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2 Values underlying preferences for adaptive governance in a Chilean small-scale fishing
3 community
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10 ABSTRACT:

11 Environmental change requires individuals and institutions to facilitate adaptive governance.
12 However, facilitating adaptive governance may be difficult because resource users' perceptions
13 of desirable ways of life vary. These perceptions influence preferences related to environmental
14 governance and may stem from the ways individuals subjectively value their work and their
15 connections to their environment. This paper uses a value-based approach to examine
16 individual and institutional preferences for adaptive governance in Carelmapu, Chile. We show
17 that two groups had different value frames rooted in divergent ontologies which influenced
18 their actions related to adaptive governance, creating conflict.

19 Key words: adaptive governance, values, environmental change, marine fisheries, adaptation

20 1. INTRODUCTION

21 Theories of adaptive governance of socio-ecological systems suggest that for resource-
22 dependent communities to adapt to unprecedented environmental change, communities must
23 have the capacity to transition to adaptive resource governance, instead of just coping
24 (Fabricius et al., 2007; Walker et al., 2004). However, achieving adaptive governance—where
25 individuals form the structures and processes they need to make decisions and share power to
26 provide a direction and collaborative vision for sustainable management (Boyle et al., 2001)—
27 can be difficult for individuals to navigate because individuals' perceptions of desirable ways
28 of life vary (Coulthard, 2008) and their cultural and historical connections to the environment

29 may differ (Jenoft and Chuenpagdee, 2009). These perceptions and connections to the
30 environment influence the decisions they make with regards to adaptation (McGregor et al.,
31 2009) as well as underpin their preferences related to governance transitions (Rein and Schon,
32 1994). Sometimes these different preferences for adaptation to environmental change may lead
33 to divergent policy actions and conflict between groups (Adger et al., 2013; Coulthard, 2011;
34 O'Brien and Wolf, 2010; Pakizeh et al., 2007; Somorin et al., 2012; Wise et al., 2014). This is
35 in part because individuals' preferences are often influenced by how resource users'
36 subjectively and differentially value their experiences and their connections to their
37 communities and environment (O'Brien and Wolf, 2010).

38 Human values, defined as 'desirable trans-situational goals, varying in importance, that
39 serve as guiding principles in the life of a person or other social entity' (Schwartz, 1994: 21),
40 refer to an individual's or group's desires, preferences, objectives, and needs (O'Brien, 2009;
41 O'Brien and Wolf, 2010; Rokeach, 1979; 2008; Schwartz, 1992; 1994). Some attention has
42 been given to examining how individuals' or groups' values influence their preferences for
43 adaptation and actions related to policy (O'Brien and Wolf, 2010; Somorin et al., 2012),
44 specifically in large policy programs such as REDD+ (Somorin et al., 2012). However, there
45 is an increasing need to substantiate and further understand how human values can act as social
46 indicators of environmental sustainability (Hicks et al., 2016) and how they can contribute to
47 understandings of individual and institutional actions in governance (Haverkamp, 2017).

48 This paper uses a values-based approach to examine how human values underpin
49 individuals' and institutional preferences for governance, using a case study of Carelmapu, a
50 community in the Lakes Region of southern Chile. In 2016, a harmful algal bloom (red tide)
51 devastated the region's economy and fishing industry, leaving residents of Carelmapu without
52 access to fishing, their main source of livelihood, for six months. With few other job

53 opportunities available outside of the fishing industry and high magnitude red tides predicted
54 in the future (Buschmann et al., 2016), the community started to plan how to adapt.

55 Analysis of ethnographic data conducted in Carelmapu in 2018 demonstrated that,
56 despite a shared dependence on the sea, two local institutions, the Lafkenche Indigenous
57 Community and the local fishing unions, had different preferences for pursuing adaptive
58 governance. The Lafkenche Indigenous Community proposed a marine protected area through
59 the Lafkenche Law, a state law implemented in 2008 which grants Indigenous Communities
60 ancestral rights to the sea. The Indigenous Community saw the protected area as a means to
61 maintain their cultural traditions and to revitalize and diversify economic opportunities. In
62 contrast, the fishing unions wanted to continue the status quo of management or to potentially
63 change legislation to harvest new species. Fishing unions did not want the protected area
64 because they were concerned that their access to resource harvesting in open-access areas
65 would change. The difference in these preferences for governance triggered conflict in
66 Carelmapu, which resulted in the fishing unions refusing to cooperate with the Indigenous
67 Community.

68 Informed by our ethnographic data and scholarship which suggests that conflict in
69 adaptation may be underpinned by opposing values (O'Brien and Wolf, 2010), we
70 hypothesized that the conflict between the two groups in Carelmapu was in part driven by
71 divergent values. To test this hypothesis, we adapted Schwartz et al., (2012)'s framework of
72 universal human values to conduct a multi-level analysis of individual and group values. A
73 values-based approach can elicit diverse conceptualizations of what is desirable, whose values
74 are prioritized, and why there may be conflict between groups (Haverkamp, 2017). It can also
75 elicit knowledge of how individuals organize their experiences and produce action in policy
76 (Schon and Rein, 1994).

