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RESEARCH ARTICLE

Moving Beyond Co-Management: Opportunities and Limitations for Enabling Transitions to Polycentric Governance in Chile's Territorial User Rights in Fisheries Policy

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This paper contributes insights to discussions of adaptive governance in marine socio-ecological systems by elucidating the conditions which limit or enable the transition 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 transition 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 an Indigenous marine protected area. 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 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. I then examine the conditions under which fishing unions in Ancud facilitated the beginnings of polycentric governance through new management plans.

Keywords: environmental governance; polycentric governance; co-management; institutions; fisheries; Chile; policy

1. 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 governance structure that can address uncertainty and complexity to foster resilient socio-ecological systems and create 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 (McClenachan, O'Connor, and Reynolds, 2015). 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. 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 (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). The specific difference between the two governance structures is that co-management is a binary sharing of power between resource users and the government (Gelcich 2014), while polycentric approaches incorporate more stakeholders into governance by allowing for autonomous, overlapping, formal institutions with many centers of decision-making (Ostrom, Tiebout, and Warren, 1961). Polycentric governance was initially conceptualized to show that centralized governance was not always necessary, and in fact, was frequently insufficient in responding to local needs (Ostrom, Tiebout, and Warren, 1961). Polycentric governance had the capacity to respond to local needs and preferences, while also meeting the needs of higher-level policy and administrative authorities (Ostrom, Tiebout, and Warren, 1961; Ostrom, Parks, and Whitaker, 1973). As studies of governance were applied to natural resource management, assumptions that resources needed to be managed by the state or be privatized (Hardin, 1968) were debunked by scholars who illustrated that local resource users often develop and enforce rules which facilitate resource conservation (McCay and Acheson, 1987; Ostrom, 1990; Ostrom, Walker, and Gardener 1992). This fundamental research underpins the development of theories of polycentricity and allows for insights into how local needs can be matched with the objectives of higher level decision-making authorities.

This paper contributes novel insights to discussions of polycentric approaches to governance by elucidating the conditions which may limit or enable transitions from co-management to polycentric governance in southern Chile's marine socio-ecological system. Southern Chile's complex marine socio-ecological system provides a lens into how individuals interact with governance structures on the ground and illustrates how local individuals act collectively across various groups to integrate diverse actors into new formal institutions which link autonomous, governing authorities to bridge the local to national levels. Specifically, I focus on how, under new legislation in Chile, local fishing unions, governed by Chile's Territorial User Rights in Fisheries (TURFs) policy, cooperate with government officials, seafood processors, and independent resource users to establish a new management committee to regulate numerous species at multiple scales.

I offer a comparative study of two coastal communities, Carelmapu and Ancud (**Figure 1**), which are both bound by the same political structures that govern marine resource governance and are home to multiple fishing unions. Although the two communities are governed by the same legislative structures, the communities have interacted with the structures differently, resulting in varying outcomes in communities' abilities to create formal institutions which link local level actors to other governing authorities to transition from co-management to polycentric approaches 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 development of a new, formal polycentric institution which bridges local fishers, national government officials, and other stakeholders, while the other community is riddled with conflict and resistance, which has posed a significant barrier to successful collective action and the emergence of an institution which bridges governance levels. This comparative design of these two communities allows me to identify specific conditions that facilitate the transition toward polycentric governance approaches in one case, but not the other.

1.1. 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 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 social, political, geographical, and institutional levels (Jentoft 2013; Pomeroy et al. 2001; Wilson et al. 2006). At the political and institutional

