preferences—some thought the TURFs system should stay the same, while others thought that a shift to a new system was needed.	11	12	Fisher from Ancud: "We need larger, more inclusive areas. We are contained to the management areas and there are others who cannot enter these areas because they are not union members. We need to all be involved together in another area. We must try to do things together because there is no work anywhere else. We need to think of something else to take care of ourselves and the ecosystem."

Table 3.1. Summary of themes from semi-structured interviews (n=26). Note: themes are not mutually exclusive.

3.5 DISCUSSION

In this discussion, I focus on the three themes related to why legislative structure may have affected Ancud's and Carelmapu's abilities to initiate polycentric governance: (1) encroachment of new ocean uses on TURFs, (2) collective preferences for management in Ancud and, (3) conflict between stakeholders in Carelmapu. The first theme was discussed by all research participants, with a frequency of being discussed five or more separate instances in each interview. This theme underpinned the subsequent two themes because it was fishers' feelings that new ocean uses were impinging upon their management areas and open-access fishing areas which brought forth discussions about preferences for future management and conflict between groups. In Ancud, the second theme of collective preferences for management dominated discussions in 10 of 11 interviews. In some instances, this theme was discussed throughout the interview or arose five or more times. In this study, when individuals were asked their preferences for future management, they had similar responses. The sharing of those individual, similar responses makes up their collective preference. In Ancud, fishers stated that they wanted larger, more inclusive management areas and to diversify their livelihoods through small-scale aquaculture and tourism, discussed further in sections below. The third theme of conflict was salient in all 15 interviews in Carelmapu, arising five or more times in all fifteen interviews, specifically discussing the conflict between non-Indigenous fishers and the Indigenous Communities.

First, I briefly discuss the legislative structures which facilitated the new configuration of stakeholders in environmental governance and the subsequent shift in power dynamics, which has resulted in conflict in the community of Carelmapu between fishers and the Indigenous community and inhibited the transformation of governance at the local scale. I then examine how fishing unions in Ancud drew upon their collective management preferences to organize and facilitate the

beginnings of polycentric governance through new management plans. Through examining both communities, I then identify the conditions which may limit or foster successful transformation to polycentric governance.

3.5.1 A changing oceanscape: Legislative structures which facilitate a new configuration of stakeholders, shift power in environmental governance, and create conflict

Socioeconomic change has swept through the Lakes Region's oceanscape since the implementation of the FAL in 1991, which has added new legislative structures to the FAL and has brought a new configuration of stakeholder groups to environmental governance. New legislative structures which govern finfish aquaculture and the creation of ECMPOs have shifted power away from fishing unions under the TURFs co-management policy. The TURF's co-management policy was created during a period of ecological restoration in 1991; where fishers needed to be empowered to collaborate with the government to manage marine resources, where aquaculture was in many ways still experimental, and where the opportunity for Indigenous communities to create ECMPOs did not exist. Now fishers must contend with or collaborate with stakeholders under the new legislative structures to facilitate a transformation from co-management to polycentric governance at the local scale.

3.5.2 Accumulation by dispossession in the Lakes Region: Finfish aquaculture and the encroachment on fishing areas

The proliferation of aquaculture in Chile's Lakes Region has in large part been facilitated by legislative structures which were implemented in 2003. Aquaculture, regulated under the FAL, has two avenues for aquaculture development: aquaculture concessions and authorized aquaculture areas. Although Chile is reviewing the FAL to integrate aquaculture into ecosystem-based

approaches to fisheries and aquaculture management (FAO 2018), the current process of aquaculture farm development only includes the applicant and government officials. Furthermore, the aquaculture development process does not include a social impact assessment of the proposed farm's effects on other ocean users. During 24 of 26 of my interviews in both Ancud and Carelmapu, fishers said they felt powerless to stop the proliferation of aquaculture in the region. They believe that the constraints that aquaculture places on their mobility in open-access harvest areas, which they rely on for much of the year, stem from the government's lack of responsibility in regulating the aquaculture development. The fishers' perceptions of the state's lack of regulation makes fishers feel there are no protections for them. The current political structure of aquaculture formation and regulation as well as the rapid increase in aquaculture production since 1995 suggests that their feelings may be justified—fishers and fishing unions are not integrated into the process and thus have no power in the decision-making regarding the formation of aquaculture farms, even though the farms take up their open-access fishing areas and encroach upon their TURF management areas.

This situation is reflective of political ecology's understandings of accumulation by dispossession (Harvey 2003), where state policies redistribute power over governance, and the redistribution creates situations where one group, such as aquaculture companies, accumulates ocean space by dispossessing others, such as fishers, of that same space. What further complicates and exacerbates this dispossession is the decentralization of resource governance in the TURFs policy. The binary co-management system of TURFs relies too heavily on fishers to overcome socio-ecological dilemmas, such as environmental change or new ocean uses. Studies of decentralized policy reveal that situation is not uncommon—government's devolution of responsibility to the local level often remakes the relationship between the state and citizens

(Cleaver 2007; Ong 2006; Shore and Wright 2011) by shifting the burden of governance and ecological outcomes onto the local stakeholders (Davis and Ruddle 2012). Thus, devolving responsibility to citizens can leave stakeholders unable to determine who is accountable for problems that arise.

How geographic ecological space is utilized, negotiated, and contested by diverse stakeholders through decentralized governance can misconstrue and redefine individuals' roles and the ecological outcomes of sustainability (Comito et al. 2013). This is evident across socio-ecological systems, such as in Anne Rademacher's studies of river restoration in Kathmandu, Nepal, where decentralized regimes with diverse actors can diffuse and dilute power, and redirect accountability to create inaction, resulting in the perpetuation of environmental crises (Rademacher 2011). This is even more likely to occur when the state becomes a 'cunning state,' where it can't be blamed because it can use multiple negotiation tactics "where the state appears only to disappear, and where it constructs and dismantles itself in ways that renders it unanswerable" (Randeria and Grunder 2011; 189). When there are legislative shifts which change power in environmental governance and current decentralized governance structures place the burden onto the local level to overcome dilemmas, those who are dispossessed of their space must overcome the dilemma on their own. In the case of fishing unions in the Lakes Region, fishers must find ways to deal with the rapid development of aquaculture—problems which they may have no power or resources to overcome.

The accumulation by dispossession has implications for the transformation from the co-management system to polycentric governance. Polycentric governance requires a political structure which fosters collaboration between groups to create multiple, overlapping governing authorities (Ostrom 1999; Brewer 2010). Moreover, it requires that stakeholders have equal power

in decision-making (Ostrom 1999). Within the current political structure, fishers do not have the same power in decision-making as aquaculture companies and are left to overcome ecological dilemmas, such as environmental change, on their own. The legislative structures and the threats from the proliferation of aquaculture pose new challenges for resource users in the Lakes Region, and Ancud and Carelmapu are responding to these threats and interacting with the marine resource governance structures in different ways.

3.5.3 Accumulation by resistance in Carelmapu: Conflict between fishers and the development of Marine Coastal Spaces for the Original Peoples (ECMPOs)

In 2008, Chile recognized Indigenous ancestral rights to coastal and marine resources through the Lafkenche Law. This new legislation created the avenue for Indigenous Communities to develop ECMPOs. The rights to create this form of marine protected area are granted to Indigenous Communities for subsistence harvesting and cultural practices by Subpesca, the same agency which governs the TURFs policy and aquaculture concessions. Intersectoral communities, such as an 'association of communities' formed by an Indigenous Community and non-Indigenous resource users, can also request ECMPOs. The areas delineated by the request are limited to protection only but do allow the potential for new economic opportunities through tourism. No commercial harvesting by Indigenous peoples is allowed in these areas, but other commercial resource users may seek permission from the Indigenous communities to create harvesting areas. If the request is approved by Subpesca, the Indigenous Communities or the 'association of communities' have jurisdiction over the defined area. The development of ECMPOs differs from the creation of aquaculture in that it allows the Indigenous communities the potential for integrating fishing unions in ECMPO development and planning.

While ECMPOs address some of the tensions rising from the loss of ocean space to aquaculture, fishing unions that have long been beneficiaries of the old co-management system of TURFs felt increasingly threatened by the ECMPOs. They felt that the ECMPOs limit their abilities to create new management areas and take away access to their open-access fishing areas. Here I focus on an event that illustrates the conflict between two communities. The Indigenous Communities in Carelmapu began planning the formation of an ECMPO, the "Borde Costero," in late 2016. Discussions about creating an ECMPO had occurred before 2016, but Indigenous Community members said in interviews that the harmful algal bloom that caused an environmental crisis in March of 2016 sped up the planning process. Indigenous Communities felt they needed jurisdiction over ocean space to legally protect their zone from contamination and the development of open-water aquaculture. The Indigenous Communities invited leaders from all five fishing unions in Carelmapu to join them in the creation of an 'association of communities' which would include representatives from the fishing unions. Three leaders from three different fishing unions attended the first meeting in November of 2017. However, after the first meeting, all non-Indigenous leaders from fishing unions refused to cooperate with the Indigenous Communities any further in planning the development of the ECMPO. When I asked why they did not want to cooperate with the Indigenous Communities, fishers responded that they felt their historical fishing rights were threatened by the ECMPO because it would prohibit their harvesting in open-access areas, as those areas would be subsumed by the ECMPO. Furthermore, the development of an ECMPO would require the fishers to ask permission from the Indigenous Communities to create new TURF harvesting areas within the ECMPO. Fishers said losing power over governance and the rights to the resource was a major tension they felt with the Indigenous Communities,

underlying their decision to not cooperate as a stakeholder in the ECMPO and resist transformation in environmental governance.

Conversely, Indigenous Communities in Carelmapu sought to form an ECMPO to protect their ancestral coastal waters from open-water aquaculture development and contamination from aquaculture and mining industries. They also hoped to diversify Carelmapu's economy by developing infrastructure for tourism, with the objective of creating jobs to retain young people in the community. To attract tourists to the area, they said they must protect their coastlines and nearshore zones. In personal communication with an Indigenous Community leader in February of 2019, I learned that the initial application for an ECMPO area was approved by Subpesca. The Indigenous Community leader said they would return to the fishing union leaders to invite them to create a management committee. However, the Indigenous leader was not hopeful that the two groups would reach a reconciliation.

This shift in power, where fishers must seek permission from the Indigenous Community to harvest in areas which fishers feel they have historical rights, has created conflict at the local scale in Carelmapu. I suggest that this is a form of dispossession, but instead of dispossession by accumulation in the case of aquaculture, it is dispossession by resistance—where the fishers who are actively resisting collaboration with the Indigenous Community are dispossessing themselves of ocean space and access. What I mean by this is that despite an invitation for collaboration by the Indigenous Community, the fishers resisted any form of cooperation and opportunity to transform co-management to more collaborative, multi-stakeholder governance structures. What they may have failed to realize is that through resisting, they were dispossessing themselves of their ocean space and sacrificing their opportunity to work jointly with the Indigenous Community to manage marine resources. This has implications for Carelmapu's ability to transform to

polycentric governance, because non-cooperation which arises from perceptions of unequal power dynamics due to shifts in political structures and conflict prevents the necessary collaboration and communication needed to form new institutions which include the diverse stakeholders.

3.5.4 The makings of polycentric governance in Ancud

In Ancud, fishers under the TURFs co-management structure were similarly affected by the aquaculture legislative structure which dispossessed fishers of their open-access harvesting areas, yet they remained unaffected by the Lafkenche Law. Fishers in Ancud did not feel threatened by the creation of ECMPOs even though the percentages of Indigenous peoples in the population are similar to Carelmapu. This is likely because there was not an active development of an ECMPO near their fishing grounds, thus the legislative structure of the Lafkenche Law was not perceived to be shifting power in governance. Despite the exclusion from the decision-making process in aquaculture development, the threats fishers faced from aquaculture catalyzed their active involvement in the transformation to polycentric governance at the local scale. I sought to understand why fishing unions were able to initiate the formation of management committee while Carelmapu was unable to do the same. I suggest that the initiation was in part facilitated through the unions' collective preferences for management which provided them common ground to cooperate. Once fishing unions acted collectively, they drew upon their social networks with government officials and universities to facilitate a transformation to polycentric governance at the local scale.

Fishers in 10 of 11 interviews in Ancud recognized a need for new policy which addressed issues regarding the development of aquaculture, stimulating discussion among fishers about their preferences for future management. In interviews, informal conversations, and attendance at union

meetings in Ancud, I asked fishers if they had visions or preferences for future management. Fishers in Ancud had similar preferences for management, stating that the threat of aquaculture development and contamination from industry may be overcome with new policy developments. Their suggestions for new policy developments go beyond the original TURFs co-management objectives to foster a move towards inclusivity in institutions and the creation of larger management areas which include union members, independent fishers, and officials from Subpesca. These larger management areas would create a platform for more variety in resource use, allowing stakeholders to diversify their livelihoods through harvesting from wild fisheries, seeding small seaweed and shellfish aquaculture concessions, and engaging in tourism.

Fishing unions have drawn upon these collective management preferences to form a new Management Committee which aims to develop a more inclusive plan which addresses industrial contamination in the river, overexploitation of productive sea beds, and demands maritime concessions. This Management Committee is an example of the management committees outlined in the 2013 amendment to the Fisheries and Aquaculture Law (FAL) which offered a platform for governance transformation (Gelcich 2014). Integral to the development of the Management Committee were fishers' abilities to draw upon their social networks with government officials and universities. Joining these multiple stakeholder groups and multiple levels of possible governing authorities resulted in a collaborative management committee which is creating a plan for Ancud Bay. The management plans bring together multiple stakeholder groups, including all Ancud's fishing unions, independent fishers, and authorities from Subpesca. They have between 16-20 meetings per year which are often extensive in length, sometimes several hours. Fishers stated that they were able to initiate the formation of this committee because of the connections some union members had with universities and the government. I attended five meetings for two

different fishing unions between February 2018 and May 2018, and of those five meetings, Subpesca or Sernapesca officials were present at three. It was evident that the officials were not only present in the capacity of an authority, but as a communicator who updated union members on changing laws and answered union members' questions. The discussions between fishing union members and government officials were cooperative, and fishers said that they usually depended on the same official each meeting for communication and information.

Through the formation of the Management Committee, fishers feel that they have more flexibility for adaptation to new ocean uses and more power in environmental governance. With the creation of a large management plan for Ancud Bay, 147 hectares of the bay were placed under a no-take protected zone for two years so that the Committee could work with the state and universities to conduct ecological studies. In areas open to diving, fishers can harvest from 25 different species which all have a quota and minimum size limits. Different than TURF management areas, the larger management plan does not exclude independent fishers who are not in unions. Independent fishers can apply to the Management Committee to enter the bay and must abide by size limits and land their product at the designated dock in Ancud. The management plan for Ancud Bay also allows individuals who are part of the unions to apply for aquaculture concessions to plant seed for small-scale seaweed and mussel aquaculture.

Fishers also stated that they have more political strength with the formation of the Management Committee because they have a larger number of people united for the same cause and they have the support of government officials. Instead of individual fishing unions which act separately to govern marine resources under the TURFs co-management policy, the Management Committee brings the unions together, along with independent fishers and Subpesca, to set local closures and formulate more localized management plans. One such local management plan

example for Ancud is for *luga roja,* red algae [sp. *Sarcothalia crispate*], harvested and sold for its carrageenan. Previously, Chile's Subpesca declared *luga roja* as overexploited and placed bans on its harvesting. With the work of the Management Committee, fishers and *recolectores de la orilla,* female shore harvesters, collaborated on policy which allows harvesters to collect the seaweed by cutting the seaweed at the base, similar to a chard plant, allowing the seaweed to regrow while simultaneously providing the best quality part of the plant which contains more carrageenan for the market. Fishers in Ancud are hopeful that with these types of collaboration and a larger, more inclusive management area they will be able to contend with large-scale aquaculture and increase their cooperation with other stakeholders on Chiloé.

3.5.5 Conditions which limit or enable polycentric governance

The comparative case study of these two communities elucidate several conditions which limit and enable the transformation from co-management to polycentric governance at the local scale. First, I discuss how the conflict in Carelmapu helped me identify the conditions which may limit the transformation to polycentric governance. Then, I identify the factors which may facilitate the transformation in governance using the example of Ancud.

The conflict between non-Indigenous fishers and the Indigenous Communities in Carelmapu, which has resulted in dispossession by resistance, has created a troublesome platform for a transition to polycentric governance. As noted in Gelcich (2014: 578), polycentricism requires cooperation and collaboration across all stakeholder groups to resolve conflicts and govern across independent decision-making centers (Ostrom et al. 1961). However, conflict in Carelmapu has prevented collaboration across groups and has inhibited the self-organization of fishing unions to form management committees to transform the TURFs co-management system

to polycentric governance. Early assessments of management committees in Chile corroborate my findings that conflict may constrain the transformation to polycentric governance. Gelcich, Reyes-Mendy, and Rios (2019) state that the development of institutions which share power is hindered by distrust among stakeholder groups. However, these assessments are limited to the examination of fishers in unions. I contribute to these findings by examining the diversity of stakeholders at the local scale to show that it is the interaction between the new legislative structures and the stakeholders which underpinned the conflict in Carelmapu. It was the legislative structure of the Lafkenche Law under which the Indigenous Communities proposed development of the ECMPO which created fishers' fears that they were losing power in governance and access rights to their open-access areas. In polycentric governance theory, the Indigenous Communities and fishing unions could work together to address the issues facing the community of Carelmapu. However, resistance by fishers to changes in the legislative structure and their perceptions that they are losing power in governance may hinder the creation of institutions, the integration of knowledge systems, and the collaboration needed to transform to polycentric governance. Furthermore, their resistance will result in the dispossession of their resource access and ocean space.