77 2. BACKGROUND

78 2.1 *The relationship between values and actions related to governance*

79 Certain values have been shown to be shared by humans across culturally, socially,
80 economically and geographically diverse groups (Schwartz, 1992; Pakizeh et al., 2007;
81 Schwartz et al., 2012). Yet, values may differ in their relative importance to the individual or
82 group (Pakizeh et al., 2007; Schwartz et al., 2012). The variation in importance is what
83 contributes to different motivations and behaviors (Schwartz, 1992), and preferences for
84 adaptation (Havercamp, 2017; O'Brien and Wolf, 2010). In a cross-cultural study of human
85 values in 44 countries, Schwartz (1992) identified ten universal human values, some of which
86 are compatible and others which stand in opposition to each other. For example, in the context
87 of adaptation, individuals who exhibit values of “self-direction” or “universalism” may focus
88 their efforts on social or environmental justice to foster equitable processes, while others who
89 exhibit values of “achievement” or “power” may prioritize their own goals, which may lead to
90 conflict (Havercamp, 2017; Schwartz et al., 1992). Schwartz furthered his theory on universal
91 human values by adding nine more values in Schwartz et al., (2012) (Table 1) to create “a finer
92 set of meaningful, conceptually distinct values which may have universal, stronger heuristic
93 and predictive power (Schwartz et al. 2012: 664). Other studies have used this theory and
94 qualitative measures of values to understand stakeholder decision-making and adaptation. For
95 example, Havercamp (2017) investigated motivational factors in climate change adaptation
96 decision-making in Hampton Roads, VA, USA while Wolf et al., (2013) examined the ways in
97 which individuals’ values were connected to their views on adaptation to demonstrate how
98 values shape individuals’ interpretations of climate change impacts in Labrador. With regards
99 to governance and policy action, how individuals and institutions organize their experiences
100 and produce a bias for action may be related to their value system (Somorin et al., 2012).

101 This paper uses eleven of Schwartz et al., (2012)'s nineteen universal values to examine
102 groups' and individuals' values which may underlie their preferences related to adaptive
103 governance. Like Haverkamp (2017) and Wolf et al., (2013), values used in this study were
104 identified through ethnographic interviews and participant observation. The remaining eight
105 values from Schwartz et al., (2012) were not used in this study because they did not emerge
106 from the ethnographic data. Following a multi-phased research design (Johnson 1998), this
107 study integrates the values we identified into a structured survey to quantitatively measure the
108 presence of the values in Carelmapu. Here, our intention is not to test Schwartz et al., (2012)'s
109 theory, but to bridge a mixed methods values-based approach with literature on adaptive
110 governance. We draw on the ethnographic research in our interpretation of how values
111 underpin the refusal of one group to cooperate with the other in resource governance.

112 *2.2 Ethnographic setting*

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

125 Carelmapu has five fishing unions with a total of 500 members and six Indigenous
126 Communities with a total of 250 individuals including children. All six Indigenous
127 Communities worked together to develop a plan for a Marine Coastal Spaces of the Original
128 Peoples (ECMPO), thus we refer to them as one group, the Indigenous Community. Another
129 700 individuals are independent divers or *recolectores*. These populations are not mutually
130 exclusive. Many members of the Indigenous Community are also members of fishing unions,
131 and some independent divers and *recolectores* are also members of the Indigenous Community.

132 Carelmapu was once an active port during the 1960s through the 1990s, but
133 demographics began to change again in the 2000's as the proliferation of aquaculture provided
134 a better economic opportunity in other parts of the region, drawing young people away from
135 Carelmapu (Ebel, 2018). The aquaculture industry in the Lakes Region continues to grow,
136 employing well over 50,000 individuals in the region. Yet, the expansion in aquaculture is not
137 without environmental consequences or social conflict (Daughters, 2018). Pollution from
138 salmon farms significantly disrupts the ecosystem, contributing to the formation of red tides,
139 which often leads to the temporary closure of commercial fisheries due to the toxicity of
140 harvestable species (Daughters, 2018). Furthermore, the encroachment of aquaculture on
141 commercial fishing areas threatens resource users' livelihoods by limiting the extent of their
142 harvest areas, forcing them to turn to other livelihood strategies or leave their communities
143 (Ebel, 2018). Residents of Carelmapu are acutely affected by environmental and economic
144 change associated with the ocean. They are increasingly caught between local and global
145 forces, such as climate change, aquaculture, and economic markets, which affect their access
146 to marine resources and subsequently, their livelihoods.

147 In 2016 an environmental crisis occurred at a magnitude the region had never seen. The
148 perfect storm of climate anomalies and pollution from aquaculture farms triggered an extensive

149 red tide which caused widespread marine species mortalities and the closure of all wild-caught
150 fisheries and aquaculture exports (Buschmann et al., 2016), paralyzing the region’s economy
151 (Daughters, 2018). The 2016 crisis disrupted resource users’ livelihoods for half a year (Ebel,
152 2018). As harmful algal blooms are predicted to occur with increased frequency (Buschmann
153 et al., 2016), the 2016 crisis prompted community-based groups in Carelmapu to think about
154 how to adjust their livelihoods to make them more adaptive to future risks.