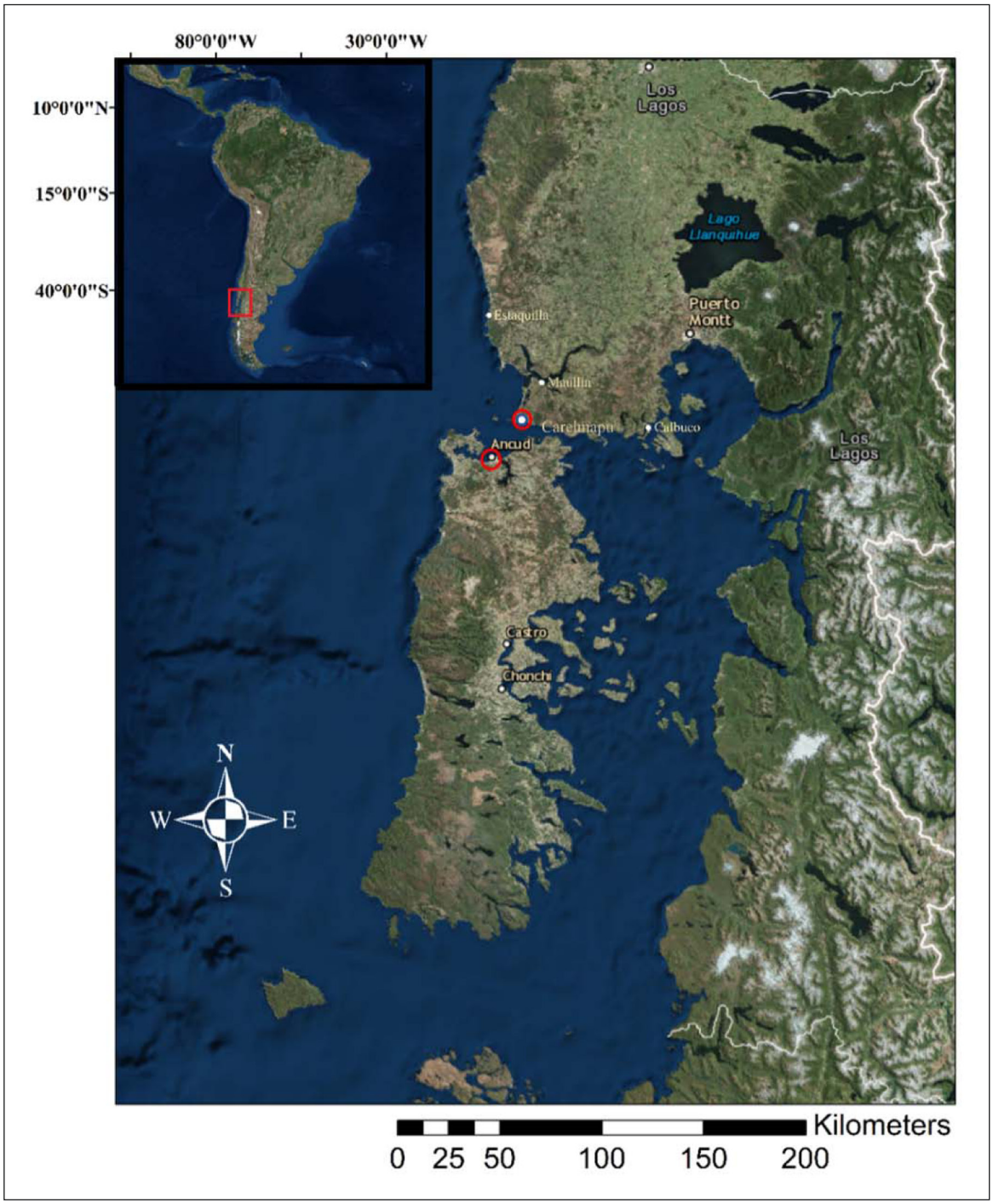

Figure 1: A map of the Lakes Region with field sites Ancud and Carelmapu circled in red.

levels, the state government must enable legislation that fosters shared power and decision-making, create supportive institutions that empower communities (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). The experiments were not only beneficial to understandings of how humans affect intertidal ecological dynamics (Castilla 1999) 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. 2005).

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, rights to the resources were leased to fishing unions. 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 transition to polycentric approaches to governance and the emergence of institutions which link automonous, governing authorities.

1.2. Opportunities for polycentric governance in Chile

New legislation, an amendment to Chile's FAL in 2013, moves away from solely having individual fishing unions as management institutions, paving the platform for the development of polycentric institutions which bring together multiple governing authorities and bridge the local to national level. Instead of the binary co-management governance, the new legislation promotes cooperation across fishing unions, independent fishers, government officials, and other stakeholders to establish management committees to regulate a multitude of species at multiple scales (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 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). If the proposal is accepted, the stakeholders who are under this management plan must comply with the new regulations (Gelcich 2014). Every three years, participating stakeholders 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 meet local needs and 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 Chile, 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.