Thus, by examining the conflict in Carelmapu, I suggest that the main condition which may limit the transformation to polycentric governance is twofold: (1) a structural shift in power through new legislative, and (2) fishers' subsequent resistance to cooperating with stakeholders within their community for fear of losing power in governance. It is fishers' interactions with the legislative structures and their non-cooperation with other stakeholders which has created the limitations.

In Ancud, fishers have been able to organize to facilitate the transition from co-management to polycentric governance by creating a management committee and a larger, more

inclusive management area. My findings suggest that there are two key conditions which facilitated their ability to initiate this transition: (1) collective preferences for management which have resulted in collective decision-making, and (2) networks with government officials and universities upon which fishers could draw to create the new institution. The important distinction is that fishers collaborated with government officials and universities to create the management committee and that they did not feel threatened by the development of ECMPOs, therefore they did not fear changes in resource access. The management committee has several representatives from each stakeholders group. This moves away from the idea of nested institutions where stakeholders are separate in their institutions but communicate across levels (Ostrom 1990) to a more inclusive, collaborative space where all stakeholders have equal power and representation in governance.

3.5 Conclusion

The legislative structures governing marine resources in the Lakes Region of Chile have shifted power in marine governance, and this study shows that the ability for communities to initiate the transition to polycentric governance was really defined by the interaction between the existing structures and how individuals perceived the legislative structures. Specifically, it was individuals' perceptions that certain legislation failed to support them which spurred their responses and demonstrated their abilities to transform governance. For example, in Ancud, my ethnographic data illustrated that fishers, threatened by the proliferation of aquaculture and failed by a legislative structure which excluded them from decision-making, drew upon their collective preferences for management to create a management committee through the new legislative structure implemented in 2013. The Management Committee in Ancud is a step toward the formation of the institutions and collaboration needed to achieve polycentric governance of marine

socio-ecological systems at the local scale. However, across the Chacao Channel in the community of Carelmapu, fishing unions, bound by the same legislative structures and facing similar threats, were unable to initiate the development of polycentric institutions. I suggest this was largely because fishing unions were not only threatened by aquaculture but perceived that their historical rights to fishing were threatened by the legislative structure that allows the creation of an ECMPO by Indigenous Communities. The development of an ECMPO sparked conflict between fishing unions and Indigenous Communities where fishers' resisted cooperating with the Indigenous communities, thereby inhibiting fishers' self-organization to transform from co-management to polycentric governance.

This study suggests that building upon co-management structures to transform to polycentric governance may be possible at the local scale in communities that have similar visions for the future and preferences for management, such as in Ancud, and in communities who do not feel that their fishing territories are threatened by new ocean uses and changes in governing power. In communities where stakeholders perceive that legislative structures have shifted power in governance, fishers' resistance and non-cooperation with other stakeholders may inhibit a transition to polycentric governance at the local scale, such as in Carelmapu. In particular, this study highlights the need to understand perceptions of legislative structures, human agency within the context of legislative structure, and diversity of stakeholders at the local level to understand how individuals can enact their agency to foster cooperation and transformations in governance. I also observed that conflict at the local scale may be underpinned by a clash of identities and individuals' perceptions of history of what constitutes rights to resources. I did not have the space to treat these observations here, but the fishers' resistance to cooperate with the Indigenous Communities in Carelmapu pointed to a need to understand individual and group identity and its

relationship to worldviews, conflict, and transformations in governance. In addition, further research is needed to understand the cultural and social factors which contribute to resolving conflict, sharing power, and integrating meaningful participation in governance at the local scale to fully realize a shift to polycentric governance in marine socio-ecological systems.

CHAPTER 4

VALUES UNDERLYING POLICY ACTIONS IN A SMALL-SCALE FISHING COMMUNITY IN CHILE[4]

4.1 Abstract

Resource-dependent communities must increasingly adapt to unprecedented biophysical and environmental changes which require individuals and institutions to have the agency and capacity to facilitate the creation of adaptive governance. However, achieving adaptive governance may be difficult because individuals' perceptions of desirable ways of life vary, and these perceptions influence the decisions they make with regards their preferences and actions related to policy. Scholarship has demonstrated that these different preferences and actions may lead to conflict between individuals or groups as these factors are often influenced by how resource users' subjectively and differentially value their experiences, their work, and their connections to their communities and environment. This paper examines values underlying how individuals and institutions frame their interpretations of, and actions related to, policy in adaptive governance in the coastal community of Carelmapu in southern Chile. In 2016, a harmful algal bloom resulted in fishing closures which exacerbated underlying tensions between institutions in the region who have incongruent visions for the oceanscape. It soon emerged that the Lafkenche Indigenous Community and small-scale fishing unions diverged on their interpretations of policy and their preferences for policy action. Drawing upon participant observation, semi-structured interviews, and quantitative surveys, we sought to understand the conflict by studying the values of individuals and institutions which underpinned their frames related to policy action to illustrate why individuals enacted or resisted transformation in governance. Examining this conflict at the

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individual and institutional levels demonstrated that two groups in the community had different value frames rooted in divergent ontologies as well as varying interpretations of, and interactions with, political structure. The knowledge that this conflict may in part be underpinned by conflicting ontologies and interpretations and interactions with political structure illuminates the challenges in facilitating the transformation of governance at the local scale. Although these different ontologies likely exacerbated the conflict between the two groups, we found that this conflict existed in large part because of interpretations and actions related to a new policy, implemented in 2008, which shifted power in environmental governance away from fishing unions to the Indigenous Community. It is their interpretations and actions related to this policy, compounded by the abrupt environmental change, which is at the heart of this conflict in adaptation. This local conflict illuminates how discussions of adaptation undertheorize the importance of diverse ontologies and tensions between individuals and institutions as contributors to successful adaptation or conflict at the local scale.

4.2 Introduction

Theories of adaptive governance of socio-ecological systems suggest that in order for resource-dependent communities to adapt to unprecedented biophysical and environmental change, communities must have both the agency and the capacity to transform resource governance and their cultural, social, and economic well-being, instead of just coping (Fabricius et al. 2007; Walker et al. 2004). However, achieving adaptive governance—where individuals form the structures and processes they need to make decisions and share power to provide a direction and vision for sustainable management (Boyle et al. 2001)—can be difficult for individuals and groups to navigate. Many resource users have few other options for economic income, and their cultures, identities, and social lives are inextricably tied to their work (Marschke

and Berkes 2006; Urquhart and Acott 2013). Furthermore, individuals' perceptions of desirable ways of life vary (Coulthard 2008). These perceptions influence the decisions they make with regards to short-term and long-term adaptation (McGregor et al. 2009) as well as underpin their interpretations and actions related to policy (Schon and Rein 1994). Resource users often have different interpretations of policy as well as preferences for adaptation, which may lead to divergent policy actions and conflict between individuals or groups (Adger et al. 2013; Coulthard 2011; O'Brien and Wolf 2010; Pakizeh et al. 2007; Somorin et al. 2012; Wise et al. 2014). These interpretations, preferences, and actions are often influenced by how resource users' subjectively and differentially value their experiences, their understandings and actions related to policy, and their connections to their communities and environment (O'Brien and Wolf 2010). Such values can be conceptualized as frames, defined as:

> "the broadly shared beliefs, values, and perspectives familiar to the members of a societal culture and likely to endure in that culture over long periods of time, on which individuals and institutions draw upon in order to give meaning, sense, and normative direction to their thinking and action in policy matters" (Schon and Rein 1994: xiii).

To better understand governance policies framed around adaptation in resource-dependent communities, this paper explores how underlying values contribute to institutional interpretations and actions which may underpin local conflict, in Carelmapu, a community in the Lakes Region of southern Chile. In 2016, an environmental crisis, a harmful algal bloom, left the community without its main source of livelihood: fishing. With marine harvesting closed for six months and few other job opportunities available, individuals and groups in the community were forced to think about how to transform environmental governance.

Analysis of ethnographic data conducted in Carelmapu in 2018 demonstrated that, despite a shared dependence on the sea, two local institutions, the Lafkenche Indigenous Community and the local fishing unions, had different preferences for pursing adaptive governance to address environmental change. The Lafkenche Indigenous Community wanted to form a protected area to conserve the marine resources on which residents of Carelmapu depend. They were able to propose a protected area through the Lafkenche Law, a state law implemented in 2008 which grants ancestral rights to the sea to Indigenous Communities. The Indigenous Community in Carelmapu saw the protected area as a means to maintain their cultural traditions and to revitalize and diversify economic opportunities through the creation of a tourist economy. In contrast, the fishing unions wanted to continue management of marine resources in its current state, and potentially work to change legislation to harvest new species. Fishing unions did not want the protected area because they were concerned that their access to resource harvesting in open-access areas would change if those areas were encompassed by the protected area. The difference in these preferences for policy action, in large part caused by interpretations and actions related to the Lafkenche Law, triggered conflict in Carelmapu which resulted in the fishing unions refusing to cooperate with the Indigenous Community to move forward with a plan.

This paper employs a values-based approach to contribute insights to the understanding of adaptation and stakeholder policy frames at the local scale by quantitatively measuring individual and group values underlying policy actions and conflict in the community of Carelmapu. Human values, defined as 'desirable trans-situational goals, varying in importance, that serve as guiding principles in the life of a person or other social entity' (Schwartz 1994: 21), refer to an individual's or group's desires, preferences, objectives, and needs (O'Brien 2009; O'Brien and Wolf 2010; Rokeach 1979; 2008; Schwartz 1992; 1994). Some attention has been given to examining how

individuals' or groups' values influence their preferences for adaptation and actions related to policy (O'Brien and Wolf 2010; Somorin et al. 2012), specifically in large policy programs such as REDD+ (Somorin et al. 2012). However, there is an increasing need to substantiate and further understandings of how human values, which motivate human behavior and decision-making and give purpose and meaning to individuals' lives (Gecas 2008; Schwartz 1992; 1994), influence individual and institutional actions in adaptive governance and policy matters (Somorin et al. 2012).

Informed by our ethnographic data, we hypothesized that the conflict between the two groups in Carelmapu was driven by divergent values which underpinned individual and institutional frames related to policy interpretations and actions. To test this hypothesis, we adapted Schwartz et al. (2012)'s framework of universal human values to construct a structured survey to conduct a multi-level analysis of individual and group values. A values-based approach can elicit diverse conceptualizations of what is desirable, whose values are prioritized, and why there may be conflict between groups (O'Brien and Wolf 2010). It can also contribute to understandings of individual and institutional frames which can elicit knowledge of how individuals organize their experiences and produce action in policy (Schon and Rein 1994).

4.2.1 Preferences, interpretations and actions related to adaptive governance and their association to universal values

Certain values have been shown to be shared by humans across culturally, socially, economically and geographically diverse groups (Schwartz 1992; Pakizeh et al. 2007; Schwartz et al. 2012). Yet, other values may differ in their relative importance to the individual or group (Pakizeh et al. 2007; Schwartz et al. 2012). The variation in importance of values to individuals and groups is what contributes to different motivations and behaviors (Schwartz 1992), and

preferences and needs for adaptation (Havercamp 2017; O'Brien and Wolf 2010). In a cross-cultural study of human values in 44 countries, Schwartz (1992) identified ten universal human values that are in structural relationship to one another, some of which are compatible and others which stand in opposition to each other. For example, in the context of adaptation, individuals who exhibit values of "self-direction" or "universalism" may focus their efforts on social or environmental justice to foster equitable processes, while others who exhibit values of "achievement" or "power" may prioritize their own goals, which may lead to conflict (Havercamp 2017; Schwartz et al. 1992). Schwartz furthered his theory on universal human values by adding nine more values in Schwartz et al. (2012) (Table 1) to create "a finer set of meaningful, conceptually distinct values which may have universal, stronger heuristic and predictive power (Schwartz et al. 2011: 664). Other studies have used this theory and qualitative measures. For example, Havercamp (2017) investigated motivational factors in climate change adaptation decision-making in Hampton Roads, VA, USA while Wolf et al. (2013) examined the ways in which individuals' values were connected to their views on adaptation to demonstrate how values shape individuals' interpretations of climate change impacts in Labrador. With regards to policy action, how individuals and institutions organize their experiences and produce a bias for action may be related to their value system (Somorin et al. 2012).

This paper uses eleven of Schwartz et al. (2012)'s nineteen universal values to examine groups' and individuals' values which may underlie their policy frames related to adaptive governance. Like Havercamp (2017) and Wolf et al. (2013), values used in this study were identified through ethnographic interviews and participant observation. The remaining nine values from Schwartz et al. (2012) were not used in this study because they did not emerge in our analysis of the ethnographic data. Following a multi-phased research design (Johnson 1998), this study

integrates the values we identified into a structured survey to quantitatively measure the presence of the values in the community of Carelmapu. Here, our intention is not to test Schwartz et al. (2012)'s theory, but to bridge a mixed methods values-based approach with literature on adaptation and environmental policy. We draw on the ethnographic research in our interpretation of how divergent values among the different groups underpin the refusal of one group to cooperate with the other in the implementation of a new MPA.

4.3 Ethnographic setting: Environmental change, adaptation, and conflict in Carelmapu

Carelmapu is situated on a peninsula boarded by the Pacific Ocean over an hour from the urban center of Puerto Montt in the Lakes Region of southern Chile (Figure 1). The Lakes Region is the country's most fishery-dependent region (Moreno and Revenga 2014), and Carelmapu, home to around 2,500 residents, is one of the region's most fishery-dependent communities. For a small community, residents of Carelmapu are ethnically diverse—many individuals are members of the geographically expansive Mapuche Indigenous group. Spanning south-central and southern Chile, the Mapuche consist of several ethnicities but share a common socio-economic structure and language. Persecuted through much of Chile's colonial history and more recent dictatorship under Pinochet in the 1970s and 1980s, the Mapuche were allowed to legally form Indigenous institutions, called Indigenous Communities, in the 1990s. In addition to the Mapuche, non-Indigenous individuals moved to Carelmapu to pursue work in the fishing industry.

Carelmapu was once an active port during the 1960s through the 1990s, but demographics began to change again in Carelmapu in the 2000's as the proliferation of aquaculture in the region provided a better economic opportunity, drawing young people away from Carelmapu (Ebel 2018). The aquaculture industry in the Lakes Region, which started in the 1980s, is vast and continues to grow, employing well over 50,000 individuals in the region (United Nations 2006). Yet, the

expansion in aquaculture is not without environmental consequences or social conflict (Daughters 2018). Pollution from salmon farms' feed, antibiotics, and salmon feces wreaks havoc on the local ecosystem, causing anoxic areas and contributing to the formation of harmful algal blooms, which in turn close commercial fisheries to harvesting due to the toxicity of harvestable species (Daughters 2018). Furthermore, the encroachment of aquaculture on commercial fishing areas—combined with a legislative structure which excludes resource users from decision-making—threatens marine resource users' livelihoods. This combination does so by limiting the areas from which they can harvest, forcing them to turn to other livelihood strategies or leave their communities (Ebel 2018). Residents of Carelmapu are acutely affected by environmental and economic change associated with the ocean. They are increasingly caught between local and global forces, such as climate change, the proliferation of aquaculture, and changes in economic markets, which affect their access to marine resources and subsequently, their livelihoods.

In 2016 an environmental crisis occurred at a magnitude the region had never seen. The perfect storm of climate anomalies and pollution from aquaculture farms triggered an extensive harmful algal bloom which caused widespread marine species mortalities and the closure of all wild-caught fisheries and aquaculture exports off the coast of the Lakes Region (Buschmann et al. 2016). Some observers suggest this event paralyzed the region's economy (Daughters 2018). The 2016 crisis displaced resource users' livelihoods in the region for half a year, and they were left to depend on subsistence agriculture and peddling of vegetables and firewood (Ebel 2018). As harmful algal blooms are predicted to occur with increased frequency (Buschmann et al. 2016), the 2016 crisis prompted community-based groups in Carelmapu to think about adaptive governance to address future environmental changes. For example, the harmful algal bloom accelerated the Indigenous Community's process of proposing an ECMPO to the state.