155 *2.3 The Indigenous Community’s history and preferences for adaptive governance*

156 The Lafkenche Indigenous Community (referred to by members as *the Indigenous*
157 *Community*) is an institution recognized by the state of Chile. The Indigenous Community in
158 Carelmapu is part of the Lafkenche people, or “People of the Sea,” a group which belongs to
159 the larger population of the Mapuche Indigenous people. In Carelmapu, the Indigenous
160 Community was formed in 1996. In 2008, “La Ley Lafkenche” (The Lafkenche Law) allowed
161 for Indigenous Communities to submit requests to the state to create ECMPOs, which would
162 give rights to Indigenous peoples to access designated marine areas based on their ancestral
163 customary use. After the 2016 crisis, the Indigenous Community in Carelmapu began the
164 process of submitting a request to the state to create an ECMPO called the “Borde Costero”
165 (Coastal Border), a protected area that would include part of the shoreline and extend out to
166 12km into the sea. The Indigenous Community was severely affected by the crisis in 2016—
167 many members of their community were out of work and were unable to continue their
168 traditional subsistence practices. They believed that a protected area would prevent further
169 industry from entering the coastal zone and contaminating the marine ecosystem. Furthermore,
170 it would help the community diversify their economic opportunities through tourism.

171 The Lafkenche Law allows Indigenous Communities to invite other stakeholders to
172 form local management committees to manage the ECMPOs. Therefore, the Indigenous

173 Community invited the fishing unions to co-develop a management committee to govern the
174 ECMPO. Despite the invitation, fishers refused to work with the Indigenous Community during
175 the planning because they interpreted the Lafkenche Law to state that fishers could no longer
176 commercially harvest within the ECMPO. This interpretation was only partly correct—fishers
177 would not be able to freely harvest in open-access areas, but they would be able to create new
178 harvesting areas with permission from the management committee.

179 *2.4 Fishing unions' history and preferences for adaptive governance*

180 In the Lakes Region, approximately 24,000 resource users are members of community-
181 based fishing unions, formed under Chile's Fisheries and Aquaculture Law (INE, 2008). The
182 specific policy under the law, known internationally as the Territorial Use Rights in Fisheries
183 (TURFs) policy, aimed at alleviating poverty and restoring fisheries by incentivizing resource
184 users to form local unions to have access rights to specific exploitation areas (Jarvis and Wilen
185 2016). Union members harvest many species by diving in management areas which are co-
186 managed by the unions and the state (Castilla and Gelcich, 2008). There are five fishing unions
187 in Carelmapu, totaling just under 500 men. In total, there are 1200 individuals who make their
188 living from the sea, including divers in fishing unions, independent divers, and *recolectores*,
189 women who harvest resources along the shore. Both divers in unions and independent divers
190 also harvest in open-access areas, areas which are not designated to any union.

191 Divers experienced hardship in 2016 because the benthic species which they harvest
192 became toxic for human consumption during the harmful algal bloom. This hardship
193 reverberated throughout the community of Carelmapu, affecting seafood processors and shop
194 owners (Ebel, 2018). The unions recognized that the coastal zone was vulnerable to the impacts
195 of environmental change and industry but had few preferences for adaptive governance that
196 went beyond opening other species to harvesting.

197 3. METHODS

198 This study was conducted in two phases: an exploratory phase and an explanatory phase
199 (Johnson, 1998). The exploratory phase was inductive where the first author gathered
200 ethnographic data through six months of participant observation from January through June
201 2018 and conducted semi-structured interviews (n=15) in Carelmapu, of which 13.5 hours are
202 recorded and transcribed. The first author attended two Indigenous Community meetings and
203 three fishing union meetings between February and May 2018. Participant observation was
204 also conducted at fishing docks and in research participants' homes between January and June
205 2018 where the first author took extensive field notes from over 300 hours of observations and
206 informal conversations. She asked resource users and their families about their hopes for the
207 future and their desirable ways of life, their perceptions of current marine resource governance,
208 and their perspectives on adaptation to the red tide. Participant observation provided an
209 ethnographic understanding of resource users' objectives in natural resource governance and
210 how these objectives intersected with their values related to conservation, family, and religion.

211 The first author also conducted fifteen semi-structured interviews with research
212 participants in Calremapu in February and March of 2018; seven Indigenous individuals and
213 eight non-Indigenous fishers. The interview guide questioned individuals about the following
214 themes: (1) demographics, (2) social learning and adaptation, (3) community infrastructure, (4)
215 belonging-if and why individuals belonged to certain institutions, and (5) resource users'
216 visions for future resource management. Participants were recruited through snowball
217 sampling where the first author built off her pre-existing relationships which she formed during
218 field work in 2016. Research participants included individuals who belonged to fishing unions,
219 independent resource users, and members of the Lafkenche Indigenous Community.

220 Semi-structured interviews and field notes were manually coded for themes by the first
221 author using inductive coding. Themes were not predetermined but were interpreted and
222 elucidated by analysis of the raw ethnographic data. Through this analysis, it was evident that
223 conflict, divergent views for governance, and traditional values were main themes between
224 fishing unions and the Indigenous Community. To better understand the reasons for the conflict
225 and divergent views for governance, the first author turned to scholarship on conflict and
226 preferences in adaptation to environmental change. The literature suggested that opposing
227 human values may underpin conflict and varying preferences for adaptation and policy
228 (Haverkamp, 2017). In an effort to further the development of values as social indicators for
229 environmental sustainability (Hicks et al., 2016), we adapted Schwartz et al. (2012)'s values
230 framework to fit our ethnographic context. The first author analyzed the raw data again through
231 a deductive approach, where she coded the data for themes related to eleven of Schwartz et al.
232 (2012)'s nineteen universal human values (Table 1). The ethnographic data helped us formulate
233 our hypotheses and the construction of a structured survey. To review, we hypothesized that
234 the conflict was driven by divergent values which underpinned individual and institutional
235 preferences for governance.