Outcomes in transitions to polycentric governance are often contextually dependent (Baldwin et al. 2016; Carlise and Gruby 2018; Gelcich 2014), and the structure of policy as well as the history of a specific area and its institutions may facilitate or hinder the formation of polycentric institutions (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 considered (da Silveira and Richards 2013) within this context. Polycentric governance should involve both competitive and cooperative relationships with "central mechanisms to resolve conflicts" (Ostrom, Tiebout, and Warren, 1961: 831), and an understanding of embedded power differentials as they may influence inequitable outcomes or dysfunction in governance transitions (da Silveira and Richards 2013: 320).

1.3. 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). 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 excludes 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 and to maintain their culture traditions. The rights to create these marine protected areas are granted to Indigenous Communities for subsistence harvesting and cultural practices by Subpesca, the same agency which governs the TURFs policy and aquaculture concessions. Indigenous communities can include other stakeholders, such as fishers, in the development and planning of ECMPOS, but it is at their discretion. The inclusion of other groups can form intersectoral communities, such as an 'association of communities' formed by

an Indigenous Community and non-Indigenous resource users. 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 for an ECMPO 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. This legislative structure has resulted in a redistribution of power in marine governance but potentially creates the space for the development 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: the TURFs policy, the Aquaculture Law, and the Lafkenche Law, has played out differently in the communities of Ancud and Carelmapu regarding their ability to form institutions which bridge multiple levels of decision-making. 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. This form of conflict may facilitate learning, and thus change, to form new institutions or new linkages to develop a coherent polycentric system (Ostrom, Tiebout, and Warren, 1961), or it may create dysfunctional competition, where the components of the governance system are unable to operate to achieve common goals (da Silveira and Richards 2013). Given that "cooperative undertakings" across independent centers of decision-making (Ostrom, Tiebout, and Warren, 1961: 831) and internal operational linkages to facilitate data and information exchange and achieve goals (da Silveira and Richards 2013) are cornerstones of polycentric governance, a meaningful shift toward polycentric governance through the creation of a new institution which bridges autonomous groups in Carelmapu seems unlikely in the short term.

2. Methods

2.1. 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 Indigenous fishers, non-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 (INE 2018). Increasingly, these stakeholders 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 (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 (**Table 1**).

Table 1: Field site description of Ancud and Carelmapu.

Field Sites	Population	# of Fishing Unions	% of Indigenous population	Proposed ECMPOs
Ancud	40,000	7	29%	0
Carelmapu	2,800	5	22%	1

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.

2.2 Data collection methods and analysis

I gathered ethnographic data in Ancud and Carelmapu over two years, including ten months of participant observation between July 2016 and June 2018. In 2018, I conducted 26 semi-structured interviews relevant to this study between February to April 2018 (n = 15 in Carelmapu and n = 11 in Ancud), of which 22 hours are recorded and transcribed. The interview guide asked individuals questions relating to the following topics: (1) demographics, (2) social learning and adaptation, (3) community infrastructure (docks, schools, hospitals, etc.), (3) flexibility of livelihoods and institutions—mainly, how individuals respond to environmental change and policy change, and (4) collective action and belonging—which groups individuals belonged to, if they had recently joined new organizations, and why. Interview participants were recruited using snowball sampling where I built off my pre-existing relationships formed during fieldwork in 2016. Participants belonged to local fishing unions, independent fishers who also worked as divers on aquaculture farms, and members of the Indigenous Community. Fishers and members of the Indigenous Community were not mutually exclusive groups—many union members were also members of the Indigenous Community or identified as Indigenous. Also, fishers who were members of local unions also belonged to regional fisher federations and national fisher confederations, thus fishing union members views also reflected the views of regional and national formal institutions. These individuals bridged levels of local, regional, and national governance, offering insights into the process of creating operational linkages (da Silveira and Richards 2013).

I also attended five fishing union meetings and three Indigenous community meetings between February and May 2018 which provided an ethnographic account of the inner-workings of local level institutions and an understanding of how various stakeholder groups were cooperating or conflicting to form new formal institutions which would bridge multi-level actors and autonomous decision centers. I also 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. In particular, I asked fishers about their visions for future marine resource management and the future of their communities. Participant observation and ethnography can provide significant insights in the process of governance transitions and the emergence of institutions, but is often still lacking in studies of governance in socio-ecological systems (Fabinyi, Foale, and Macintyre 2015; Poe, Norman, and Levin 2014). I took comprehensive field notes from over 400 hours of observations and informal conversations with stakeholders in 2018, documenting topics discussed at meetings and fishers' interactions with government officials from Subpesca during meetings which Subpesca officials were present.