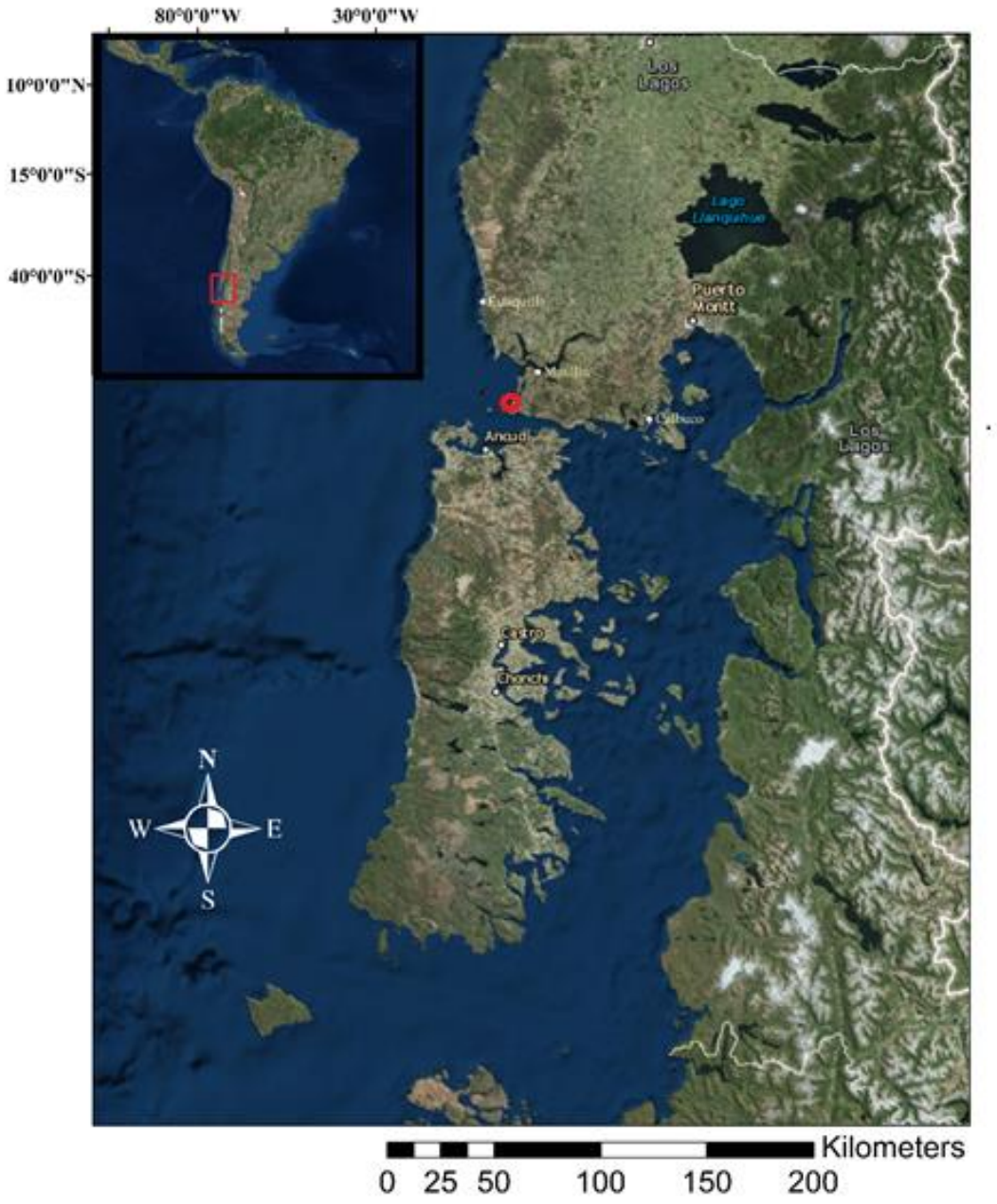

Figure 4.1. Chile's coastal Lakes Region. The community of Carelmapu is encircled in red.

4.4 Methods

This study was conducted in two phases: an exploratory phase and an explanatory phase (Johnson 1998). The exploratory phase was inductive where the first author gathered ethnographic

data through six months of participant observation from January through June 2018 and conducted semi-structured interviews (n=15) in Carelmapu, of which 11.5 hours are recorded and transcribed. The town of Carelmapu has five fishing unions with a total of 500 members and six Indigenous Communities with a total of 250 individuals including children. Another 500 individuals are independent divers or *recolectores*, women who harvest products along the shore. These populations are not mutually exclusive. Many members of the Indigenous Community are also members of fishing unions, and some independent divers and *recolectores* are also members of the Indigenous Community. Semi-structured interview data and participant observation demonstrated that a conflict in Carelmapu existed over the two groups' preferences for policy action related to adaptive governance. It was this ethnographic data that helped us formulate our hypotheses and the construction of a structured survey. To review, we hypothesized that the conflict was driven by divergent values which underpinned individual and institutional frames related to policy interpretations and actions. Specifically, it was the Lafkenche Law, implemented in 2008, in combination with the harmful algal bloom, which brought to the surface individuals' and groups' desires for different policy actions.

During phase two, we developed and administered a structured survey (n=44) which measured individuals' levels of agreement with statements associated with universal human values. Prior to the construction of the survey, we looked in the literature to see how values have been measured and found Schwartz et al. (2012)'s universal human values framework. We adapted their framework to fit our ethnographic context. We then constructed the survey using eleven of nineteen of Schwartz et al. (2012)'s universal human values which were found during the analysis of the ethnographic semi-structured interviews. We administered the survey during April and May 2018. Participants were recruited randomly on fishing docks, before fishing union meetings, and

before and after Indigenous Community meetings. The first author approached each individual and asked their willingness to take a survey. 68 out of 70 individuals (97%) asked participated in the survey. Structured surveys were read to each participant to account for issues of literacy and took around twenty minutes to complete. Of 44 individuals surveyed, 41 were economically dependent on marine resource harvesting, 36 belonged to fishing unions, 9 were members of the Indigenous Community, and 12 self-identified as indigenous. Five individuals did not belong to either group, and 6 individuals belonged to both the Indigenous Community and a fishing union.

The 11 values identified in semi-structured interviews were measured in the structured survey using a 5-point Likert Scale. In the survey, each value had corresponding statements (see Table 1) to which the individual had to answer, "strongly agree," "agree," "I don't know," "disagree," or "strongly disagree." Survey data was entered into Excel and coded on the 5-point scale: 1 for "strongly disagree" through 5 for "strongly agree." Statistical analysis was conducted at the individual and group level. The individual level was analyzed between "self-identified indigenous individuals" and "non-indigenous individuals." The group level was analyzed between groups labeled "fishing unions" and the "Indigenous Community."

A Kruskal–Wallis analysis was used to test for significant ($\alpha = 0.01$) variation in Likert-ranked responses to each individual statement associated with Schwartz et al. (2012) values between each level of analysis: individuals and groups (Mircioiu & Atkinson 2017). This method is a non-parametric alternative to a one-way ANOVA that is better suited to ordinal data, and was carried out using R software version 3.3.2 (R Core Team Development 2016). Critical level of significance was adjusted from $\alpha = 0.05$ to $\alpha = 0.01$ to account for multiple testing (Schwartz et al. 2012).

Differences in the compositions of Likert-ranked responses associated with Schwartz et al. (2012)'s universal human values were analyzed at the individual and group levels with a multivariate approach using the multidimensional scaling (MDS) and adonis procedures. For these analyses, the vegan package within R software version 3.3.2 was used (Oksanen et al. 2008, R Core Team Development 2016). Similarity matrices of Likert-ranked response data were constructed for each surveyed individual using the Euclidian distance measure (Schwartz et al. 2012). MDS based on similarity matrices was used to generate 2D pots depicting similarity in the structure of Likert ranked responses between groupings at the individual and group levels. Spider diagrams were overlaid upon 2D NMDS plots to show group centroids and spread.

To further explore the divergent responses underlying the conflict between two groups in the community, survey responses from the five initial groups (non-Indigenous fishing union members, non-Indigenous independent divers, Indigenous Community members, and independent Indigenous divers) were then divided into three groups: non-Indigenous individuals in fishing unions, non-Indigenous individuals independent of fishing unions, and the Indigenous Community. Indigenous fishing union members are included in the grouping of the Indigenous Community because we interviewed no Indigenous individuals who were not members of the Indigenous Community. We removed one group, the independent Indigenous individuals in fishing unions, because of the small sample size (n=1). The groups we left in the analysis were visible within the ethnographic data. To show similarity between the three groups, 3D MDS was used. Ellipsoids encompassing 50% similarity of each grouping were added to capture the central tendency and variability in Likert-ranked responses to questions and better highlight group differences. Significant ($\alpha = 0.05$) variation in Likert-ranked responses between non-indigenous individuals in fishing unions, non-indigenous individuals independent of fishing unions, and the

Indigenous Community was tested using the adonis function in the vegan package (Oksanen et al. 2008). This function performs a permutational multiple analysis of variance (PERMANOVA) using similarity matrices based on the Euclidian distance measure to assign variation in Likert ranked responses among groupings. The number of permutations used in these analyses was 999. Pairwise comparisons were then used to test the where significant variation occurred between each of the three groupings. For all pairwise comparisons, critical level of significance was adjusted from $\alpha = 0.05$ to $\alpha = 0.01$ to account for multiple testing.

4.5 Results

This section reports on the results from the ethnographic data and quantitative analysis of values to compare the differences between the two institutions to support our hypothesis that divergent values exist. The ethnographic data demonstrated that there was a conflict which existed between the Indigenous Community and the fishing unions in Carelmapu. The two groups had tried to work together to formulate an adaptation plan in November of 2017, but they disagreed on the ways to transform the governance of marine resources from co-management to a more collaborative, adaptive governance structure. The Indigenous Community wanted to use their ancestral rights to sea, granted to them by the state's Lafkenche Law, to form a protected area, but the members of fishing unions pushed back, saying that the protected area would exclude non-Indigenous divers from their traditional harvesting in open-access areas and would require divers to request permission from the Indigenous Community.

4.5.1 The Indigenous Community's history and preferences for adaptive governance

The Lafkenche Indigenous Community (referred to by members as *the Indigenous Community)* is an institution recognized by the state of Chile. The Indigenous Community in

Carelmapu was formed in 1996 and is currently made up of six smaller groups, each with their own leaders and legal aides. Smaller groups are formed under the larger institution because smaller groups allow the community to reach decisions more easily. Smaller groups also allow members to receive more state funding, including university scholarships for their children.

In 2008, "La Ley Lafkenche" (The Lafkenche Law or the "People of the Sea" Law) allowed for Indigenous communities to submit requests to the state to create Marine Coastal Spaces of the Original Peoples (ECMPOs), which would give rights to Indigenous peoples to access designated marine areas based on their ancestral customary use. Aware of this law, the Indigenous Community in Carelmapu began meeting after the 2016 crisis to envision adaptation and begin the process of submitting a request to the state to create an ECMPO called the "Borde Costero" (Coastal Border), a protected area that would include part of the shoreline and extend out to 12km from the peninsula into the sea. The Indigenous Community was severely affected by the harmful algal bloom in 2016—many members of their community were out of work and they were unable to continue their traditional subsistence practices. They believed that a protected area would prevent further industry from entering the coastal zone and contaminating the marine ecosystem. Furthermore, it would help the community diversify their economic opportunities through tourism.

The Lafkenche Law which allows for the development of ECMPOS allows Indigenous Communities to invite other stakeholders to form local institutions to manage the ECMPOs. The Indigenous Community interpreted this to suggest that they could work with non-Indigenous fishers to develop management protocols for the protected area. During the initial planning process of the ECMPO, the Indigenous Community invited the fishing unions to work with them to development a management committee which would work together to govern the ECMPO. Despite the invitation, fishers refused to work with the Indigenous Community during the planning because

they interpreted the Lafkenche Law to state that fishers could no longer commercially harvest within the ECMPO. This interpretation was only partly correct—fishers would not be able to harvest in open-access areas, but they would be able to create new harvesting areas with permission from the Indigenous Community or the management committee.

4.5.2 The fishing unions' history and preferences for adaptive governance

In the Lakes Region, approximately 24,000 resource users are members of community-based fishing unions, formed under Chile's fisheries and aquaculture law, *La Ley de Pesca y Acuicultura* (INE 2008). The specific policy under the law, known internationally as the Territorial Use Rights in Fisheries (TURFs) policy, passed in 1991 and amended in 2013, aimed at alleviating poverty and restoring fisheries by incentivizing resource users to form local unions to have access rights to specific exploitation areas (Jarvis and Wilen 2016). Union members harvest many species, including the economically and culturally important *loco* (abalone *Concholepas conchoelpas*), sea urchin, crab, barnacles, and octopus, by diving in management areas which are co-managed by the unions and the state (Castilla and Gelcich 2008). There are five fishing unions in Carelmapu, totaling just under 500 men. In total in Carelmapu, there are 1200 individuals who make their living from the sea, including divers in fishing unions, independent divers, and women who harvest resources along the shore. Divers also harvest in open-access areas, areas which are not designated to any union. Many divers depend on harvesting resources in these open-access areas throughout other parts of the year when they are not fishing for *loco* in TURFs from May through July.

Resource users experienced hardship in 2016 because they depended upon benthic species, many of which become toxic for human consumption during harmful algal blooms. Many divers had no fishery landings for almost half a year. This hardship reverberated throughout the community of Carelmapu, affecting seafood processors and shop owners (Ebel 2018). The unions

recognized that the coastal zone was vulnerable to the impacts of environmental change and industry but had few preferences for adaptive governance that went beyond maintaining the status quo of current marine resource management, opening other species to harvesting, and asking for subsidies from the government in the case of another crisis. Fishers did not want the development of the ECMPO, stating that it threatened their historical fishing rights.

4.5.3 Survey of individual and group values underlying preferences for adaptive governance

As stated, we used the ethnographic data from phase 1 to construct a survey to measure individuals' responses to statements associated with eleven of Schwartz et al. (2012)'s values to illuminate how values may influence preferences for adaptive governance. The survey indicated that nine out of eleven values were shared between the Indigenous Community, the fishing unions, self-identified indigenous individuals, and non-indigenous individuals (Figures 2 and 3). However, responses to the Likert-ranked statements, *I think that change in the ecosystem is an opportunity to do something different* and *Humans have control of the environment*, associated with the two values "stimulation" and "tradition" respectively, were significantly different between indigenous and non-indigenous individuals ("stimulation": $p = 0.004$; "tradition": $p=0.001$; Figure 2) as well as between the Indigenous Community and fishing unions ("stimulation": $p = 0.001$; "tradition": $p=0.002$; Figure 3).

MDS ordination of Likert-ranked responses shows dissimilarity in the overall composition of values per individual between self-identified indigenous and non-indigenous groupings as well as between the Indigenous Community and fishing unions (Figure 4). 3D MDS ordination of Likert-ranked responses also shows dissimilarity in the overall composition of values per individual in three groupings: The Indigenous Community, non-indigenous individuals independent of fishing unions, and non-indigenous individuals in fishing unions (Figure 5).

PERMANOVA shows that individual level (indigenous individuals vs. non-indigenous individuals) significantly explained 9.74% ($F = 4.53$; $R^2 = .097$; $p = 0.01$) of variation in Likert-ranked responses of individuals belonging to each group type (Indigenous Community vs. fishing unions) significantly explained 10.61% ($F = 4.98$; $R^2 = 0.11$; $p < 0.001$) of the variation in Likert-ranked responses of individuals belonging to each group. Additionally, when Likert-ranked responses between three groups: The Indigenous Community, non-indigenous individuals independent of fishing unions, and non-indigenous individuals in fishing unions, were compared together, PERMANOVA shows that grouping factor significantly explained 14.07% ($F = 2.86$; $R^2 = 0.14$; $p < 0.01$) of total variation. Pairwise comparisons show a significant difference in the composition of Likert-ranked responses between the Indigenous Community and non-indigenous individuals in fishing unions ($F = 4.47$, $R^2 = 0.12$, $p = 0.001$) and between the Indigenous Community and non-indigenous individuals independent of fishing unions ($F = 4.67$, $R^2 = 0.34$, $p = 0.001$). A statistically similar composition of Likert-ranked responses was found between non-indigenous individuals who are members of Fishing Unions and non-indigenous individuals who are not members of the study groups ($F = 0.85$, $R^2 = 0.03$, $p = 0.548$).