236 During phase two, we administered a structured survey (n=44) which measured
237 individuals' levels of agreement with statements associated with universal human values. We
238 constructed the survey using eleven of nineteen of Schwartz et al., (2012)'s universal human
239 values. The survey also included questions related to social capital, flexibility, social learning,
240 and collective action, topics which are not treated in this paper. We administered the survey
241 during April and May 2018. Participants were recruited randomly on fishing docks, before
242 fishing union meetings, and before and after Indigenous Community meetings. The first author
243 approached each individual and asked their willingness to take a survey. 44 out of 45
244 individuals approached (98%) agreed to participate in the survey. Structured surveys were read

245 to each participant to account for issues of literacy and took around twenty to twenty-five
 246 minutes to complete. Of 44 individuals surveyed, 41 were economically dependent on marine
 247 resource harvesting, 36 belonged to fishing unions, 9 were members of the Indigenous
 248 Community, and 12 self-identified as Indigenous. Self-identified Indigenous individuals are
 249 those who identify as Indigenous but do not belong to an Indigenous Community. Five
 250 individuals were independent divers, and 6 individuals belonged to both the Indigenous
 251 Community and a fishing union.

Value	Definition (Schwartz et al. (2012))	Ethnographic Example	Survey Likert Statement
Self-direction-action	Freedom to cultivate one's own ideas and abilities	When an individual said they were a leader of a fishing union or Indigenous Community, or when the individual was connected to connected to the government or a university	I am a leader in my community.
Self-direction-thought	Freedom to determine one's own actions	When an individual stated whether they determined their individual access rights to resources and/or were willing to share management.	I have rights to marine resources. I feel it is better if we share marine management with the government.
Stimulation	Excitement, novelty, and change	When an individual said that they are optimistic, excited about change, hopeless, and/or helpless.	I think that the change in the ecosystem and marine economy is an opportunity to do something different. I feel that aquaculture is changing the environment and there is nothing I can do.
Achievement	Success according to social standards	When an individual discussed how they felt their work was valued by their community and the government, whether or not they said that they enjoyed their work, the ways in which they discussed their contributions to their community.	I feel my job is valued by others. I feel satisfied with my job.
Power-resources	Power through control of material and social resources	When an individual stated or suggested that their relationship with the environment was reciprocal, that they could change management mechanisms, any human relationship with the environment.	My community should have control of management of marine resources. Humans have control of the environment.
Security-personal	Safety in one's immediate environment	When an individual discussed having or not having the information needed to understand marine resource management, resources	I have the resources and support I need to do my job and take care of my family.

		they need to take care of their families (food, education).	
Security-societal	Safety and stability in the wider society	When an individual discussed how they felt about the current and future situation of their community.	I feel optimistic for the future of my community. I feel discouraged about my future and the future of my community.
Tradition	Maintaining and preserving cultural, family, or religious traditions	When an individual mention either: (1) Indigenous traditional fishing practices and ancestral roots to the sea; (2) historical fishing rights to fishing unions	Access to marine resources are necessary to maintain my culture and my religious and family practices.
Conformity-rules	Compliance with rules, laws, and formal obligations	When an individual discussed how they agree with, like, dislike, or disagree with current resource management.	I feel that the situation of marine resource management is good and does not have to change.
Universalism-concern	Commitment to equality, justice, and protection for all people	When an individual discussed equity, history of oppression, changing power in policy.	I think all people deserve access to marine resources.
Universalism-nature	Preservation of the natural environment	When individuals discussed conservation, preservation, or taking care of the environment,	It is my responsibility to take care of the environment and natural resources.

252 Table 1. Values measured in structured survey. Values arose in ethnographic data and then
253 were coded using Schwartz et al., (2012)'s universal human values framework.

254

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

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

268 Critical level of significance was adjusted from $\alpha = 0.05$ to $\alpha = 0.01$ to account for multiple
269 testing (Schwartz et al., 2012).

270 Differences in the compositions of Likert-ranked responses were analyzed at the
271 individual and group levels with a multivariate approach using the multidimensional scaling
272 (MDS). For these analyses, the *vegan* package within R software version 3.3.2 was used
273 (Oksanen et al., 2008, R Core Team Development, 2016). Similarity matrices of Likert-ranked
274 response data were constructed for each surveyed individual using the Euclidean distance
275 measure (Schwartz et al., 2012). MDS based on similarity matrices was used to generate 2D
276 plots depicting similarity in the structure of Likert ranked responses between groupings at the
277 individual and group levels. Spider diagrams were overlaid upon 2D NMDS plots to show
278 group centroids and spread.

279 To further explore the responses between the conflicting institutions in the community,
280 survey responses from the five initial groups (non-Indigenous fishing union members, non-
281 Indigenous independent divers, Indigenous Community members, and independent Indigenous
282 divers) were then divided into three groups: (1) non-Indigenous individuals in fishing unions,
283 (2) non-Indigenous independent divers, and (3) the Indigenous Community. Indigenous fishing
284 union members are included in the Indigenous Community. We removed one of the original
285 five groups, the independent Indigenous divers, because of the small sample size ($n=1$). The
286 groups we left in the analysis were visible within the ethnographic data.