Semi-structured interviews and field notes were manually coded for themes using inductive coding where the themes were not pre-determined, but instead were interpreted from the raw ethnographic interview and fieldnote transcriptions. Themes were identified when the same topic arose three or more times in one interview, and across more than one third of all individual interviews in each community. Themes included the three discussed here: ocean use conflict, stakeholder conflict, and preferences for management, as well as ontologies, values, adaptation, livelihood resilience, and gender. The three themes most relevant to the discussion of a transition co-management to a polycentric approach are the three discussed in this paper. Themes were verified by two union leaders from each of the two communities who also belonged to regional fisher federations and one Indigenous community leader from Carelmapu.

3. Results

3.1. 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 2**). The themes are: (1) ocean use conflict, described as the encroachment of other ocean uses on fishing unions' TURF management areas, (2) stakeholder conflict, which includes individuals' mentions of conflict with other stakeholder groups, and (3) preferences for management, which arose from questions asking individuals about their visions and hopes for the future. The potential for theme 1, ocean use conflict, is illustrated in **Figures 2** and **3**.

Ocean use conflict was pervasive through interviews with fishers and Indigenous Communities in both Ancud and Carelmapu, being discussed five or more instances per interview by all research participants. This theme initiated the ethnographic study of stakeholders' interactions with legislative structures, as well

Table 2: Summary of themes from semi-structured interviews (n = 26). Note: themes are not mutually exclusive.

Theme	Theme Description	Ancud (n =11 interviews)	Carelmapu (n = 15 interviews)	Examples of Quotes Coded with Theme
Ocean Use Conflict	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."
Stakeholder 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 their visions and hopes for the future of their communities and marine resource management. I found that fishers in Ancud had similar visions and 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."

as the creation of a map of ocean use in the Lakes Region (**Figures 2** and **3**) to explore the theme of ocean use conflict through geographic space. This theme in large part 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 stakeholder groups. The second theme of stakeholder conflict was salient in all 15 interviews in Carelmapu, arising five or more times in all interviews, specifically discussing the conflict between