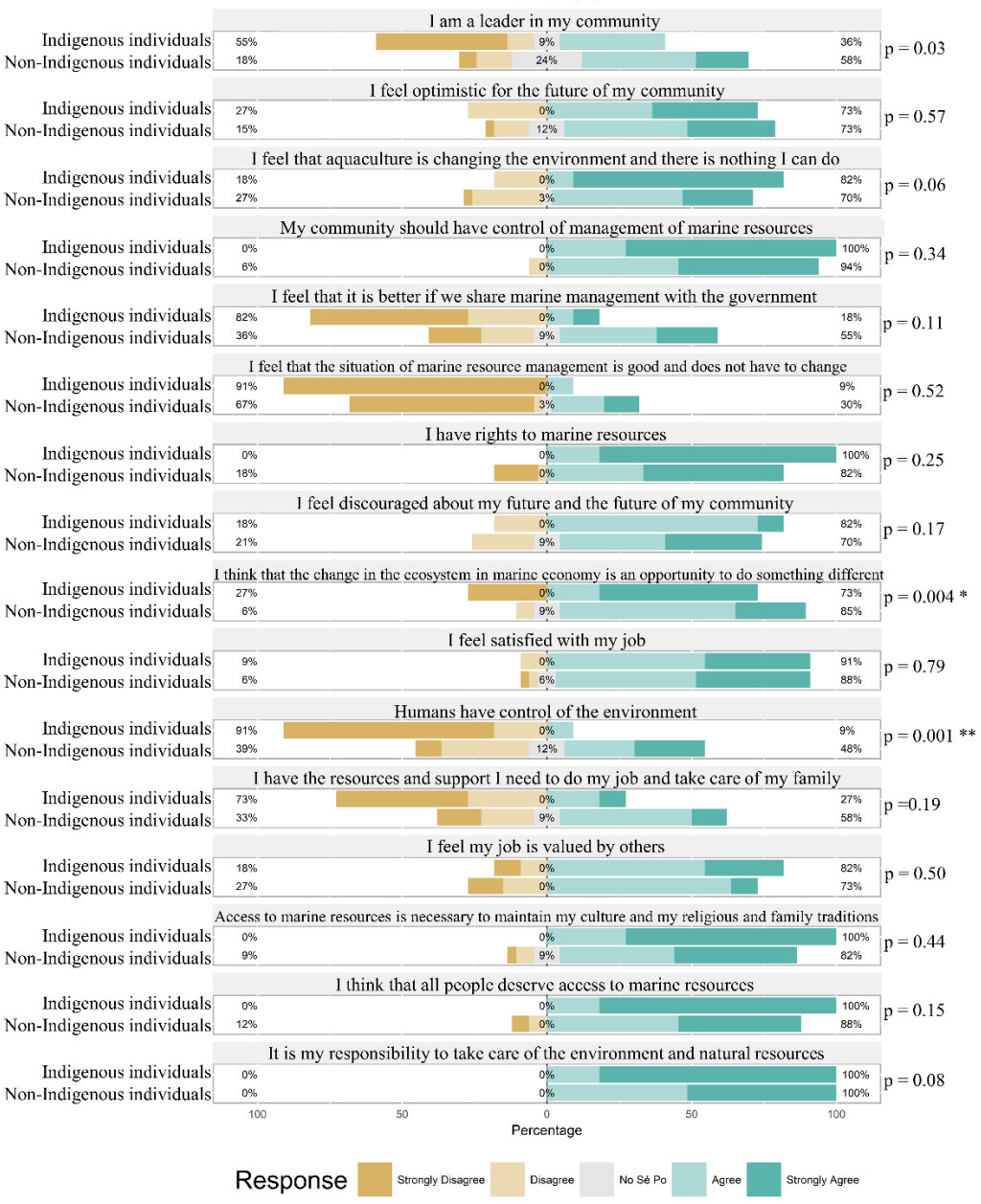

Figure 4.2. Likert ranked responses of self-identified Indigenous individuals and non-Indigenous individuals to statements associated with Schwartz et al. (2012) values. Significant differences in Likert ranked responses between indigenous individuals and non-indigenous individuals, identified by Kruskal–Wallis analysis, are denoted as follows: *p < 0.01, **p < 0.005, ***p < 0.001

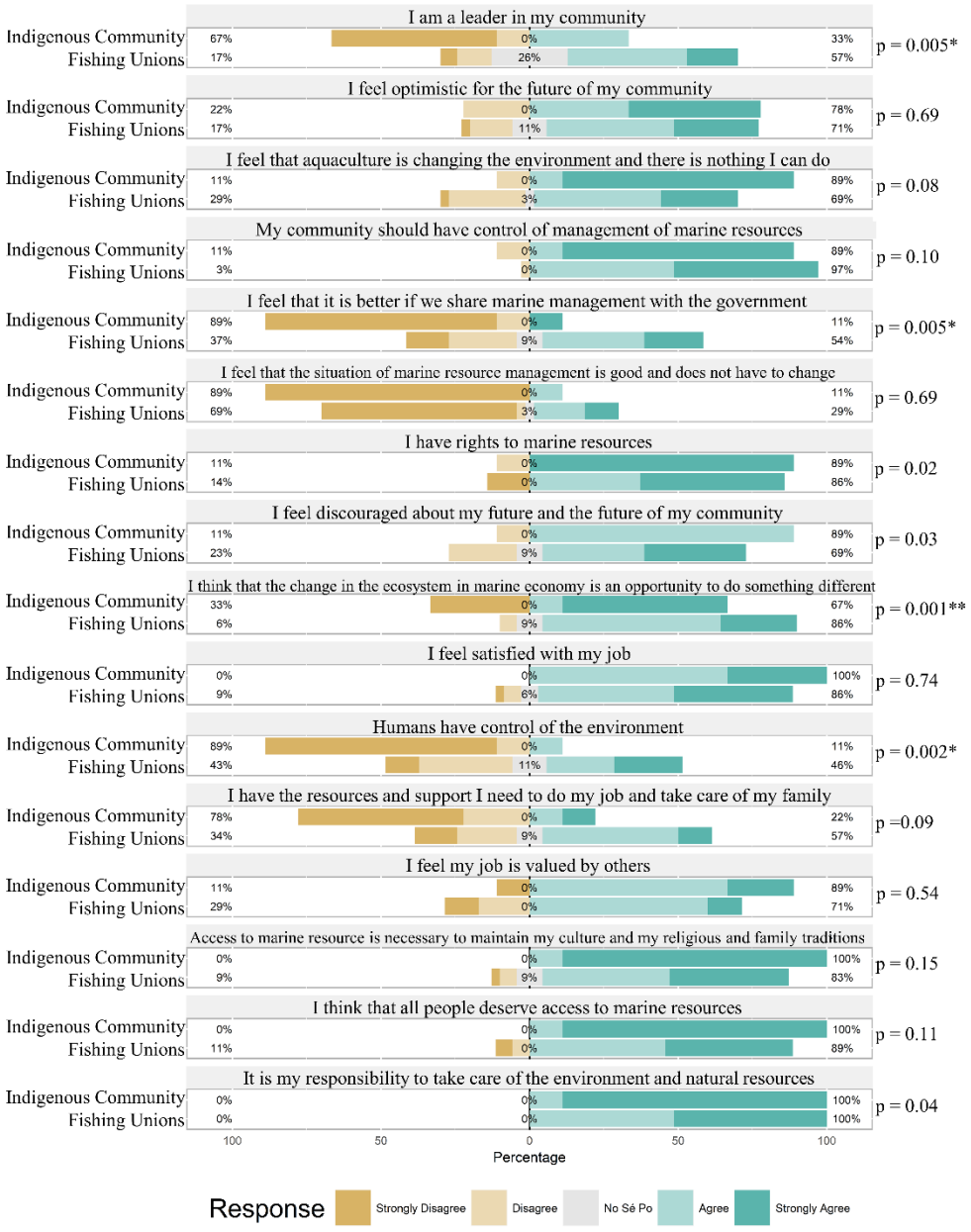

Figure 4.3. Likert ranked responses of the Indigenous Community and the fishing unions to statements associated with Schwartz et al. (2012) values. Significant differences in Likert ranked responses between the Indigenous Community and the fishing unions, identified by Kruskal–Wallis analysis, are denoted as follows: *$p < 0.01$, **$p < 0.005$, ***$p < 0.001$

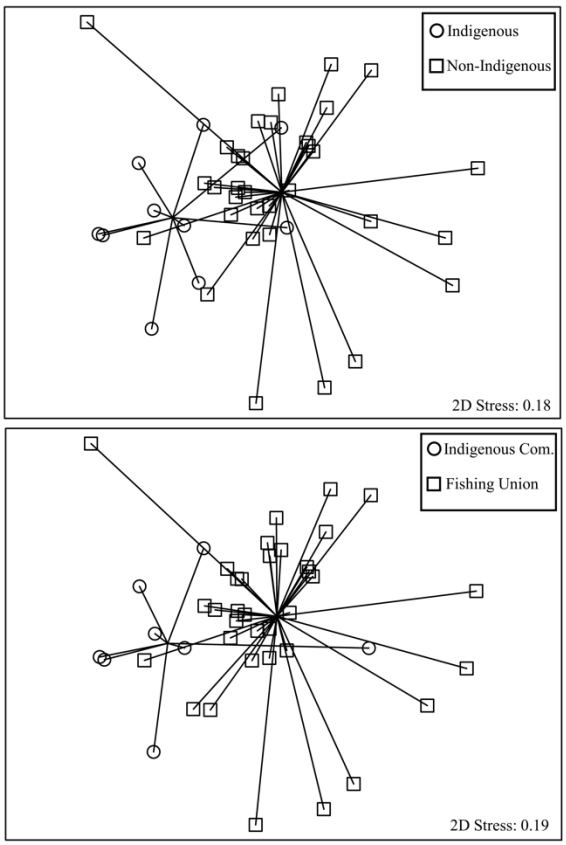

Figure 4.4. Multidimensional scaling (MDS) ordination of Euclidian distance similarities from Likert ranked responses of all statements associated with Schwartz et al. (2012) values. The top plot shows similarity in the compositions of Likert ranked responses of indigenous individuals and non-indigenous individuals and the bottom plot shows individuals who are members the Indigenous Community and fishing unions. Spider plots are overlaid to highlight group centroids and variability. For these analyses the vegan package within R software version 3.3.2 was used.

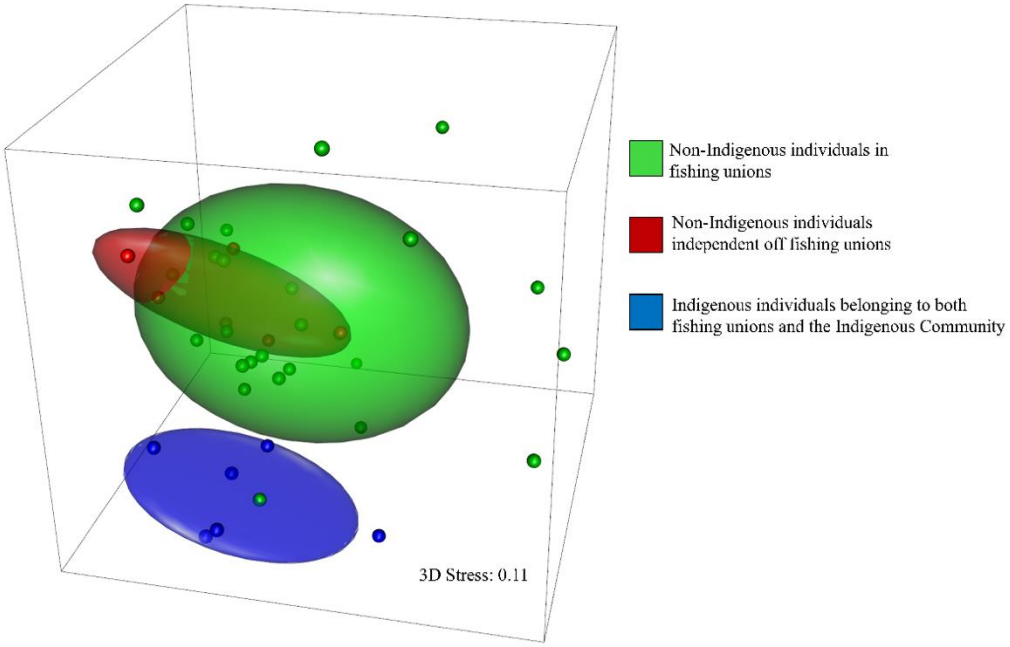

Figure 4.5. 3D Multidimensional scaling (MDS) ordination of Euclidian distance similarities from Likert ranked responses of all statements associated with Schwartz et al. (2012) values. Ellipsoid clusters are delineated at the 50 % level of similarity for non-indigenous individuals in fishing unions, non-Indigenous individuals independent of fishing unions, and all Indigenous individuals belonging both to the Indigenous Community and fishing unions. For these analyses the vegan and rgl packages within R software version 3.3.2 was used.

4.6 Discussion

Based on our ethnographic research conducted in Carelmapu, we hypothesized that the conflict between the Indigenous Community and fishing unions was rooted in different values which underpinned divergent frames relating to policy interpretations and actions in adaptive governance. We found this to be accurate in part—the two institutions had both divergent and shared values which contributed to their interpretations and actions related to policy. High sharing occurred in values of tradition, personal and societal security, and achievement. On the other hand, two of the values measured were not shared: stimulation and power over resources. We suggest that the shared value of "tradition" and the divergent value "power over resources" are the two critical

values underlying individual and institutional frames which underpinned their desirable policy actions and the current disagreement among the two groups about how to move forward with models of adaptive governance within the socio-ecological system.

The divergent values of "power over resources" suggests two different frames related to policy interpretation and action. In other words, the fishing unions and independent divers were more focused on marine resource extraction which resulted in their preferences for either maintaining or changing harvest controls on marine species, while the Indigenous Community and self-identified Indigenous individuals were more focused on conservation. In the following sections, we lay out our interpretation of our results: first we outline the limitations in our data, then we discuss the shared value of "tradition," and lastly, we follow with a discussion of how the critical value of "power over resources" fostered the divergence in policy interpretation and action, underpinning conflict. We propose that the conservation-focused frame, combined with policy which supports these values, influenced the Indigenous Community's preference for a protected area as a form of governance, while the fishing union's resource-focused frame fostered their preferences for changes to fisheries management and reliance on current marine resource governance. Our ethnographic observations suggest that these different values and subsequent frames are rooted in distinct sociopolitical histories and relationships with the environment.

4.6.1 Limitations in data

While 9 out 11 values were shared between members of all groups, PERMANOVA offers a unique perspective through observing similarity in the overall assemblage of Likert ranked responses among groups. In each comparison of the assemblage of questions between groups, group type explained only ~10% of the variation in Likert-ranked responses. However, the MDS plots reveal distinct assemblages of Likert-ranked responses between each group, driven largely

by differences in responses to two values, “power over resources” and “stimulation.” The MDS plots also show a large variation within groups which we attribute to differences in individuals’ sex, age, place of birth, etc. which effectively masks the variation attributable to each group. However, our relatively small sample size precluded our ability to test these factors individually.

Despite our small sample size, we feel that the individuals surveyed accurately represent the make-up of the groups. In addition, our ethnographic data also suggests that our sample size of individuals (n=44) accurately represents the groups (n=2). We attribute some of the shared values to similarities in geographical, social, and economic contexts in which individuals and groups are embedded. However, although values may be shared by the two distinct groupings, our ethnographic data suggests that the shared values may arise from distinct sociopolitical histories and relationships with the environment, which we describe below. Furthermore, we put forward that it is the shared value of “tradition”, regarding the importance marine resources to family and religious traditions, along with the divergent value of “power over resources,” which fostered the difference in policy frames, leading to the conflict in preferences for adaptive governance.

4.6.2 Shared values: The salience of “tradition”

Individuals and groups shared 9 of the 11 values measured in the survey, with strong sharing occurring between statements that measured values related to family and religious “tradition.” It is important to note that shared and differing values indicate the value’s relative importance to the group (Schwartz 1992). For example, in the case of Carelmapu, the strongly shared value of “tradition” suggests that each group feels that access to marine resources is necessary to their cultural, family, and religion traditions. The shared value does not indicate that they have the same traditions. This is significant because the differences in their traditions

combined with how the groups highly value "tradition" is what underpins interpretations and actions related to policy in adaptive governance.

Individuals in Carelmapu have social and cultural ties to resource harvesting and the sea, portrayed by our ethnographic data as well as by the strong sharing of the values of "tradition" between the groupings. Social and cultural ties to the sea are common in many resource-dependent communities where individuals rely on the ocean for many of their family and religious traditions (Pitchon 2015). 100% of self-identified Indigenous individuals and 82% non-Indigenous individuals agreed or strongly agreed that access to marine resources was necessary to maintaining their cultural, family, and/or religious traditions (Figure 2).

4.6.3 Traditional fishing practices and ancestral roots to the sea: The Indigenous Community and Indigenous peoples in Carelmapu

The Indigenous Community and Indigenous individuals in Carelmapu are part of the Lafkenche people, or "People of the Sea," a group which belongs to the larger population of the Mapuche Indigenous people. In our semi-structured interviews, Indigenous individuals said that subsistence on marine resources was essential to maintaining their cultural traditions and social connections. Interviews with Indigenous individuals highlighted that the Lafkenche people have subsisted on marine resources and practiced traditional fishing practices in the region for hundreds of years. This was corroborated by Daughters (2018) who wrote that the Lafkenche people have harvested fish from the sea using rock and mud-and-stick weirs, cultivated and harvested seaweed along the shore, and gathered shellfish through wading along the shore and diving since the fifteenth century. They also had an economy based on reciprocity and bartering of marine resources until the 1960s when commercialization and the market economy came to the region

(Daughters 2018). Indigenous people still use many of these techniques including harvesting seaweed from the shore and intertidal zone.

In the 1973, a coup overthrew Salvador Allende's government and forcibly placed Chile under the regime of Augusto Pinochet (Holton 2004). Under Pinochet's dictatorship, the Mapuche people were heavily persecuted. They were no longer allowed to speak their language or speak openly about being indigenous. In March of 1979, the Junta Decree Law No. 2568 was passed which stated that Mapuche inhabitants in Chile "ceased to be Indigenous, as did their lands" (Holton 2004: 103). Mapuche history was erased from official history textbooks "under the doctrine of national security" and the state expanded their jurisdiction over Mapuche lands (Holton 2004: 103). Consequently, Indigenous people were not taught about Indigenous culture in schools or at home. In an interview, one woman elder in the Indigenous Community in Carelmapu said,

> "We never saw benefits from being Indigenous, not like ones you would most expect. We would expect to learn from our elders' roots, but we practically didn't know anything, we didn't know what an Indigenous community was, what the people did before, because our grandparents never taught us because the Indigenous were so discriminated against, we were very discriminated against."