287 To show similarity between the three groups, 3D MDS was used. Ellipsoids
288 encompassing 50% similarity of each grouping were added to capture the central tendency and
289 variability in Likert-ranked responses to questions and better highlight differences. Significant
290 ($\alpha = 0.05$) variation in Likert-ranked responses between non-Indigenous individuals in fishing
291 unions, non-Indigenous independent divers, and the Indigenous Community was tested using

292 the adonis function in the vegan package (Oksanen et al., 2008). This function performs a
293 permutational multiple analysis of variance (PERMANOVA) using similarity matrices based
294 on the Euclidean distance measure to assign variation in Likert ranked responses among
295 groupings. The number of permutations used in these analyses was 999. Pairwise comparisons
296 were then used to test where significant variation occurred between each of the three groupings.
297 For all pairwise comparisons, critical level of significance was adjusted from $\alpha = 0.05$ to $\alpha =$
298 0.01 to account for multiple testing.

299 3. RESULTS

300 This section reports on the results from the qualitative data and quantitative analysis of
301 values to compare the differences between individuals and institutions to evaluate our
302 hypothesis that divergent values underpinned resource users' preferences for adaptive
303 governance.

304 Four salient themes emerged from the semi-structured interviews with research
305 participants. These themes included: (1) human-environment relationships, where individuals
306 discussed their social, cultural, or economic connections to the ocean, (2) adaptation, where
307 individuals mentioned the need to adapt to environmental change in the future, (3) natural
308 resource management, where individuals spoke about the need to change or maintain marine
309 resource management, and (4) conflict, where individuals mentioned conflict in management,
310 with government, or within the community. Salience was determined if the individual made
311 statements related to the theme three or more times in an interview, and if over one third of all
312 research participants discussed each theme. All fifteen interviews mentioned the salient themes
313 of adaptation, natural resource management, and conflict three or more times. All seven
314 Indigenous individuals mentioned human-environment relationships and five fishers discussed
315 human-environment relationships three or more times in each interview.

316 The survey indicated that nine out of eleven values were shared between the Indigenous
317 Community, the fishing unions, Indigenous individuals, and non-Indigenous individuals
318 (Figures 2 and 3). However, responses to the Likert-ranked statements, *I think that change in*
319 *the ecosystem is an opportunity to do something different* and *Humans have control of the*
320 *environment*, associated with the two values “stimulation” and “power-resources”
321 respectively, were significantly different between Indigenous and non-Indigenous individuals
322 (“stimulation”: $p = 0.004$; “power-resources”: $p=0.001$; Figure 2) as well as between the
323 Indigenous Community and fishing unions (“stimulation”: $p = 0.001$; “power-resources”:
324 $p=0.002$; Figure 3).

325 MDS ordination of Likert-ranked responses shows dissimilarity in the overall
326 composition of values per individual between Indigenous and non-Indigenous groupings as
327 well as between the Indigenous Community and fishing unions (Figure 4). 3D MDS ordination
328 of Likert-ranked responses also shows dissimilarity in the overall composition of values per
329 individual in three groupings: The Indigenous Community, non-Indigenous individuals
330 independent of fishing unions, and non-Indigenous individuals in fishing unions (Figure 5).
331 PERMANOVA shows that individual level (Indigenous individuals vs. non-Indigenous
332 individuals) significantly explained 9.74% ($F = 4.53$; $R^2 = .097$; $p = 0.01$) of variation in Likert-
333 ranked responses of individuals belonging to each group type (Indigenous Community vs.
334 fishing unions) significantly explained 10.61% ($F = 4.98$; $R^2 = 0.11$; $p < 0.001$) of the variation
335 in Likert-ranked responses of individuals belonging to each group. Additionally, when Likert-
336 ranked responses between three groups: The Indigenous Community, non-Indigenous
337 individuals independent of fishing unions, and non-Indigenous individuals in fishing unions,
338 were compared together, PERMANOVA shows that grouping factor significantly explained
339 14.07% ($F = 2.86$; $R^2 = 0.14$; $p < 0.01$) of total variation. Pairwise comparisons show a
340 significant difference in the composition of Likert-ranked responses between the Indigenous

341 Community and non-Indigenous individuals in fishing unions ($F = 4.47$, $R^2 = 0.12$, $p = 0.001$)
342 and between the Indigenous Community and non-Indigenous individuals independent of
343 fishing unions ($F = 4.67$, $R^2 = 0.34$, $p = 0.001$). A statistically similar composition of Likert-
344 ranked responses was found between non-indigenous individuals who are members of Fishing
345 Unions and non-indigenous individuals who are not members of the study groups ($F = 0.85$,
346 $R^2 = 0.03$, $p = 0.548$).

347 4. DISCUSSION

348 Based on our ethnographic research conducted in Carelmapu, we hypothesized that the
349 conflict between the Indigenous Community and fishing unions was rooted in divergent values
350 which underpinned their adaptation preferences and subsequent conflict. We found this to be
351 accurate in part—the two institutions had both divergent and shared values which contributed
352 to their adaptation preferences. High sharing occurred in values of “tradition”, “personal and
353 societal security”, and “achievement”. On the other hand, two of the values measured were not
354 shared: “stimulation” and “power over resources.” We suggest that the shared value of
355 “tradition” and the divergent value “power over resources” are the two critical values
356 underlying perceptions of desirable adaptation pathways.

357 In the following sections, we lay out our interpretation of our results: first we outline the
358 limitations in our data, then we discuss the shared value of “tradition.” Lastly, we follow with
359 a discussion of how the critical value of “power over resources” fostered the divergence in
360 preferences for adaptive governance, underpinning conflict. We propose that the Indigenous
361 Community’s preference for a protected area was rooted in a conservation-focused ontology,
362 combined with a policy which supports these values, while the fishing unions’ preferences for
363 changes to fisheries management was rooted in a resource-focused ontology.