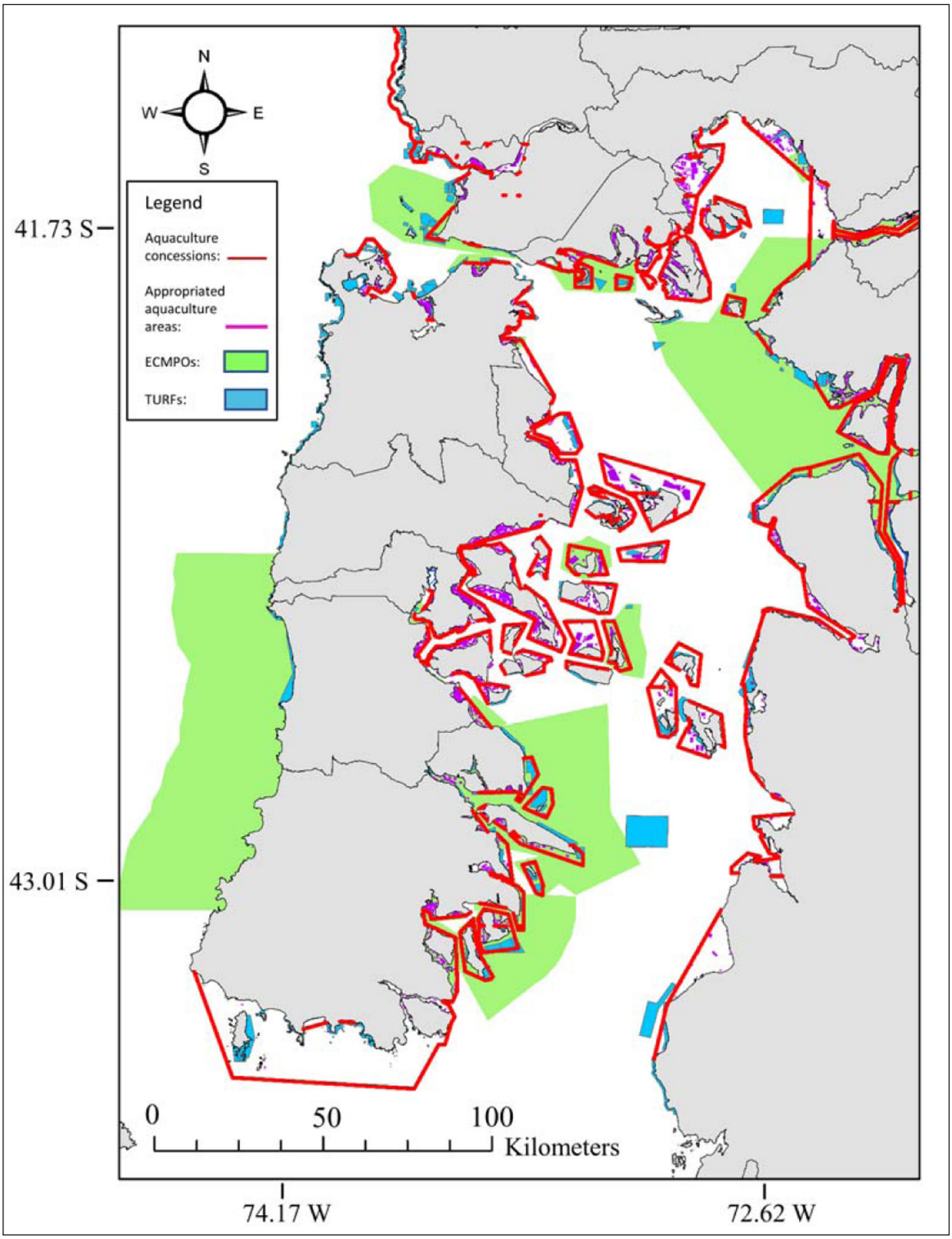

Figure 2: A map of ocean use around Chiloé Island. This map shows how ocean uses in the Lakes Region are in close proximity, which has caused tensions within Ancud and Carelmapu. Map made using ArcGIS Version 10.2 and data spatial data requested from Sernapesca, Chile's national fisheries service.