Despite the persecution of the Mapuche, the Indigenous people maintained a strong connection to the land and sea (Daughters 2018; Kowalczyk 2013). The woman elder we interviewed spoke of harvesting seaweed and mussels along the shoreline, netting fish, and gathering chamomile, mint, and wheat from their gardens. She said that in the 1990s, the Mapuche people started "raising their voice, saying that we [the indigenous people] were citizens like any other, with rights and duties." Environmental protection and indigenous movements to reclaim

land and natural resources were pervasive throughout Latin America in the 1990s (Kowalczyk 2013; Tomaselli 2012; Van Cott 2005). In the case of the Mapuche, they demanded autonomy, distancing themselves from the Chilean government (Kowalczyk 2013). The Lafkenche Indigenous Community in Carelmapu did this through the creation of six smaller Indigenous Communities in 1996 and claimed ancestral rights to the sea through the Lafkenche Law in 2008. Exercising these rights allowed the Indigenous Communities to continue many of their traditional harvesting practices and to develop a plan for a protected area as a means to govern the socio-ecological system in the face of future environmental change.

In another interview, an Indigenous leader from Carelmapu said that the environmental crisis in 2016 alerted the Indigenous Community to the reality of the threats posed by industry on the ecosystem and on their traditional livelihoods, mobilizing community leaders to begin the process to create the protected area through the Lafkenche Law. In their opinion, protection of the marine ecosystem from industry was essential.

Our findings suggest that the value of "tradition" is linked to three underlying reasons that foster the Indigenous Community's policy actions in proposing the creation of a protected area. Firstly, if the protected area were harmed by contamination from mining or aquaculture industry, the Indigenous Community would reserve the right to sue the state. Secondly, a protected area would add economic opportunity for the community through the development of ecotourism. Indigenous Community leaders said that they wanted to develop ecotour trips which would take tourists by boat to explore marine life while also telling tourists the history and stories of the community of Carelmapu. The Indigenous Community plans to hold tourism workshops where residents of Carelmapu can be trained as tour guides or as business owners. Lastly, the Indigenous Community members who want to reclaim their ancestral rights are supported by the Lafkenche

Law which recognizes their rights and supports them in maintaining their cultural traditions. One Indigenous Community leader said he hopes that with the formation of a protected area, inhabitants of Carelmapu can "continue to maintain their rhythm of life, their social well-being—and to improve it, to protect our main source of wealth which we get from the sea." He said that in the future, "every child of Carelmapu may have the option to decide to stay in town and not be forced to leave because there are no opportunities."

It is the Indigenous Community's traditional fishing practices and cultural connection to the ocean which underlies their held value of "tradition" and in part drives their actions related to policy to form a protected area for adaptive governance. However, the belief that certain individuals and certain groups have historical rights to marine resources is also shared by the fishing unions in Carelmapu. Divergence in the conceptualization and meaning of tradition often varies across groups (Ingold and Kurtilla 2000), and it is this divergence between which group has traditional rights to the resource that in part underpins the conflict in policy actions related to adaptive governance.

4.6.4 Historical fishing rights and fisheries policy: Fishing unions in Carelmapu

Resource users in fishing unions in Carelmapu have designated access rights to marine resources which started in 1991 when governance of marine resources was decentralized under the TURFs policy. After two decades of environmental deregulation and overexploitation of fisheries during Pinochet's dictatorship in the 1970s and 1980s, the TURFs policy in 1991 incentivized resource users to form local unions to co-manage resources and have access rights to specific exploitation areas (Jarvis and Wilen 2016). Resource users harvest from management areas as well as from open-access areas. Traditionally, divers access their management areas and the open-access areas using small boats which have one or two tenders- individuals accompany the diver

and take care of boat and the catch while the divers are below the surface of the water. Divers sell their catch locally or to processers for national and international markets. In our interviews with members of fishing unions, fishers stated that they had historical rights to fishing grounds near Carelmapu, including rights to both management areas and open-access areas. In their opinion, they have done well managing the marine resources since the formation of the TURFs policy in 1991.

With the introduction of the Lafkenche Law, non-Indigenous fishers now feel that shifted power away from fishers to the Indigenous Community and that the proposed protected area threatened to take away their historical rights to access marine resources. They were unwilling to cooperate with the Indigenous Community to create an adaptive governance plan because they were concerned that the protected area will harm their ability to access open-access areas. The protected area plan would require divers and fishing unions to formulate new management plans for any areas outside of the management areas. One diver, who is also the president of his fishing union, said,

> "The Lafkenche Law would have been good if it said that the artisanal fishers from unions who carried out harvesting in these zones within the proposed protected area did not lose their rights to harvest. But the fact is this law makes us lose our rights, there will be no more free entry. I have had the opportunity to be in several conversations with respect to the Lafkenche Law and losing our rights is the main conflict we have with the Indigenous Community."

Another diver said,

> "The president of the Indigenous Community is a teacher and he is not from here, he does not depend on the sea. All those free spaces he requested for protection—we work in those areas when the management areas are closed. I have worked in those spaces all of my life."

We observed that only three leaders of fishing unions discussed the proposed plan of the protected area with the Indigenous Community. These meetings were only open to leaders of the fishing unions and leaders of the Indigenous Community, in total around twelve people. When the fishing union members disagreed with the proposed plan, they offered no new plan or new preference for adaptive governance outside of changing harvesting controls. They also refused to have any future meetings with the Indigenous Community, and the conflict between the two groups grew.

4.6.5 Power over resources

Finally, our survey revealed that the two groups diverged in their feelings of power over resources. "Power over resources" was measured using two statements: "*Humans have control over the environment"* and *"My community should have control of marine resources."* While individuals and the groups agree that they communities should have control of marine resources, there was a significant difference between the groups' responses to the statement "*humans have control over the environment*." Members of fishing unions were split evenly between those who agreed that humans can control the environment (43%) and members who disagreed with the statement (46%). Similarly, 48% of non-Indigenous individuals agreed with the statement and 39% disagreed. In contrast, the 89% of the Indigenous Community and 91% of Indigenous individuals disagreed that humans were in control of the environment.

Indigenous people in Carelmapu did not see themselves as controllers of the environment, but instead saw themselves as uniquely tied to marine resources and responsible for the sea's protection from industry and overexploitation. We suggest that how Indigenous people responded to this statement exemplifies a unique Indigenous ontology, or way of being, that contributes to their conservation-focused frame. Members of the Indigenous Community and Indigenous divers described their relationship with the marine environment as reciprocal. They stated that if they conserved and protected the environment, the sea would replenish its resources and take care of them for generations. This belief influenced their preference for a protected area. One Indigenous Community member and diver in a fishing union said,

> "For me, this sea is my sea, it is the sea of my daughters, it is the sea of my grandchildren, and of the generations that come, so if I can have the opportunity to protect it, that is what I am going to do. That is within my hands to protect. The effects of the red tide were evil but came for a good reason because we woke up, we just realized we need to take more protective measures at sea."

Many Indigenous groups around the world have ontologies embedded in their relationship with the environment where they see the relationship as one which strives for unity between humans and nature (Nadasdy 2007; Royal 2002; Schmidt and Dowsley 2010). In studies of other Indigenous communities in Latin America, this belief in reciprocity has been shown to influence preferences and policy actions in the context of environmental change. For example, in the Cusco Region of Peru, Quecha communities have been shown to hold the value "ayni" which is a value rooted in reciprocity that "implies that all elements of natural give and receive to contribute to the harmony of the world" (Walshe and Argumedo 2016: 167). This value is equated to the concept

and political movement of *buen vivir* in Bolivia and Ecuador which emphasizes climate justice and adaptive governance created by Indigenous peoples (Gudynas 2011; Walsh 2010).

These ontologies based in conservation-oriented, reciprocal values foster the development of community-based adaptation strategies where communities take measures to protect the environment and sustain their knowledge systems and Indigenous practices to reduce their vulnerability to environmental change (Mugambiwa 2018). In Carelmapu, these values, in conjunction with the policy support from the Lafkenche Law, contributed to the Indigenous peoples' frames related to policy action where individuals began the process to create the protected area to maintain their traditional ways of life and adapt to environmental change—even if this meant decreasing resource exploitation.

In contrast, non-Indigenous individuals and members of fishing unions were divided over whether they agreed that humans have control over the environment. Few non-Indigenous resource users had preferences for governance outside of changes in controls in marine resource management. For example, union members discussed switching to the harvest of sea urchins or finfish when they are unable to harvest other shellfish because of algal blooms. A diver said,

> "Well there is no specific plan because one, that is, there is no way to prevent red tides in the future. We could diversify the activity of diving in the coastal edge with some harvesting of fish. However, currently the records and resources are practically closed. If I could dive and shoot fish, I could have an alternative, but according to the legislation they are closed."

This form of governance is not an uncommon preference—many humans respond to environmental change by looking to increase controls over resources (Holling et al. 1996; Folke et al. 2005). Our ethnographic interviews demonstrated that many non-Indigenous resource users' attitudes remain focused on resource extraction. This may suggest that they have a different ontology than the Indigenous community, a way of being which is based in resource extraction instead of conservation. Individuals' resource extraction focuses and their resistance to change their rights to resources has been shown in other studies of Chilean resource users, particularly fishing union members under the TURFs policy (Gelcich et al. 2009; Gelcich et al. 2015). Although resource users have become more empowered to become stewards in governance through the implementation of the TURFs policy, they believe their livelihoods are at risk (Gelcich et al. 2009) and are unwilling to relinquish their rights (Gelcich et al. 2017). Even prior to the Lafkenche Law in 2008, fishers perceived that their open-access areas were becoming scarce, in large part because of the proliferation of aquaculture (Ebel 2018) and the creation of state-run non-Indigenous marine protected areas (Gelcich et al. 2009). With the implementation of the Lafkenche Law and the ability for Indigenous Communities to create protected areas, fishers interpreted the law as a threat and perceived their traditional rights being taken away. Their resource-focused frame influenced their policy action, where they resisted working with the Indigenous Community in Carelmapu, and instead sought changes in harvesting controls in fisheries management.

According to Schwartz et al. (2012) , the variable "power over resources" reflects a motivational continuum. This could signify that the individual or group values are opposite in relation to one another and are thus incompatible and may cause conflict. For example, in her qualitative study of Hampton Roads, VA, Havercamp (2017) found that the dominant values of groups were "power" and "security" which were in structural opposition to the values which

fostered social and environmental justice. These values, she stated, were a key factor underpinning conflict in adaptation in Hampton Roads, VA. In contrast, our quantitative measures showed divergence in only two statements associated with two values, while most individual and groups values were shared. The divergence in the value "power over resources" illustrates how although the value systems may not be divergent, they may suggest different frames related to policy interpretation and action, specifically with regards to conservation and environmental governance.

4.7 Conclusion: Ontologies, frames, friction, and policy actions

Recent calls in adaptation studies advocate for more attention to community-level factors which influence behavior and decision-making in the context of environmental change (Adger et al. 2013; Agrawal 2008). Attention to human values in the context of how individuals and institutions frame policy interpretations and action is essential because it is human values that demonstrate individual or group desires, preferences, and objectives (O'Brien and Wolf 2010; Schwartz 1992; 1994). However, these value systems must be examined within the context of historical systems of oppression and new state policies which shift power in environmental governance. Situating individual and institutional values within historical and sociopolitical context illustrates how and why individuals and institutions interpret policies, how they are affected by the existing political structures, and why they may pursue certain policy actions. It is this situated understanding which may reveal individual and group ontologies. Within the context of local to global engagement, these ontologies may meet to create areas of friction (Tsing 2004; 2012) which can contribute to understandings of conflict and explanations of how individuals and local communities interact with structure at the national and international level (Tsing 2004).

This paper examined values underlying individual and institutional frames related to conflict in policy interpretations and actions in adaptive governance at the local scale. This values-based approach illustrated that the Indigenous Community and fishing unions had divergent ontologies which are based in relationships with the environment, history, and sociopolitical context. These ontologies underpin the individual and institutional policy frames. These frames, combined with ethnographic explanations of the political structures and historical systems of oppression, explain individual and institutional preferences actions related to adaptive governance. Thus, we suggest that a values-based approach can address areas of friction and elucidate individual and institutional frames which can provide information on how individuals and groups understand policy and interact with political structures. Furthermore, such an approach can illuminate why conflict might exist between groups. Future studies should seek to understand how ontologies and interpretations of political structure are articulated through individuals' discourse to illuminate how divergent identities and conflict emerge through local to global connections and create new areas of friction (Tsing 2004).

Lastly, our mixed methods approach integrating qualitative ethnographic data with quantitative measures offers unique insights into how culturally embedded values at multiple levels underlie conflict or disagreement over appropriate responses to environmental change. Moreover, differentiation and/or consensus at the individual level has important implications for group-level collective action and the formation of adaptive, transformative governance. Adaptive governance requires individual levels of agency, shared values and cooperation between groups, and the creation of ordered rule and collective action, thus the understanding of the factors which may contribute to conflict in preferences for adaptive governance at the local level is imperative. The outcomes of this study suggest the integration of quantitative and ethnographic methods can

further understandings of how values contribute to various preferences and policy actions with implications for potentially mitigating conflict in resource-dependent communities undergoing often rapid and complex environmental change.

CHAPTER 5

STRUCTURE, AGENCY, AND WICKED PROBLEMS: THEORETICAL, METHODOLOGICAL, AND POLICY CONTRIBUTIONS TO STUDIES OF SOCIO-ECOLOGICAL GOVERNANCE

5.1 Addressing wicked problems through insights from anthropology

Through the case study of Chile's Lakes Region, we see how global processes, such as climate change and socioeconomic change, play out at the local scale to create areas of friction, but also potential for transformation. This study demonstrates that it is the interactions between individual and group ontologies, their relationships with the environment, historical processes of engagement or oppression, and individual and institutional interactions with political structures which create these spaces for friction or transformation. These insights from anthropology help to situate the "wicked" problem of governance, one with no technical solution that requires governance that brings together the collective judgment of stakeholders (Jentoft and Chuenpagdee 2009), in processes of social and cultural change. To address these wicked problems, most studies of environmental governance focus on the determinants of good governance (Adger 2000; Cote and Nightingale 2012; Tompkins and Adger 2004). However, a sole focus on outcomes in the system ignores the nature of the problem's shifting components and the cultural and social factors which may inhibit governance transformations (Cote and Nightingale 2012; Jenoft and Chuenpagdee 2009). Studies of socio-ecological systems must not treat the systems as static nor only seek to evaluate determinants of successful governance (Cote and Nightingale 2012; Jentoft and Chuenpagdee 2009). Instead, studies must elucidate the details of the problem facing the system (Jenotft and Chuenpagdee 2009) as well as the process of how individuals are constrained

by or interact with governance structures (Cote and Nightingale 2012) to illuminate how transformations in governance can occur at multiple scales.

In this multi-level analysis of individuals and institutions in the Lakes Region of Chile, I have addressed these gaps in knowledge by exploring the relationship between individuals, institutions, and governance structure to examine the social, cultural, and political factors which may facilitate or constrain the transformation in governance at the local scale, with attention to legislative structure, shifting power dynamics, conflict, and differential access to resources. By doing so, my dissertation makes several unique contributions theory, methodological approaches to studies of governance, and applications to policy. In this chapter, I will summarize the theoretical, methodological, and applied contributions this study offers, not only anthropological understandings of marine and coastal governance, but broader understandings of socio-ecological systems.

5.2 Theoretical contributions to studies of governance in socio-ecological systems

This dissertation contributes to studies of governance in socio-ecological systems by bridging anthropological theories of structure and agency with studies of socio-ecological governance as a "wicked problem." I draw on anthropological perspectives on structure and agency (Bourdieu 1977; Giddens 1979; Radcliffe-Brown 1952) to illuminate how diverse stakeholders at the local scale experience differential abilities to transform environmental governance. A focus on the relationship between structure, agency, and governance can help studies move away analyzing the determinants of governance to instead see governance as a constantly evolving, dynamic process. Furthermore, the integration of Giddens (1979)'s theories of structure and agency into studies of governance can help better articulate patterns of social

processes and shifting power dynamics to address the gaps in understanding of how diverse stakeholders and existing governance structures complicate governance transformations. Chile's TURFs co-management system did not recognize the diversity of stakeholders in its implementation in 1991. However, with new legislative policies under the Fisheries and Aquaculture Law, such as the Aquaculture Law (2003), Lafkenche Law (2008), and legislation to promote management committees (2013), political structures now recognize the diversity. These new structures have created new opportunities for collaboration while simultaneously creating areas of friction, shifting in power away from fishing unions to new ocean users. This shift in power dynamics away from fishing unions to aquaculture companies and Indigenous communities has created a contentious platform to bring together the collective judgment of stakeholders to transform governance.