364 4.1 *Limitations in data*

365 While 9 out of 11 values were shared between members of all groups, PERMANOVA
366 offers a unique perspective through observing similarity in the overall assemblage of Likert
367 ranked responses among groups. In each comparison of the assemblage of questions between
368 groups, group type explained only ~10% of the variation in Likert-ranked responses. However,
369 the MDS plots reveal distinct assemblages of Likert-ranked responses between each group,
370 driven largely by differences in responses to two values, “power over resources” and
371 “stimulation.” The MDS plots also show a large variation within groups. Our relatively small
372 sample size precluded our ability to test these factors individually, but we believe this variation
373 may be attributed to differences in individuals’ sex, age, place of birth, etc. which effectively
374 masks the variation attributable to each group.

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

385 4.2 Shared values: The salience of “tradition”

386 Individuals and groups shared 9 of the 11 values measured, with strong sharing
387 occurring between statements that measured values related to family and religious “tradition.”
388 It is important to note that shared and differing values indicate the value’s relative importance

389 to the group (Schwartz, 1992). For example, in Carelmapu, the strongly shared value of
390 “tradition” suggests that each group feels that access to marine resources is necessary to their
391 cultural, family, and religion traditions. It does not indicate that they have the same traditions.
392 This is significant because the importance of the value but the differences in their traditions is
393 what underpins their preferences. Social and cultural ties to the sea are common in many
394 resource-dependent communities where individuals rely on the ocean (Pitchon, 2015). In
395 Carelmpau, 100% of Indigenous individuals and 82% of non-Indigenous individuals agreed or
396 strongly agreed that access to marine resources was necessary to maintaining their traditions
397 (Figure 2).

398 *4.3 Indigenous traditional fishing practices and ancestral roots to the sea*

399 Interviews highlighted that Indigenous people have subsisted on marine resources in
400 the Lakes Region for hundreds of years, and this subsistence was essential to maintaining their
401 cultural traditions and social connections. This was corroborated by Daughters (2018) who
402 wrote that the Lafkenche people have harvested fish, seaweed, and shellfish since the fifteenth
403 century. Indigenous peoples still practice these traditions today, which in large part drives their
404 preferences for adaptive governance. One Indigenous Community leader said that with the
405 formation of a protected area, inhabitants of Carelmapu can “continue to maintain their rhythm
406 of life, their social well-being—and to improve it, to protect our main source of wealth which
407 we get from the sea.”

408 The legal opportunity for the Lafkenche people to reclaim their ancestral rights to the
409 sea in 2008 was a significant event for the Indigenous Communities in Chile. Prior to the 1990s,
410 Indigenous peoples were heavily persecuted during the dictatorship under Augusto Pinochet
411 (Holton, 2004). Indigenous people were no longer allowed to speak their language or speak
412 openly about being Indigenous. In March of 1979, the Junta Decree Law No. 2568 was passed

413 which stated that Mapuche inhabitants in Chile “ceased to be Indigenous, as did their lands”
414 (Holton, 2004: 103). Mapuche history was erased from official history textbooks “under the
415 doctrine of national security” and the state expanded their jurisdiction over Mapuche lands
416 (Holton, 2004: 103). Consequently, Indigenous people were not taught about Indigenous
417 culture in schools or at home.

418 Despite the persecution of the Mapuche, the Indigenous people maintained a strong
419 connection to the land and sea (Daughters, 2018; Kowalczyk, 2013). An elderly woman we
420 interviewed spoke of harvesting seaweed and mussels along the shoreline, using rock weirs to
421 net fish. She said that in the 1990s after the end of the dictatorship, the Mapuche people started
422 “raising their voice, saying that we [the Indigenous people] were citizens like any other, with
423 rights and duties.” Environmental protection and Indigenous movements to reclaim land and
424 natural resources were pervasive throughout Latin America in the 1990s (Kowalczyk, 2013;
425 Tomaselli, 2012; Van Cott, 2005). In the case of the Mapuche, they demanded autonomy,
426 distancing themselves from the Chilean government (Kowalczyk, 2013). The Lafkenche in
427 Carelmapu did this in 1996 and, most recently, claimed ancestral rights to the sea through the
428 Lafkenche Law in 2008. Exercising these rights allowed the Indigenous Communities to
429 openly continue many of their traditional harvesting practices and to develop a plan for a
430 protected area to adapt to future environmental and socioeconomic change.

431 It is the Indigenous Community’s traditional fishing practices and cultural connection
432 to the ocean which underlies their held value of “tradition” and in part drives their preferences
433 for adaptive governance to form a protected area. However, the belief that certain individuals
434 and certain groups have historical rights to marine resources is also shared by the fishing unions
435 in Carelmapu. Divergence in the conceptualization and meaning of tradition often varies across

436 groups (Ingold and Kurtilla, 2000), and it is this divergence that in part underpins the conflict
437 in preferences.