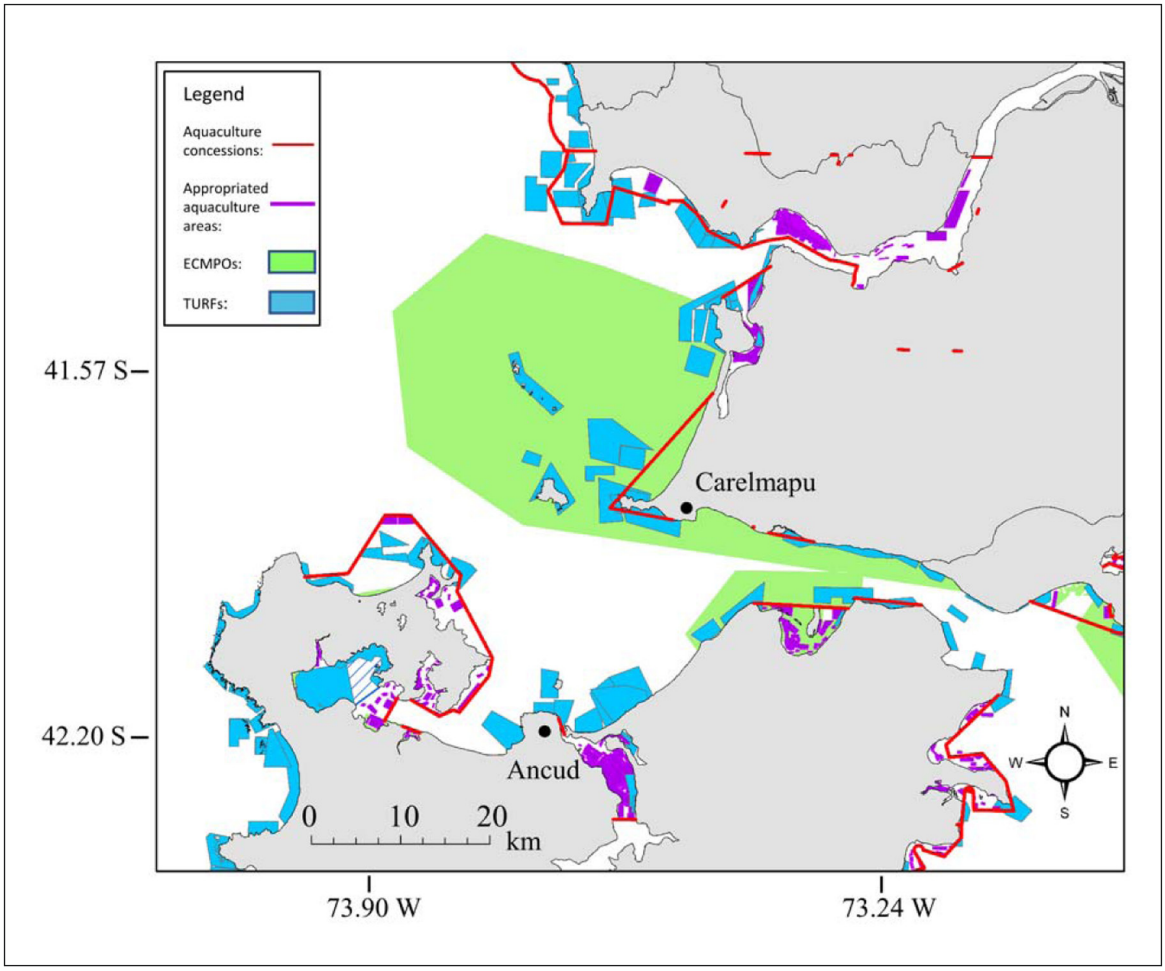

Figure 3: A map of ocean use surrounding the communities of Ancud and Carelmapu. The green polygon off of Carelmapu is the proposed ECMPO which has caused conflict between Indigenous and non-Indigenous stakeholders. Map made using ArcGIS Version 10.2 and data spatial data requested from Sernapesca, Chile's national fisheries service.

non-Indigenous fishers and the Indigenous Communities. However, this theme was not discussed in Ancud. Instead, the theme of preferences for management dominated discussions in Ancud. When individuals were asked their visions for the future of marine resource management, they had similar responses, arising five or more times in 10 out of 11 interviews. The sharing of those individual 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. Collective preferences for management, particularly in Ancud, may have existed prior to the conflict in ocean use, but it was evident that the conflict in ocean use spurred discussions about future management. These three themes suggest that the new stakeholders who entered the picture of environmental governance after the inception of the FAL in 1991 have created new ocean uses through new legislative structures which have shifted power dynamics in environmental governance.

4. Discussion

Around the world, the intersection between traditional resource users, global markets, and Indigneous groups foster complex dynamics and frustration among groups as to how to agree on objectives in natural resource management (Berkes 2006) and achieve transitions in governance (Bixler 2014). These dynamics and these frustrations are rooted in sociopolitical history, conflicts in space, and the demands driven by globalization. Here, I explore this problem by examining how legislative structures have shifted power dynamics in environmental governance in southern Chile, which has resulted in conflict in the community of Carelmapu, but collective action in Ancud. 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 transition from co-management to polycentric governance. By examining both communities, I identify the conditions which may limit or foster successful transitions to polycentric governance.

4.1. 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 appropriated aquaculture areas (**Figures 2** and **3**). 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. 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 regulation as well as the rapid increase in aquaculture production since 1995 suggests that their feelings may be justified—fishers are not integrated into the process and thus have no power in decision-making.

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 this 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, Wright and Peró 2011) by shifting the burden of governance and ecological outcomes onto the local stakeholders (Davis and Ruddle 2012).

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 study 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 local level actors 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 transition 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) or facilitates functional competition between groups (da Silveira and Richards 2013; Ostrom, Tiebout, and Warren 1961). Embedded power differentials, as seen in the formation of aquaculture, may cause inequitable outcomes in governance and dysfunctional competition because groups will be unable to create operational linkages (da Silveira and Richards 2013: 321). 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 on their own. The legislative structures and the threats from the proliferation of aquaculture pose new challenges for resource users, and Ancud and Carelmapu are responding to these threats and interacting with the governance structures in different ways.