Using this theoretical approach, my dissertation findings demonstrate that individuals and institutions at the community-level have different abilities to transform governance, and their abilities are affected by their interactions with overarching legistlative structures (Chapter 3). I demonstrate that there are different outcomes in communities' abilities to transform governance because of how diverse stakeholders interact with or are impacted by legislative structures (Chapter 3). These findings are essential to understanding the formation of adaptive governance in socio-ecological systems because they show that even in similar cultural and biophysical contexts and under the same legislative structures, there are social, cultural, and political factors which may facilitate or inhibit the transformation of governance. For example, in Ancud, fishers enacted their agency by drawing upon their collective management preferences and social networks with government officials and universities to create a management committee with Subpesca. However, in the nearby community of Carelmapu, fishers did not organize, felt

dispossessed of their ocean space, and resisted any form of cooperation with the Indigenous communities because fishers felt threatened by the creation of an ECMPO.

I explored these differential outcomes further by examining the values underlying individual and institution frames related to policy actions in adaptive governance. By doing so, I illustrated the potential ontological and structural reasons why the Indigenous Community can enact their conservation-focused frames, and why fishing unions refused to cooperate with the Indigenous Community, instead focusing their effots on changing harvesting controls in fisheries management (Chapter 4). This study's findings are significant to understandings of adaptive goverance in socio-ecological systems because they begin to address the gap in understanding how culture and structure affects individuals' and groups' abilities to transform governance. It also points to the need to dig deeper into understanding how cultural worldviews and interpretations affect behaviors and actions related to the formation of governance and the ability to individuals to adapt under the context of global change.

Lastly, to illustrate the individual factors which may constrain or facilitate transformations in governance, I used these anthropological concepts to show how many fishers in the Lakes Region were only able to cope during environment crisis, instead of being able to draw upon their agency to act collectively to transform their livelihoods and the governance structure (Chapter 2). This ethnographic study illustrated that fishers' inabilities to transform governance during an environmental crisis was in large part due to the lack of their resources, such as other job opportunities, formal education, transportation, and healthcare (Chapter 2). Further, the study highlights that a theoretical focus which suggests that livelihood diversification during crisis scenarios as a form of resilience may essentialize resource-dependent communities, ignore the power relations and structural impediments, and overlook individuals' desires for transformative

adaptation and resilience. These findings are vital to studies of environmental governance because understandings of environmental governance are often focused on successful outcomes and ignore the individual-level and structural factors that affect individuals' behaviors and abilities to act. This study illuminates the need to focus on structures which go beyond solely marine resource management to ask questions of broader ocean governance and questions external to marine governance, such as education and healthcare structures, which affect individuals' well-being and their abilities to enact their own agency.

5.3 Methodological contributions to studies of socio-ecological systems

In this dissertation, I use multi-level analysis of individuals and institutions to illustrate how diverse stakeholders, bound by the same state legislative structures and affected by similar environmental problems, have different abilities to facilitate the transformation from co-management to adaptive governance. The multi-level study allows for the examination of how individuals and institutions are affected by, interact with, and contest policy between different sites over time (Wright and Reinhold 2011). Further, the study integrates ethnography into examinations of governance. Studies of socio-ecological governance often lack ethnography (Fabinyi, Foale, and Macintyre 2015; Poe, Norman, and Levin 2014), but ethnography can illuminate the processes of governance transformations and the social, cultural, and political factors which affect individuals' and institutions' abilities to transform governance.

By using ethnography in the study of environmental governance in the Lakes Region, I learned that even at the local scale, individual and institutional abilities to transform governance vary widely. In studies of socio-ecological systems and environmental governance, studies often assume that individuals and institutions have the same objectives, preferences, and needs related

governance (Coulthard 2012). Yet, my ethnographic data illustrate that individuals have varying objectives and preferences for governance which influence their actions related to policy (Chapter 4). Further, the study demonstrates that individuals may be differentially affected by the lack of resources which inhibits their abilities to transform governance (Chapter 2). For example, even in the small community of Carelmapu, home to 2,800 people, individuals and institutions differ in their preferences and policy actions related to adaptive governance (Chapter 4). While individuals in the Indigenous Community want to create an ECMPO to promote conservation and tourism, non-Indigenous fisheries in fishing unions want to maintain the TURFs co-management structure and continue to harvest from open-access areas. To understand the friction, which had structural roots from the Lafkenche Law, I then incorporated measures of human values. However, the quantitative measures of human values explained little without further interpretation using ethnography which illustrated the ontological and political reasons why the two groups which underpinned conflict in their preferences and actions related to transformations to adaptive governance.

Furthermore, employing ethnography as a method to understand governance transformations offered insights into why legislative structures plays out differently in two locales in the same region. My comparative study of Ancud and Carelmapu (Chapter 3) examined policy and governance structures using ethnography to illustrate why the two communities experienced different outcomes in their abilities to transform to polycentric governance. This comparative case study illuminates the need for studies of governance to incorporate ethnography to explore the process of governance transformations. Further, the use of ethnography demonstrates how the interplay between political structure and individuals may have differential outcomes in communities' abilities to individuals to transform environmental governance.

5.4 Policy implications and recommendations

This research demonstrates that policies which address only one sector, such as fisheries management, may become obsolete or ineffective in a globalized, rapidly changing socio-ecological system. The TURFs policy, when implemented in 1991, was considered an ideal form of governance in fisheries—a structure which empowered fishers at the local level and restored the abundance and diversity of nearshore benthic resources (Moreno and Revenga). However, the TURFs policy in 1991 did not have to contend with the proliferation of aquaculture or state recognition of ancestral rights to Indigenous Communities. More recent studies suggest that the governance of TURFs has problems related to lack of enforcement and increased poaching in management areas (Gelcich et al. 2017) as well as distrust between fishers and the government which inhibit successful transformations from TURFs co-management to polycentric governance (Gelcich et al. 2019). My study corroborates and adds to these findings and suggests that we should revisit the idea of TURFs as an ideal form of governance. Discussion of TURFs as a form of governance must be complicated further by understandings of politics, diversity at the local and regional level, diverse ontologies at the local level, and willingness or unwillingness of stakeholders to cooperate between groups. It is through complicating this form of governance that we can see ways to transform co-management to polycentric governance to become more adaptive in light of global change.

Thus, this dissertation suggests that the adaptation of existing policies or formation of new governance structures must consider the diversity of stakeholders and their various objectives and needs, as well as how political structures create areas of friction and/or transformation.

Furthermore, policies need to go beyond delineating spaces in the ocean which exclude users by addressing the fluidity of stakeholders' engagement with each other and resources to address the evolving nature of the socio-ecological system.

5.5 Calls for future research

This study makes evident the need for research which moves away from solely examining determinants of successful governance to seeing governance as a process. Furthermore, it suggests that studies of adaptive governance in socio-ecological systems can integrate understandings of structure and agency and friction to elucidate local to global connections and the social, cultural, and political reasons why governance transformations may or may not occur. Furthermore, I believe my dissertation began to elucidate understandings of social change, in large part because I employed ethnography. Thus, this dissertation calls for more ethnographic studies of environmental governance because of the method's ability to illuminate processes of social and political change at the community level which can explain outcomes in governance transformations.

5.6 Directions for Future Research

My dissertation demonstrates that there is a need to conduct long-term studies of the transformation of governance in marine socio-ecological systems which integrate ethnography with anthropological understandings of structure and human agency. In the future, I aim to develop a longitudinal study of this region to illustrate the process of governance transformations and the cultural and social factors which facilitate or constrain the transformation. I am particularly interested in the factors which facilitate or hinder social well-being in the context of environmental governance and socioeconomic change. I would like to design research which addresses not only

questions of ocean governance, but also how other factors, such as healthcare and education, may affect social well-being and transformations in governance. My objective in this research is to illuminate how individuals' visions for their own well-being influence their preferences and needs for governance. I aim to create participatory approaches to understand diverse individuals' and groups' objectives, needs, and desires for governance across varying scales and geographic locations, and to create qualitative and quantitative metrics of well-being. Indicators of well-being can be scalable across geographic space and transcend the context of fishing communities to be applicable in other natural resource-dependent regions. Furthermore, these metrics can be used for local and regional decision-making as a baseline to assess the social outcomes of environmental governance. Social well-being provides a framework to illuminate a more nuanced understanding of the aspects which foster successful governance transformations and is a framework which can address the needs of diverse stakeholders alongside the need for conservation.

Lastly, I would like to develop and write an ethnography of the Lakes Region's sociopolitical and environmental change by following resource users' lived experiences, starting with Pinochet's dictatorship up through their current struggle for power in the conflict for ocean space with large-scale aquaculture industry. I have been closely connected to individuals in the Lakes Region for nine years and would like to compile my experiences in the region to further my own understandings of how sociopolitical history and institutional factors affect individual behavior to build off insights in anthropology as to why actors have differential opportunities to exercise agency to have access to decision-making (Agrawal 2005; Cleaver 2007). I would like to engage with Anna Tsing's literature on friction to illuminate the local to global connections, as I feel the case study of the Lakes Region can add significant insight into these relationships. By

doing so, I hope to illuminate why actors experience or do not experience equitable outcomes, situating their experiences in a globalized context.

BIBLIOGRAPHY

Adger, W. N. (2000). Social and ecological resilience: are they related?. *Progress in human geography*, *24*(3), 347-364.

Adger, W. N., Barnett, J., Brown, K., Marshall, N., & O'brien, K. (2013). Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change*, *3*(2), 112.

Addun, R. P., & Muzones, D. M. (1997). Community-based coastal resource management (CBCRM): Tambuyog's experience in the Philippines. *Community Involvement in Wetland Management: Lessons from the Field. Wetlands International, Kuala Lumpur*, 219-230.

Agrawal, A. (2005). Environmentality: technologies of government and the making of subjects. *Durham, NC: Duke University Press.*

Agrawal, A. (2008). The role of local institutions in adaptation to climate change.

Allison, E. H., & Ellis, F. 2001. The livelihoods approach and management of small-scale fisheries. *Marine policy*, *25*(5), 377-388.

Andersson, K. P., & Ostrom, E. (2008). Analyzing decentralized resource regimes from a polycentric perspective. *Policy sciences*, *41*(1), 71-93.

Armitage, D. R., Plummer, R., Berkes, F., Arthur, R. I., Charles, A. T., Davidson-Hunt, I. J., ... & McConney, P. (2009). Adaptive co-management for social–ecological complexity. *Frontiers in Ecology and the Environment*, *7*(2), 95-102.

Barrett, G., Caniggia, M. I., & Read, L. 2002. "There are More Vets than Doctors in Chiloé": Social and Community Impact of the Globalization of Aquaculture in Chile. *World Development*, *30*(11), 1951-1965.

Barton, J. R., & Fløysand, A. (2010). The political ecology of Chilean salmon aquaculture, 1982–2010: A trajectory from economic development to global sustainability. *Global Environmental Change*, *20*(4), 739-752.

Beddington, J. R., Agnew, D. J., & Clark, C. W. 2007. Current problems in the management of marine fisheries. *science*, *316*(5832), 1713-1716.

Béné, C. 2003. When fishery rhymes with poverty: a first step beyond the old paradigm on poverty in small-scale fisheries. *World development*, *31*(6), 949-975.

Béné, C., & Friend, R. M. (2011). Poverty in small-scale fisheries: old issue, new analysis. *Progress in Development Studies*, *11*(2), 119-144.

Berkes, F. (2003). Alternatives to conventional management: lessons from small-scale fisheries. *Environments*, *31*(1), 5-20.

Berkes, F. (2006). From community-based resource management to complex systems: the scale issue and marine commons. *Ecology and Society*, *11*(1).

Berkes, F. (2007). Adaptive co-management and complexity: exploring the many faces of co management. *Adaptive co-management: Collaboration, learning, and multi-level governance*, 19-37.

Berkes, F. (2009). Evolution of co-management: role of knowledge generation, bridging organizations and social learning. *Journal of environmental management*, *90*(5), 1692 1702.

Berkes, F., Hughes, T. P., Steneck, R. S., Wilson, J. A., Bellwood, D. R., Crona, B., ... & Nyström, M. (2006). Globalization, roving bandits, and marine resources. *Science*, *311*(5767), 1557 1558.

Bourdieu, P. (1977). *Outline of a Theory of Practice* (Vol. 16). Cambridge university press.

Boyle, M., Kay, J., & Pond, B. (2001). Monitoring in support of policy: an adaptive ecosystem approach. *Encyclopedia of global environmental change*, *4*(14), 116-137.

Brewer, J. F. (2010). Polycentrism and flux in spatialized management: evidence from Maine's lobster (Homarus americanus) fishery. *Bulletin of Marine Science*, *86*(2), 287-302.

Brooks, J. S. (2011). Buddhism, economics, and environmental values: A multilevel analysis of sustainable development efforts in Bhutan. *Society & Natural Resources*, *24*(7), 637-655.

Brosius, J. P., Tsing, A. L., & Zerner, C. (1998). Representing communities: Histories and politics of community-based natural resource management.

Buschmann, A., Farias, L., Tapia, F., Varela, D., Vasquez, M. (2016). Informe Final: Comisión Marea Roja 2016.

Carlsson, L., & Berkes, F. (2005). Co-management: concepts and methodological implications. *Journal of environmental management*, *75*(1), 65-76.

Cassell, P. (Ed.). (1993). *The giddens reader*. Macmillan International Higher Education.

Castilla, J. C., & Gelcich, S. (2008). Management of the loco (Concholepas concholepas) as a driver for self-governance of small-scale benthic fisheries in Chile. *FAO Fisheries technical paper*, *504*, 441.

Castilla, J. C. (2010). Fisheries in Chile: small pelagics, management, rights, and sea zoning. *Bulletin of Marine Science*, *86*(2), 221-234.

Castilla, J.C. (1999). Coastal marine communities: Trends and perspectives from human exclusion experiments. *Trends Ecol Evol*, 14:280-283.

Chaffin, B. C., & Gunderson, L. H. (2016). Emergence, institutionalization and renewal: rhythms of adaptive governance in complex social-ecological systems. *Journal of Environmental Management*, *165*, 81-87.

Chan, K. M., Satterfield, T., & Goldstein, J. (2012). Rethinking ecosystem services to better address and navigate cultural values. *Ecological economics*, *74*, 8-18.

Cleaver, F. (2007). Understanding agency in collective action. *Journal of human development*, *8*(2), 223-244.

Collins, S. L., Carpenter, S. R., Swinton, S. M., Orenstein, D. E., Childers, D. L., Gragson, T. L., ... & Knapp, A. K. (2011). An integrated conceptual framework for long-term social ecological research. *Frontiers in Ecology and the Environment*, *9*(6), 351-357.

Coulthard, S. (2008). Adapting to environmental change in artisanal fisheries—Insights from a South Indian Lagoon. *Global Environmental Change*, *18*(3), 479-489.

Coulthard, S. (2012). Can we be both resilient and well, and what choices do people have? Incorporating agency into the resilience debate from a fisheries perspective. *Ecology and Society*, *17*(1), Art-4.

Coulthard, S., Johnson, D., & McGregor, J. A. (2011). Poverty, sustainability and human wellbeing: a social wellbeing approach to the global fisheries crisis. *Global Environmental Change*, *21*(2), 453-463.

Crate, B. S. A., Einarsson, N., Ford, J. D., Lahsen, M., Paolisso, M., Schlee, G., & Crate, S. A. (2008). Gone the bull of winter? Grappling with the cultural implications of and anthropology's role (s) in global climate change. *Current anthropology*, *49*(4), 569-595.

Cutter, S. L. (2016). Resilience to what? Resilience for whom?. *The Geographical Journal*, *182*(2), 110-113.

Daughters, A. (2016). Southern Chile's Archipelago of Chiloé : Shifting Identities in a New Economy, 21(2), 317–335. https://doi.org/10.1111/jlca.12199

Daughters, A. (2018). Chiloé Today and Over the Centuries. In *Chiloé* (pp. 1-20). Springer, Cham.

Davis, A., & Ruddle, K. (2012). Massaging the misery: recent approaches to fisheries governance and the betrayal of small-scale fisheries. Human Organization, 71(3), 244 254.

De Haan, L. J. 2000. Globalization, localization and sustainable livelihood. *Sociologia Ruralis*, *40*(3), 339-365.

Doane, M. (2014). From community conservation to the lone (forest) ranger: accumulation by conservation in a Mexican forest. *Conservation and Society*, *12*(3), 233-244.

Durkheim, É. (1900). La sociologie et son domaine scientifique. *Textes. 1. Éléments d'une théorie sociale*, 13-36.

Ebel, S. A. (2018). Livelihood Diversification as a Form of Resilience? An Ethnographic Account of Artisanal Fishers in Chile's Lakes Region. In *Chiloé* (pp. 39-52). Springer, Cham.

Ellis, F. (2000). The determinants of rural livelihood diversification in developing countries. *Journal of agricultural economics*, *51*(2), 289-302.

Emirbayer, M., & Goodwin, J. (1994). Network analysis, culture, and the problem of agency. *American journal of sociology*, *99*(6), 1411-1454.

Escobar, O. (2015). Scripting deliberative policy-making: Dramaturgic policy analysis and engagement know-how. *Journal of Comparative Policy Analysis: Research and Practice*, *17*(3), 269-285.