438 *4.4 Fishing unions' historical fishing rights and fisheries policy*

439 Resource users in fishing unions have designated access rights to marine resources
440 which started in 1991 when governance of marine resources was decentralized under the
441 TURFs policy. After two decades of environmental deregulation and overexploitation of
442 fisheries during Pinochet's dictatorship in the 1970s and 1980s, resource users formed local
443 unions to co-manage resources (Jarvis and Wilen, 2016). Resource users harvest from
444 management areas as well as from open-access areas. Traditionally, divers access their
445 management areas and the open-access areas using small boats, working in teams of two or
446 three. Divers sell their catch locally or to processors for national and international markets. In
447 our interviews, fishers stated that they had historical rights to fishing grounds near Carelmapu,
448 including rights to management areas and open-access areas. In their opinion, they have done
449 well managing the marine resources and their traditions and social well-being are directly
450 connected to harvesting from the sea.

451 With the introduction of the Lafkenche Law, non-Indigenous fishers feel that power in
452 governance has shifted away from fishers to the Indigenous Community and that the proposed
453 protected area threatened to take away their historical access rights. One diver, who is also the
454 president of his fishing union, said,

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

459 with respect to the Lafkenche Law and losing our rights is the main conflict we have
460 with the Indigenous Community.”

461 We observed that only three fishing union leaders discussed the proposed plan of the
462 protected area with the Indigenous Community. These meetings were only open to union
463 leaders and Indigenous Community leaders, in total around twelve people. When the fishing
464 union leaders disagreed with the proposed plan, they offered no new plan or new preference
465 for adaptive governance outside of changing harvesting controls. Both groups needed rights to
466 the sea to maintain their traditions, and the conflict between the two groups grew.

467 4.5 *Power over resources*

468 Finally, our survey revealed that the two groups diverged in their feelings of who has
469 power over resources. “Power over resources” was measured using two statements: “*Humans*
470 *have control over the environment*” and “*My community should have control of marine*
471 *resources.*” While all individuals and both groups agreed that their communities should have
472 control of marine resources, there was a significant difference between the groups’ responses
473 to the statement “*Humans have control over the environment.*” Members of fishing unions were
474 split evenly between those who agreed that humans can control the environment (43%) and
475 members who disagreed with the statement (46%). Similarly, 48% of non-Indigenous
476 individuals agreed with the statement and 39% disagreed. In contrast, the 89% of the
477 Indigenous Community and 91% of Indigenous individuals disagreed that humans were in
478 control of the environment.

479 Indigenous people did not see themselves as controllers of the environment, but instead
480 saw themselves as uniquely tied to marine resources and responsible for the sea’s protection.
481 We suggest that how Indigenous people responded to this statement exemplifies a unique
482 Indigenous ontology, or way of being, that contributes to a conservation-focused frame.

483 Indigenous peoples described their relationship with the marine environment as reciprocal,
484 stating that if they conserved and protected the environment, the sea would replenish its
485 resources and take care of them for generations. This belief influenced their preferences for
486 adaptive governance—the development of a protected area. One Indigenous Community
487 member and diver in a fishing union said,

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

493 Many Indigenous groups around the world have ontologies embedded in their
494 relationship with the environment where they strive for unity between humans and nature
495 (Nadasdy, 2007; Royal, 2002; Schmidt and Dowsley, 2010). In studies of other Indigenous
496 communities in Latin America, this belief in reciprocity has been shown to influence adaptation
497 preferences in the context of environmental change. For example, in the Cusco Region of Peru,
498 Quecha communities hold the value “ayni” which is a value rooted in reciprocity that “implies
499 that all elements of nature give and receive to contribute to the harmony of the world” (Walshe
500 and Argumedo, 2016: 167). This value is equated to the concept and political movement of
501 *buen vivir* in Bolivia and Ecuador which emphasizes climate justice and adaptive governance
502 created by Indigenous peoples (Gudynas, 2011; Walsh, 2010).

503 These ontologies based in conservation-oriented, reciprocal values foster the
504 development of community-based adaptation strategies where communities take measures to
505 protect the environment and sustain their knowledge systems and practices to reduce their
506 vulnerability to environmental change (Mugambiwa, 2018). In Carelmapu, these values, in

507 conjunction with the policy support from the Lafkenche Law, contributed to the Indigenous
508 peoples' preferences for adaptive governance—even if this meant decreasing resource
509 exploitation.

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

515 “Well there is no specific plan because there is no way to prevent red tides in the
516 future. We could diversify the activity of diving in the coastal edge with some
517 harvesting of fish. However, currently the resources are practically closed. If I could
518 dive and shoot fish, I could have an alternative, but according to the legislation they
519 are closed.”

520 This preference is not uncommon—many humans respond to environmental change
521 by looking to increase controls over resources (Holling et al., 1996; Folke et al., 2005). Our
522 interviews demonstrated that many non-Indigenous divers' attitudes remain focused on
523 resource extraction. This may suggest that they have a different ontology than the Indigenous
524 community. Whereas the ontology of the Indigenous Community is based in a reciprocal
525 relationship with nature, the non-Indigenous divers have an ontology rooted in resource
526 extraction. A focus on resource extraction and non-Indigenous divers' resistance to changing
527 management has been shown in other studies of Chilean resource users, particularly fishing
528 union members (Gelcich et al., 2009; Gelcich et al., 2015). Although divers have become more
529 empowered to become stewards in governance through the TURFs policy, they believe their
530 livelihoods are at risk (Gelcich et al., 2009) and are unwilling to relinquish their rights (Gelcich

531 et al., 2017). Even prior to the Lafkenche Law in 2008, fishers perceived that their open-access
532 areas were becoming scarce, in large part because of the proliferation of aquaculture (Ebel,
533 2018; Ebel, 2020) and the creation of state-run marine protected areas (Geleich et al., 2009).
534 Fishers interpreted the Lafkenche Law as a threat and perceived their traditional rights were
535 being taken away. Their resource-focused frame influenced their adaptation preferences, where
536 they resisted working with the Indigenous Community, and instead sought changes in fisheries
537 management.