4.2. 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, which created the avenue for Indigenous Communities to form ECMPOs. While ECMPOs address some of the tensions rising from the loss of ocean space to aquaculture, fishing unions in Carelmapu that have long been beneficiaries of the co-management system of TURFs felt increasingly threatened by the ECMPOs. The interaction between the Lafkenche Law and individuals bring the conflict in ocean use directly between community-level stakeholders, which differs from the conflict with aquaculture farms where those who have power to develop aquaculture farms are often not residing in local communities and "disappear," similar to Randeria and Grunder (2011)'s "cunning state" (189).

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 a 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. After the first meeting, all non-Indigenous leaders from fishing unions refused to cooperate any further in planning the development of the ECMPO. When I asked the fishers 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.

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. 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. Despite an invitation for collaboration by the Indigenous Community, the fishers resisted any form of cooperation and opportunity to transition 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. This has implications for stakeholders' abilities to transition co-management to polycentric governance, because non-cooperation which arises from perceptions of unequal power dynamics prevents the necessary communication and data exchange pathways needed to form new institutions (da Silveira and Richards 2013).

4.3. The makings of polycentric governance in Ancud

In Ancud, fishers 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, likely because there was not an active proposal of an ECMPO near their fishing grounds. Therefore, the Lafkenche Law was not perceived to be shifting power in governance. Instead, the exclusion from decision-making related to aquaculture catalyzed fishers' active involvement in the transition to polycentric governance by initiating the emergence of a formal institution which bridges independent, multi-level centers of decision-making. I sought to understand why fishing unions were able to initiate the formation of a management committee. I suggest that the initiation was in part facilitated by 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 the formation of a new institution which bridged the local level to higher level authorities.

Fishers in 10 of 11 interviews in Ancud recognized a need for new policy, stimulating discussion among fishers about their preferences for future management. In interviews, informal conversations, and attendance at union meetings, I asked fishers how they envisioned future resource management. Fishers had similar preferences for management, stating that the threat of aquaculture development may be overcome with new policy development. Their suggestions for new policy development go beyond the original 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 allow 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 to address industrial contamination in the river and overexploitation of productive sea beds. It also demands maritime concessions. This Management Committee is an example of the management committees outlined in the 2013 amendment to the FAL which offered a platform for governance transitions (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 with multiple levels of 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.

The Management Committee seems to have excluded Ancud's Indigenous Communities as stakeholder in the decision-making process. This may be due to a currently inactive Indigenous Community in marine resource management in Ancud. ECMPOs have been formed off certain regions of Chiloé Island in the past, but there is no current proposal for an ECMPO in areas where Ancud's fishers harvest resources. In contrast, in Carelmapu the Indigenous Community plays an active role in envisioning the future of marine resources and has proposed an ECMPO off the coast. It remains to be seen if the Management Committee in Ancud will be willing to coordinate management efforts with the Indigenous Community if Ancud's Indigenous Community becomes more active in marine resource management.

With 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 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 also allows fishing union members to apply for aquaculture concessions 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 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 seaweed [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 it at the base, allowing the seaweed to regrow while simultaneously providing the best quality part of the plant for the market. Fishers are hopeful that with collaboration and a larger, more inclusive management area, they will be able to contend with large-scale aquaculture.

4.4. Conditions which limit or enable polycentric governance

By examining the conflict in Carelmapu, I suggest that the main condition which may limit the transition to polycentric governance is twofold: (1) a structural shift in power through new legislation, and (2) fishers' subsequent resistance to cooperating with other community-level stakeholders for fear of losing power in governance. It is fishers' interactions with the legislative structures and their perceived competition

with the Indigenous Communities for resource access that has led to non-cooperation and dysfunctional competition (da Silveira and Richards 2013).

As noted in Gelcich (2014: 578), polycentricism requires cooperation and collaboration across stakeholder groups to resolve conflicts and govern across independent decision-making centers. Furthermore, polycentric governance systems may be dysfunctional or unachievable when the system's components are unable to coordinate and cooperate operationally to work towards objectives which achieve multiple interests (da Silveira and Richards 2013). Conflict in Carelmapu has prevented the formation of operational linkages and has inhibited stakeholders' self-organization. Early assessments of management committees in Chile corroborate my findings that this form of dysfunctional competition and conflict may constrain the transition to polycentric governance (Gelcich, Reyes-Mendy, and Rios, 2019). 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 to show that it is the interaction between the new legislative structures and stakeholders which stimulated fishers' fears that they were losing power in governance and access rights to their open-access areas. Resistance by fishers may hinder the creation of institutions, the integration of knowledge systems, and the collaboration needed to transition to polycentric governance. Furthermore, their resistance will result in the dispossession of their resource access and ocean space.