Fabinyi, M., Foale, S., and Macintyre, M. (2015). Managing inequality or managing stocks? An ethnographic perspective on the governance of small-scale fisheries. *Fish and Fisheries, 16*(3), 471-485

Fabricius, C., Folke, C., Cundill, G., & Schultz, L. (2007). Powerless spectators, coping actors, and adaptive co-managers: a synthesis of the role of communities in ecosystem management. *Ecology and Society*, *12*(1).

Fernández, G. L. G., & Friman, E. (2011). New marine commons along the Chilean coast–the management areas (MAs) of Peñuelas and Chigualoco. International Journal of the Commons, 5(2), 433-458.

Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C. S., & Walker, B. (2002). Resilience and sustainable development: building adaptive capacity in a world of transformations. AMBIO: A journal of the human environment, 31(5), 437-441.

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annu. Rev. Environ. Resour.*, *30*, 441-473.

Food and Agriculture Organization of the United Nations (FAO) (2018). http://www.fao.org/fishery/countrysector/naso_chile/en

Galaz, V., Crona, B., Österblom, H., Olsson, P., Folke, C., Stockholms universitet, & Stockholm Resilience Centre. (2012). Polycentric systems and interacting planetary boundaries emerging governance of climate change–ocean acidification–marine biodiversity. Ecological Economics, 81(1), 21-32.

Gecas, V. (2008). The ebb and flow of sociological interest in values. In *Sociological Forum* (Vol. 23, No. 2, pp. 344-350). Oxford, UK: Blackwell Publishing Ltd.

Gelcich, S. (2014). Towards polycentric governance of small-scale fisheries: insights from the new 'Management Plans' policy in Chile. Aquatic Conservation: Marine and Freshwater Ecosystems, 24(5), 575-581.

Gelcich, S., Godoy, N., & Castilla, J. C. (2009). Artisanal fishers' perceptions regarding coastal co-management policies in Chile and their potentials to scale-up marine biodiversity conservation. *Ocean & Coastal Management*, *52*(8), 424-432.

Gelcich, S., Guzman, R., Rodríguez-Sickert, C., Castilla, J. C., & Cárdenas, J. C. (2013). Exploring external validity of common pool resource experiments: insights from artisanal benthic fisheries in Chile. Ecology and Society, 18(3).

Gelcich, S., Hughes, T. P., Olsson, P., Folke, C., Defeo, O., Fernández, M., ... & Steneck, R. S. (2010). Navigating transformations in governance of Chilean marine coastal resources. *Proceedings of the National Academy of Sciences*, *107*(39), 16794-16799.

Gelcich, S., Kaiser, M. J., Castilla, J. C., & Edwards-jones, G. (2008). Engagement in co management of marine benthic resources influences environmental perceptions of artisanal fishers, 35(1), 36–45.

Gelcich, S., Peralta, L., Donlan, C. J., Godoy, N., Ortiz, V., Tapia-Lewin, S., ... & Godoy, F. (2015). Alternative strategies for scaling up marine coastal biodiversity conservation in Chile. *Maritime Studies*, *14*(1), 5.

Gelcich, S., Reyes-Mendy, F., & Rios, M. (2019). Early assessments of marine governance transformations: insights and recommendations for implementing new fisheries management regimes. Ecology and Society, 24(1).

Gelcich, S., Cinner, J., Donlan, C. J., Tapia-Lewin, S., Godoy, N., & Castilla, J. C. (2017). Fishers' perceptions on the Chilean coastal TURF system after two decades: problems, benefits, and emerging needs. *Bulletin of Marine Science*, *93*(1), 53-67.

Gelcich, S., EDWARDS-JONES, G. A. R. E. T. H., & Kaiser, M. J. (2005). Importance of Attitudinal Differences among Artisanal Fishers toward Co-Management and Conservation of Marine Resources. *Conservation Biology*, *19*(3), 865-875.

Gelcich, S., Edwards-Jones, G., Kaiser, M. J., & Castilla, J. C. (2006). Co-management policy can reduce resilience in traditionally managed marine ecosystems. *Ecosystems*, *9*(6), 951 -966.

Giddens, A. (1979). *Central problems in social theory: Action, structure, and contradiction in social analysis* (Vol. 241). Univ of California Press.

Goulden, M. C., Adger, W. N., Allison, E. H., & Conway, D. 2013. Limits to resilience from livelihood diversification and social capital in lake social–ecological systems. *Annals of the Association of American Geographers*, *103*(4), 906-924.

Gudynas, E. (2011). Buen Vivir: today's tomorrow. *Development*, *54*(4), 441-447

Harvey, D. (2003). *The new imperialism*. OUP Oxford.

Haverkamp, J. A. (2017). Politics, values, and reflexivity: The case of adaptation to climate change in Hampton Roads, Virginia. *Environment and Planning A*, *49*(11), 2673-2692.

Holling, C. S., & Meffe, G. K. (1996). Command and control and the pathology of natural resource management. *Conservation biology*, *10*(2), 328-337.

Holton, G. E. (2004). The state, literacy, and popular education in Chile, 1964–1990. *Journal of Iberian and Latin American Research*, *10*(1), 102-104.

INE. 2008. Instituto Nacional de Estadisticas de Chile. www.ine.cl.

INE. Informe económico regional enero-marzo 2008. INE; 2008

Jarvis, L. S., & Wilen, J. E. (2016). The Political Economy of the Chilean Nearshore Fisheries Reform.

Jentoft, S. (2005). Fisheries co-management as empowerment. Marine Policy, 29(1), 1-7.

Jentoft, S. (2013). Social justice in the context of fisheries–a governability challenge. In *Governability of Fisheries and Aquaculture* (pp. 45-65). Springer, Dordrecht.

Jentoft, S., & Chuenpagdee, R. (2009). Fisheries and coastal governance as a wicked problem. *Marine policy*, *33*(4), 553-560.

Johnson, J. C. (1998). Research design and research strategies. *Handbook of methods in cultural anthropology*, *1*, 131-171.

Kowalczyk, A. M. (2013). Indigenous peoples and modernity: Mapuche mobilizations in Chile. *Latin American Perspectives*, *40*(4), 121-135.

Latta, A., & Aguayo, B. E. C. (2012). Testing the limits: neoliberal ecologies from Pinochet to Bachelet. Latin American Perspectives, 39(4), 163-180.

Lebel, L., Anderies, J. M., Campbell, B., Folke, C., Hatfield-Dodds, S., Hughes, T. P., & Wilson, J. (2006). Governance and the capacity to manage resilience in regional social-ecological systems.

Linkov, I., Satterstrom, F. K., Kiker, G., Batchelor, C., Bridges, T., & Ferguson, E. (2006). From comparative risk assessment to multi-criteria decision analysis and adaptive management: Recent developments and applications. *Environment International*, *32*(8), 1072-1093.

Lizardo, O. (2010). Beyond the antinomies of structure: Levi-Strauss, Giddens, Bourdieu, and Sewell. *Theory and Society*, *39*(6), 651-688.

Lockwood, M., Davidson, J., Curtis, A., Stratford, E., & Griffith, R. (2010). Governance principles for natural resource management. *Society and natural resources*, *23*(10), 986-1001.

Marschke, M. J., & Berkes, F. (2006). Exploring strategies that build livelihood resilience: a case from Cambodia. *Ecology and Society*, *11*(1).

McLean, J. E. (2015). Beyond the pentagon prison of sustainable livelihood approaches and towards livelihood trajectories approaches. *Asia Pacific Viewpoint*, *56*(3), 380-391.

Mcclenachan, L., Connor, G. O., & Reynolds, T. (2015). Adaptive capacity of co-management systems in the face of environmental change : The soft-shell clam fi shery and invasive green crabs in Maine, 52, 26–32. https://doi.org/10.1016/j.marpol.2014.10.023

McGregor, J.A., Camfield, L., Woodcock, A., 2009. Needs, wants and goals: wellbeing, quality

Mircioiu, C., & Atkinson, J. (2017). A comparison of parametric and non-parametric methods applied to a likert scale. *Pharmacy*, *5*(2), 26.

Moreno and Revenga 2014. The Systems of Territorial User Rights in Rights in Chile. The Nature Conservancy, Arlington, VA 1-88.

Mugambiwa, S. S. (2018). Adaptation measures to sustain indigenous practices and the use of indigenous knowledge systems to adapt to climate change in Mutoko rural district of Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies*, *10*(1), 1-9.

Nadasdy, P. (2007). The gift in the animal: the ontology of hunting and human–animal sociality. *American Ethnologist*, *34*(1), 25-43.

Nursey-Bray, M., & Rist, P. (2009). Co-management and protected area management: Achieving effective management of a contested site, lessons from the Great Barrier Reef World Heritage Area (GBRWHA). Marine Policy, 33(1), 118-127.

Nursey-bray, M., Fidelman, P., & Owusu, M. (2018). Does co-management facilitate adaptive capacity in times of environmental change ? Insights from fi sheries in Australia. Marine Policy, 96(August), 72–80. https://doi.org/10.1016/j.marpol.2018.07.016

O'Brien, K. (2009). Do values subjectively define the limits to climate change adaptation?. *Adapting to climate change: Thresholds, values, governance*, 164-180.

O'Brien, K. L., & Wolf, J. (2010). A values-based approach to vulnerability and adaptation to climate change. *Wiley Interdisciplinary Reviews: Climate Change*, *1*(2), 232-242.

Oksanen, J., Kindt, R., Legendre, P., O'Hara, B., Simpson, G. L., Solymos, P., ... & Wagner, H. (2008). The vegan package. *Community ecology package.[http://r-forge. r-project. Fishing Uniorg/projects/vegan/]*.

Olson, T. K., & Criddle, K. R. (2008). Industrial evolution: a case study of Chilean salmon aquaculture. *Aquaculture Economics & Management*, *12*(2), 89-106.

Olsson, P., Folke, C., & Hahn, T. (2004). Social-ecological transformation for ecosystem management: the development of adaptive co-management of a wetland landscape in southern Sweden. *Ecology and Society*, *9*(4).

Olsson, P., Folke, C., Galaz, V., Hahn, T., & Schultz, L. (2007). Enhancing the fit through adaptive co-management: creating and maintaining bridging functions for matching scales in the Kristianstads Vattenrike Biosphere Reserve, Sweden. *Ecology and society*, *12*(1).

Olsson, P., Gunderson, L., Carpenter, S., Ryan, P., Lebel, L., Folke, C., & Holling, C. S. (2006). Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems. *Ecology and society*, *11*(1).

Ong, A. (2006). *Neoliberalism as exception: Mutations in citizenship and sovereignty*. Duke University Press.

Organisation for Economic Cooperation and Development. https://stats.oecd.org/.

Ostrom, E. (2005). Self-governance and forest resources. Terracotta reader: A market approach to the environment, 12.

Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, *325*(5939), 419-422.

Ostrom, E. (2010). Beyond markets and states: polycentric governance of complex economic systems. American economic review, 100(3), 641-72.

Ostrom, E. (2010). Polycentric systems for coping with collective action and global environmental change. Global environmental change, 20(4), 550-557.

Ostrom, V., Tiebout, C. M., & Warren, R. (1961). The organization of government in metropolitan areas: a theoretical inquiry. American political science review, 55(4), 831-842.

Pakizeh, A., Gebauer, J. E., & Maio, G. R. (2007). Basic human values: Inter-value structure in memory. *Journal of Experimental Social Psychology*, *43*(3), 458-465.

Peterson, N. D. 2014. Breaking the bounds of rationality: values, relationships, and decision making in Mexican fishing communities. *Conservation and Society*, *12*(3), 245.

Pitchon, A. (2015). Large-Scale Aquaculture and Coastal Resource-Dependent Communities: Tradition in Transition on Chiloe Island, Chile. *The Journal of Latin American and Caribbean Anthropology*, *20*(2), 343-358.

Pitchon, A. 2011. Sea hunters or sea farmers? Transitions in Chilean fisheries. *Human Organization*, *70*(2), 200-209.

Poe, M. R., Norman, K. C., & Levin, P. S. (2014). Cultural dimensions of socioecological systems: key connections and guiding principles for conservation in coastal environments. *Conservation Letters*, *7*(3), 166-175.

Pomeroy, R. S., Katon, B. M., & Harkes, I. (2001). Conditions affecting the success of fisheries co-management: lessons from Asia. *Marine policy*, *25*(3), 197-208.

Pomeroy, R. S., Cinner, J. E., Nielsen, J. R., & Andrew, N. L. (2011). Conditions for successful co-management: Lessons learned in Asia, Africa, the Pacific, and the wider Caribbean. *Small-scale fisheries management: Frameworks and approaches for the developing world*, 115-131.

Rademacher, A. (2011). *Reigning the river: Urban ecologies and political transformation in Kathmandu*. Duke University Press.

Randeria, S., & Grunder, C. (2011). The (un) making of policy in the shadow of the World Bank: infrastructure development, urban resettlement and the cunning state in India. *Policy worlds: anthropology and the analysis of contemporary power*, *14*, 187-204.

Rein, M., & Schön, D. (1994). Frame reflection: Toward the resolution of intractable policy controversies. *New York: Basic Book*.

Rokeach M, ed. (1979; 2008). *Understanding Human Values: Individual and Societal*. New York: Free Press.

Rosas, J., Dresdner, J., Chávez, C., & Quiroga, M. (2014). Effect of social networks on the economic performance of TURFs: The case of the artisanal fishermen organizations in Southern Chile. *Ocean & coastal management*, *88*, 43-52.

Ros-Tonen, M., Derkyi, M., & Insaidoo, T. (2014). From co-management to landscape governance: Whither Ghana's modified taungya system?. *Forests*, *5*(12), 2996-3021.

Royal, T. A. C. (2002). Indigenous worldviews: A comparative study. *Report for Ngati Kikopiri, Te Wananga-o-Raukawa, Te Puni Kokiri, Fulbright New Zealand, Winston Churchill Memorial Trust*, *21*.

Schmidt, J. J., & Dowsley, M. (2010). Hunting with polar bears: problems with the passive properties of the commons. *Human Ecology*, *38*(3), 377-387.

Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In *Advances in experimental social psychology* (Vol. 25, pp. 1-65). Academic Press.

Schwartz, S. H. (1994). Are there universal aspects in the structure and contents of human values?. *Journal of social issues*, *50*(4), 19-45.

Schwartz, S. H., Cieciuch, J., Vecchione, M., Davidov, E., Fischer, R., Beierlein, C., ... & Dirilen-Gumus, O. (2012). Refining the theory of basic individual values. *Journal of personality and social psychology*, *103*(4), 663.

Sewell, W. (1992). *A Theory of Structure: Duality, Agency, and Transformation*. American Journal of Sociology 98 :1-29.

Shore, C., Wright, S., & Però, D. (Eds.). (2011). *Policy worlds: Anthropology and the analysis of contemporary power* (Vol. 14). Berghahn Books.

Smit, B., & Wandel, J. 2006. Adaptation, adaptive capacity and vulnerability. *Global environmental change*, *16*(3), 282-292.

Somorin, O. A., Brown, H. C. P., Visseren-Hamakers, I. J., Sonwa, D. J., Arts, B., & Nkem, J. (2012). The Congo Basin forests in a changing climate: policy discourses on adaptation and mitigation (REDD+). *Global Environmental Change*, *22*(1), 288-298.

Tomaselli, A. (2012). Natural resources claims, land conflicts and self-empowerment of Indigenous movements in the Cono Sur–The case of the Mapuche People in Chile. *International Journal on Minority and Group Rights*, *19*(2), 153-174.

Tompkins, E., & Adger, W. N. (2004). Does adaptive management of natural resources enhance resilience to climate change?. *Ecology and society*, *9*(2).

Tsing, A. L. (2004). *Friction: An ethnography of global connection*. Princeton University Press.

Tsing, A. (2012). Frictions. *The Wiley-Blackwell Encyclopedia of Globalization*.

Under secretariat of Fisheries, Chile (2019). Subpesca.

Urquhart, J., & Acott, T. (2013). Constructing 'The Stade': Fishers' and non-fishers' identity and place attachment in Hastings, south-east England. *Marine Policy*, *37*, 45-54.

Urquhart, J., & Acott, T. 2013. Constructing 'The Stade': Fishers' and non-fishers' identity and place attachment in Hastings, south-east England. *Marine Policy*, *37*, 45-54.

Van Cott, D. L. (2005). Building inclusive democracies: Indigenous peoples and ethnic minorities in Latin America. *Democratisation*, *12*(5), 820-837.

Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability and transformability in social–ecological systems. *Ecology and society*, *9*(2).

Walsh, C. (2010). Development as Buen Vivir: Institutional arrangements and (de) colonial entanglements. *Development*, *53*(1), 15-21.

Walshe, R., & Argumedo, A. (2016). Ayni, Ayllu, Yanantin and Chanincha: the cultural values enabling adaptation to climate change in communities of the potato park, in the Peruvian Andes. *GAIA-Ecological Perspectives for Science and Society*, *25*(3), 166-173.

Weeks R, Jupiter SD. Adaptive co-management of a marine protected area network in Fiji. Conserv Biol 2013;27:1234–44

Wilen, J. E. (2006). Why fisheries management fails: treating symptoms rather than the cause. *Bulletin of Marine Science*, *78*(3), 529-546.