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. This allowed them to collaborate across groups and form a management committee with representatives from each 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 space where there are vertical, horizontal, and cross-level interactions between multiple, autonomous institutions.

4.5. Advancing polycentric governance

Research has shown that polycentric approaches to governance may allow for cooperative monitoring of socio-ecological systems, social learning, and innovation (Galaz et al. 2012; Ostrom, 2010) and may be a better fit for some social, administrative, and ecological contexts (Baldwin et al. 2016). Baldwin et al. (2016) show how centralized control of water resources in Kenya was reformed to polycentric approaches to better match Kenya's social, ecological, and administrative context. Centralized governance in Kenya had several shortcomings, including resistance, rebellion, and informal lawlessness because of Kenya's limited administrated capacity (Baldwin et al. 2016; 215–216). A transition to polycentric approaches in Kenya's water governance allowed for sharing of responsibility across multiple governing authorities, from local and regional associations to centralized management authorities, which fostered the formalization of collaborative governance (Baldwin et al. 2016). In many ways, polycentric governance has been found to foster more effective, equitable, and sustainable socio-ecological outcomes (Baldwin et al. 2016; Ostrom 2010).

While recent studies have offered significant insights into polycentric governance by examining the transition from centralized governance to polycentric approaches, such as in Kenya's water governance (Baldwin et al. 2016; McCord et al. 2017) and community-based management to polycentric approaches, such as in the forestry sector in Revelstoke, British Columbia (Bixler 2014) and small-scale fishing in Palau (Carlisle and Gruby 2018), it is still less known what conditions facilitate the reform of co-management systems to transition to a polycentric approach (Gelcich 2014; Ros-Tonen, Derkyi, and Insaidoo 2014). What is known is that reform must be built upon the existing strengths of co-management systems, their social structures, and the knowledge which actors have gained over time (Gelcich et al. 2010; Gelcich, 2014; Ros-Tonen, Derkyi, and Insaidoo 2014). Furthermore, the transition requires collaboration and working through stakeholder conflict (Gelcich 2014; Gelcich et al. 2018). As this study suggests, knowledge of diverse stakeholders' objectives, worldviews, and social networks, as well as an empirical understanding how political structures facilitate or constrain the formation of polycentric governance approaches, are also necessary.

5. Conclusion

This study illustrates that the ability for communities to initiate the transition to polycentric governance in southern Chile was, in part, defined by the interaction between the existing structures and individuals' perceptions of 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 showed that fishers, threatened by the proliferation of aquaculture and failed by a legislative structure that excluded them from decision-making, drew upon their collective preferences for management and their social networks to create a management committee through a new legislative policy implemented in 2013. The Management Committee in Ancud is a polycentric institution which bridges the local, regional, and national levels and multiple bodies of decision-making. However, in the community of Carelmapu, fishing unions, bound by the same legislative structures, were unable to initiate the development of a polycentric institution. 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 Lafkenche Law and the creation of ECMPOs by Indigenous Communities.

This study suggests that building upon co-management structures to transition to polycentric governance may be possible in communities that have similar visions for the future and preferences for management, such as in Ancud, and in communities where conflict does not result in dysfunction and the inability to create operational linkages. Resource users' resistance and non-cooperation with other stakeholders may inhibit a transition to polycentric governance, such as in Carelmapu. In particular, this study highlights the need to understand individuals' perceptions of legislative structures and human agency within the context of legislative structure to understand how individuals can enact their agency to foster cooperation and transitions in governance. I also observed that conflict may be underpinned by a clash of identities, ontologies, and individuals' perceptions of history and 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 pointed to a need to understand individual and group identity and its relationship to worldviews, conflict, and governance. In addition, further research is needed to understand the process of creating just transformations in sustainability and environmental governance (Bennett et al. 2019) and the cultural and social factors which contribute to resolving conflict, sharing power, and integrating meaningful participation in governance to fully realize a shift to polycentric governance in socio-ecological systems.

Competing Interests

The author has no competing interests to declare.

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