Wise, R. M., Fazey, I., Smith, M. S., Park, S. E., Eakin, H. C., Van Garderen, E. A., & Campbell, B. (2014). Reconceptualising adaptation to climate change as part of pathways of change and response. *Global Environmental Change*, *28*, 325-336.

Wilson, D. C., Ahmed, M., Siar, S. V., & Kanagaratnam, U. (2006). Cross-scale linkages and adaptive management: fisheries co-management in Asia. *Marine Policy*, *30*(5), 523-533.

Wolf, J., Allice, I., & Bell, T. (2013). Values, climate change, and implications for adaptation: Evidence from two communities in Labrador, Canada. *Global Environmental Change*, *23*(2), 548-562.

Wright, S., & Reinhold, S. (2011). 'Studying through': a strategy for studying political transformation. Or sex, lies and British politics. *Policy worlds: Anthropology and the analysis of contemporary power*, *14*, 86.

APPENDICES

Appendix 1. Informed Consent

Consentimiento informado para el proyecto de Sarah Ebel

Usted está invitado a participar en un proyecto de investigación como parte de la Universidad de Programa de Política Ambiental de la Antropología y de Maine diseñada por PI Sarah Ebel (Departamento de Antropología) y su profesora, Dr. Christine Beitl (Departmento de Antropologia). El propósito de la entrevista es aprender acerca como su adaptó a los cambios de la marea roja. Las entrevistas se llevarán a cabo por Sarah Ebel y Maribel Bustamante Toro. Debe tener al menos 18 años de edad para participar.

¿Qué va a pedir que haga?
Si está de acuerdo, se le pedirá a participar en una entrevista de 45-60 minutos dependiendo de su tiempo y disposición a elaborar en cada pregunta. Con sólo su permiso, me gustaría grabar la conversación con una grabadora de voz digital. Para continuar, vamos a hacerle una serie de preguntas acerca de su conocimiento del ecosistema, su sindicato, y las cosas ustedes hicieron a adaptarse a los cambios en el mar.

¿Hay riesgos o beneficios?
Los únicos riesgos asociados con este estudio son inconvenientes y su tiempo.
Sus ventajas incluyen la oportunidad de compartir su conocimiento de la gestión de los recursos bentónicos en Chile. Esta forma de conocimiento y cómo los sindicatos y cooperar puede ser beneficioso tanto para los pescadores y los administradores de las pesquerías en Chile y en todo el mundo. Usted será capaz de compartir su voz con el gobierno y la comunidad científica que pueden ayudar a mejorar la gestión de la pesca.

Nota de confidencialidad
Su nombre no aparece en todos los documentos o informes y las conclusiones se informó en un resumen de mantener su confidencialidad. Vamos a utilizar un número de código en lugar de su nombre en el papel de grabación y audio de la entrevista. Una de las claves del papel que une el código con el nombre que se almacenará en el escritorio bloqueado de Ebel en la Universidad de Maine. Este proyecto puede durar hasta el 1 de mayo 2019 y el documento de la vinculación de su nombre y el número de código será destruido por el 1 de mayo 2019. Todos los archivos de audio y transcripciones serán guardados en un disco duro externo en el escritorio bloqueado de Ebel. Los archivos de audio y transcripciones sin información de identificación se mantendrán indefinidamente en el disco duro externo.

Voluntario
Su participación es voluntaria. Si decide participar en este estudio, puede parar en cualquier momento. Puede saltarse cualquier pregunta que no desee responder.

¿Preguntas?
Si usted tiene alguna pregunta acerca de la investigación, es posible que no dude en ponerse en contacto con el Co-PI Sarah Ebel en la siguiente dirección:

Sarah Ebel, Departamento de Antropología
5770 S Stevens Hall, Orono, ME 04469 a 5770
Teléfono: (860) 707-0613; E-mail: sarah.ebel@maine.edu

O, Facultad Patrocinador:
Dr. Christine Beitl, Departamento de Antropología
Teléfono: (207) 581-1893; E-Mail: christine.beitl@maine.edu

Si usted tiene alguna pregunta sobre sus derechos como participante en la investigación, por favor, póngase en contacto con Gayle Jones, asistente de la Universidad de Maine de Protección de Sujetos Humanos de la Junta de Revisión.

Gayle Jones, Oficina del Vicepresidente de Investigación

Teléfono: +1 (207) 581-1498; E - mail: gayle.jones@umit.maine.edu

Appendix 2. Semi-structured Interview (administered 2016 and 2018)

Disertación: Visiones del mar y acción colectiva en las áreas de manejo de los recursos bentónicos después de la Marea Roja en 2016
Semiestructurada Protocolo de Entrevista

Fecha: _____ Número Entrevista: _____

• Gracias por aceptar participar (presentes y explicar el consentimiento informado).
Este proyecto se lleva a cabo a través del Departamento de Antropología de la Universidad de Maine para la tesis doctoral de Sarah Ebel. El propósito de la entrevista es aprender sobre sus conocimientos del ecosistema, sus experiencias, y como respondieron a la marea roja después de 2016.
• La entrevista debe tomar 45-60 minutos dependiendo de su tiempo y disposición a elaborar en cada pregunta.
• Con su permiso, nos gustaría grabar la conversación con una grabadora de voz digital.
• Confidencial: información personal retirado, los resultados reportados en forma agregada para proteger su identidad.
• Voluntario: Si usted no se siente cómodo respondiendo a una pregunta, podemos pasar o terminar la entrevista.
• ¿Tiene alguna pregunta antes de empezar?

I. Línea de base demográfica y la información acerca de la pesca (establecer el contexto de sus respuestas)

1) ¿Cuántos años tiene usted?

2) ¿A qué bucear? (si solo dice loco, dice: **¿Algo más? **)

3) ¿Qué sindicato pertenece usted?

4) ¿Es usted de una familia de pescadores o buzos? ____ ¿Cuántas generaciones? 1º 2º 3º + (círculo)

5) ¿Siempre ha vivido en esta área y ha trabajado como buzo?

6) ¿Participa en reuniones o cualesquiera otras asociaciones?

7) ¿Tiene la pesca proporciona en la actualidad la mayoría de los ingresos de su familia?

8) Si no es así, ¿lo que proporciona la mayoría de los ingresos de su familia?

9) ¿Qué nivel de educación formal usted tiene?

10) Y sus hijos, ¿Qué nivel de la educación formal tienen?

11) ¿Tiene seguro de salud? ¿Como usted obtiene este? ¿A través del estado, o un sindicato?

12) ¿Han otros beneficios que usted recibe desde el sindicato? ¿Qué son?

II. Percepciones del mar: hábitat, poblaciones y distribución de especies, el clima, la acuicultura…

13) Por favor, marque en el mapa los hábitats, distribución de especies, y otras cosas que usted ve en el mar.

(***Usa el mapa y marque las áreas donde los buzos dicen***)

15) (Free List) En general, ¿Qué hace un ecosistema deseable en su opinión? (si necesitas, dice: por ejemplo, ¿hay una temperatura del mar que es mejor para algo?)

16) ¿Por qué estés hábitats o especies son más deseable?

17) (Depende en su respuesta) ¿En el ecosistema, que funciona tiene [este hábitat, o esta especie?]

18) ¿Usted nota cambios en el mar? ¿Qué tipos de cambios? ¿Y algo más? (***Por cada cambio, le pregunta***): ¿Por cuánto tiempo usted nota este cambio? ¿Los cambios se quedan, o se fueron desde poco tiempo?

19) ¿En este tiempo, cuales los problemas en el mar?

III. Las percepciones de la marea roja y la acción colectiva (***dimensiones de capacidad adaptiva***)

1. Social Capital

20) ¿Usted pertenece a asociaciones, organizaciones, o grupos en su comunidad? (¿Y sigue, "algo más?")

21) ¿Usted habla con socios de su sindicato en un base regular? ¿Cuántas veces cada semana? ¿Con quién habla?

22) ¿Usted habla con otra gente en su comunidad? ***Sigue…*** ¿Afuera de su comunidad? ***Sigue***… ¿Como la conoce?

23) ¿Había confianza con sus dirigentes? ¿O entre buzos en su sindicato? ¿Había la confianza entre sindicatos en esta región?

24) ¿Tiene confianza en el gobierno? (si o no, sigue…) ¿Por qué?

2. Agency

25) ¿Como usted y su familia respondió cuando la marea roja pasó?

26) ¿Sus ingresos recuperaron después de la marea roja?

27) ¿Como el sindicato respondió a la marea roja? ¿Había reuniones en su sindicato cuando la marea roja pasó?

28) ¿Había tipos de acción en su comunidad a discutir o a responder a la marea roja?

29) ¿Había conversaciones sobre la marea roja entre los sindicatos en región X?

30) ¿Si había, sobre que parte de la marea roja? ¿Ustedes hablan con la federación o hablan con la confederación nacional?

31) ¿Ve cambios a las políticas a adaptarse a los cambios en el mar?

3. Infraestructura

32) ¿Su comunidad tiene una municipalidad o centro de municipalidad?

33) ¿Hay una escuela primera? ¿Hay un colegio?

34) ¿Si por favor, describe la trasportación acá- hay buses? ¿Cuántas veces cada día sirven Puerto Montt u otros lugares?

35) ¿Hay médicos en su comunidad? ¿Hay un hospital? Si o, donde tiene que ir si necesita un médico/hospital?

36) ¿Cuándo la marea roja pasó, como afectó la infraestructura en su comunidad? Por ejemplo, ¿había infraestructura a ayudar su comunidad a adaptar?

37) ¿La marea roja influyó la construcción de infraestructura nueva? (si sí, sigue…) ¿Qué tipo, y por qué?

4. Learning

38) ¿Los cambios en el mar desde la marea roja duraron mucho tiempo? ¿Cuánto tiempo? ¿Cuáles cambios duraron la mayoría del tiempo?

39) ¿Usted cambió sus prácticas del buzo después de la marea roja?

40) ¿Usted o su sindicato cambió sus mercados o donde venden sus productos después de la marea roja?

41) ¿Los cambios en sus mercados duraron mucho tiempo? ¿Cuánto tiempo? ¿Como ajustaron?

IV. Visiones del mar

42) ¿Cuáles son sus visiones del mar para el futuro?

43) ¿Que quiere usted por el futuro de su trabajo y familia? ¿Como llegar a un bienestar?

44) ¿Usted tiene preferencias de manejo para la pesca artesanal? ¿Cuál son?

Appendix 3. Structured Survey (administered April-May 2018)

Nombre de Comuna: _____

Nombre de Sindicato o/y Comunidad Indígena:_____

I. Datos de base demografico

1. **¿Cuántos años tiene usted?** _____
2. **Su sexo**: M / F
3. **Usted trabaja como (encierre cada una que aplica a usted):**

   Buzo Pescador Artesanal Recolector Otro: _____
4. **¿A cuáles asociaciones pertenece usted? (por favor, marca cada una que usted pertenece)**

   a. Sindicato
   b. Federación
   c. CONAPACH
   d. CONDEPP Chile
   e. CONFEPACH
   f. Comunidad Indígena
   g. Comité de Manejo
   h. La Mesa de la Marea Roja
   i. Otro: _____
   l. No pertenezco a una asociación.
5. **¿Usted es dirigente de su sindicato/comunidad indígena? (circulo):** Si / No
6. **Usted es indígena (no significa que necesita estar en una comunidad indígena):** Si / No
7. **¿Cuál es su nivel de educación?**: _____
8. **Su lugar de nacimiento**: _____
9. **¿Ha salido alguna vez a trabajar fuera de su caleta o comuna?** Si / No
10. **Si sÍ, ¿dónde fue usted a trabajar?** _____
11. **¿Por qué usted salió a trabajar afuera de la comuna? (por favor escribe en el espacio abajo)**

12. ¿Cuánto dinero ganan usted y su familia al mes? _____

13. Sus hijos (por favor, marca cada una que aplica:

a. Bucean en la pesca artesanal
b. Trabajan en la pesca artesanal
c. Trabajan en las salmoneras
d. Están en la universidad
e. Están en el colegio/el liceo
f. Otro: _____

14. ¿Si usted es buzo, cuantas veces bucea al mes? _____

15. ¿En qué profundidad usted bucea normalmente? _____

16. ¿Tiene usted una enfermedad de buceo? Si / No

17. ¿Usted buseaba durante al marea rojo? Si / No

18. ¿Durante de la marea roja en el 2016, usted recibió un bono? Si / No

19. ¿Usted tiene una cuenta con el Banco Estado para recibir el bono? Si / No

II. Participación en Asociaciones

20. ¿Cuántas veces al mes usted participa en reuniones de sus asociaciones en total?

a. 1 vez b. 2 veces c. 3 veces d. más que 3 veces

Por favor, lee la frase y marca si usted está muy de acuerdo, en acuerdo, no sabe, está en desacuerdo, o está en muy desacuerdo. Marca la respuesta que más refleja lo que piensa usted.

21. Yo creo que es importante que nuestro sindicato tome decisiones en conjunto.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé
b. d. Estoy de desacuerdo e. Estoy muy desacuerdo

22. Me gusta bucear porque me siento independiente.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

23. Soy un líder en mi comunidad.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé
d. Estoy de desacuerdo e. Estoy muy desacuerdo

24. Estoy optimista por el futuro de mi comunidad.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

25. Siento que la acuicultura está cambiando el medioambiente y no hay nada que puedo hacer.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

26. Mi comunidad debería tener control del manejo de los recursos del mar.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

27. Siento que es mejor si compartimos el manejo del mar con el gobierno.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé .

d. Estoy de desacuerdo e. Estoy muy desacuerdo

28. Siento que la situación del manejo de los recursos del mar está bien y no tiene que cambiar.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé .

e. Estoy de desacuerdo e. Estoy muy desacuerdo

29. Yo tengo derechos a los recursos del mar.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé .

f. Estoy de desacuerdo e. Estoy muy desacuerdo

30. Me siento desanimado sobre mi futuro y el futuro de mi comunidad.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

31. Creo que el cambio en el ecosistema y la economía del mar es una oportunidad para que nuestra comunidad pueda hacer algo diferente.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

32. Me siento satisfecho con mi trabajo.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

33. Los humanos tienen el control de la naturaleza.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

34. Cada día, yo tengo los recursos y el apoyo que necesito para hacer mi trabajo y cuidar a mi familia.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

35. Siento que mi trabajo es valorado por otros.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

36. El acceso a los recursos marinos es necesario para mantener mi cultura y mis tradiciones religiosas o familiares.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

37. Creo que todas las personas merecen acceso a recursos naturales.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

38. Es mi responsabilidad cuidar la naturaleza y los recursos naturales.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

39. Los puntos de vistas que son diferentes de los míos son importantes a considerar cuando tomamos decisiones del manejo de recursos del mar.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

40. Siento que mi asociación puede tener influencia en la política del mar, como la ley de pesca y acuicultura.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

41. Siento que las confederaciones nacionales, como CONAPACH, CONFEPACH y CONDEPP, representan las cosas que mi sindicato necesita.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

42. Yo tengo la información y los recursos que necesito para entender las políticas del mar.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

43. A veces, yo hablo con los políticos, como senadores, alcaldes, diputados etc., del estado para comunicar las cosas que mi comunidad necesita.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

44. Yo tengo conexiones con gente que trabaja para el gobierno del estado.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

45. Yo hablo con una universidad que estudia la pesca artesanal.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

46. Yo hablo con los dirigentes de las confederaciones nacionales.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

47. Mi asociación tiene un plan para adaptarse si un evento como la marea roja ocurre en el futuro.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

48. Me uní a una nueva organización que se formó después de la marea roja en 2016 con la esperanza de que pudiera influenciar en las decisiones del gobierno.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

49. Yo puedo cambiar mi trabajo y hacer otra cosa si es necesario.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

50. Cambié mis prácticas de bucear o de recolectar después de la marea roja, como también en donde vendo mis productos.

a. Estoy muy de acuerdo b. Estoy en acuerdo c. No sé

d. Estoy de desacuerdo e. Estoy muy desacuerdo

51. ¿En su opinión, que tipo de recursos o información necesita usted para adaptarse a los cambios en el mar? Por favor, escriba abajo:

BIOGRAPHY OF THE AUTHOR

Sarah A. Ebel was born in Simsbury, CT on November 24th, 1987. She was raised in Simsbury and graduated from Simsbury High School in 2006. Sarah moved to Maine in 2006 to attend Bowdoin College (Brunswick, Maine) where she earned a bachelor's degree in Biology and Environmental Studies in 2010. After graduating, she traveled around the world for a year as a Thomas J. Watson Fellow exploring community organizing and marine management in coastal communities in Chile, New Zealand, Tanzania, Indonesia, and Scotland. She returned to Maine in late 2011 to work as a Community and Outreach Coordinator with Maine Center for Coastal Fisheries. Upon finishing there, Sarah worked as a sternman on a lobster boat, the F/V Nightingale, for two years before returning to school to pursue her PhD at the University of Maine. Sarah is a candidate for Doctor of Philosophy degree in Anthropology and Environmental Policy from the University of Maine in May 2019.