538 5. CONCLUSION

539 5.1 *Understanding values to improve natural resource management*

540 Recent calls in adaptation studies advocate for more attention to community-level
541 factors which influence behavior and decision-making in the context of environmental change
542 (Adger et al. 2013; Agrawal 2008). Attention to human values in the context of how individuals
543 and institutions frame adaptive governance is essential because it is human values that
544 demonstrate individual or group desires, preferences, and objectives (O'Brien and Wolf 2010;
545 Schwartz 1992; 1994). However, these value systems must be examined within the context of
546 historical systems of oppression and new state policies which shift power in environmental
547 governance. Situating individual and institutional values within historical and sociopolitical
548 context illustrates how individuals and institutions interpret policies, how they are affected by
549 the existing political structures, and why they may pursue certain policy actions. It is this
550 situated understanding which may reveal individual and group ontologies. Within the context
551 of local to global engagement, these ontologies may meet to create areas of friction (Tsing
552 2004; 2012) which can contribute to understandings of conflict and explanations of how
553 individuals and local communities interact with structure at the national and international level
554 (Tsing 2004).

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

567 Lastly, our mixed methods approach integrating qualitative ethnographic data with
568 quantitative measures offers unique insights into how culturally embedded values underlie
569 disagreement over appropriate responses to environmental change. Moreover, differentiation
570 and/or consensus at the individual level has important implications for group-level collective
571 action and the formation of adaptive governance. Adaptive governance requires individuals to
572 resolve conflict, thus understanding the factors which may contribute to conflict in adaptive
573 governance at the local level is imperative. The outcomes of this study suggest the integration
574 of quantitative and ethnographic methods can further understandings of how values contribute
575 to adaptation preferences and actions related to governance with implications for potentially
576 mitigating conflict in resource-dependent communities undergoing often rapid and complex
577 environmental change. We suggest that natural resource managers and policymakers can use
578 data on values to engage resource users in focus groups and shared governance which may
579 promote discussion between individuals and institutions about how to find common ground.

580 One way to move forward is to build upon shared values, such as tradition and universalism
581 (concern and nature) to illuminate that individuals' desires and hope for the future are, in many
582 ways, similar.

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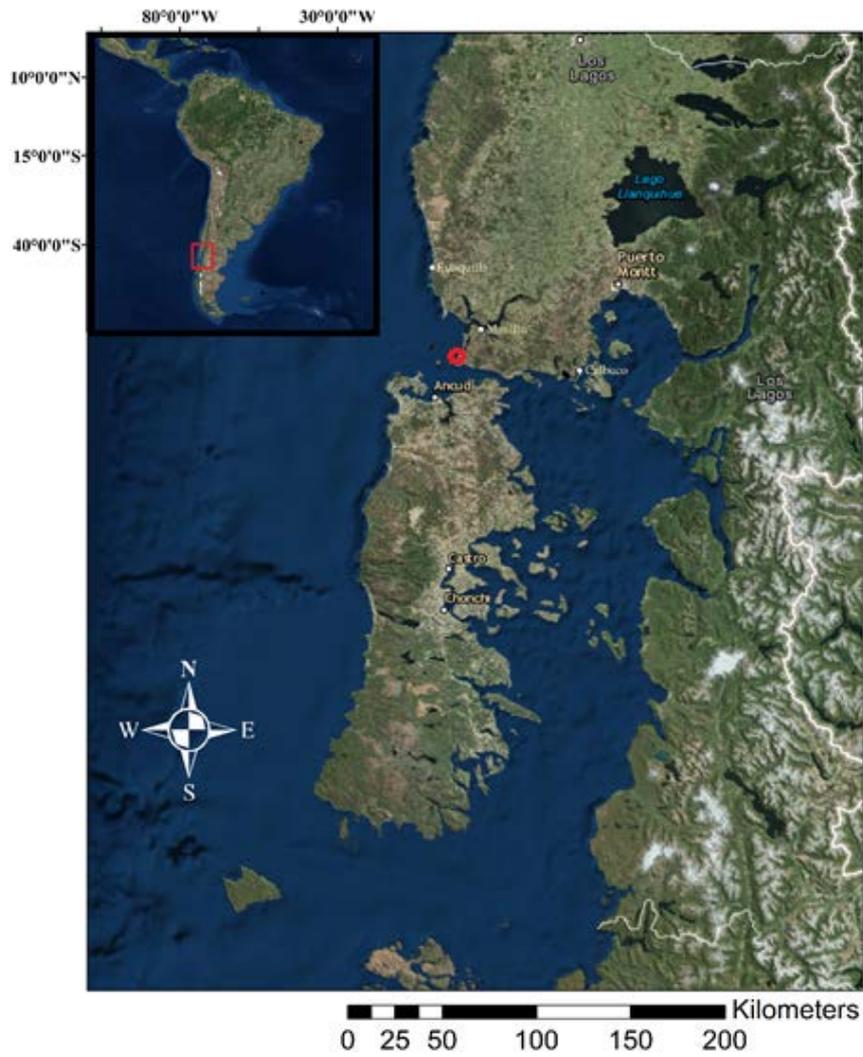
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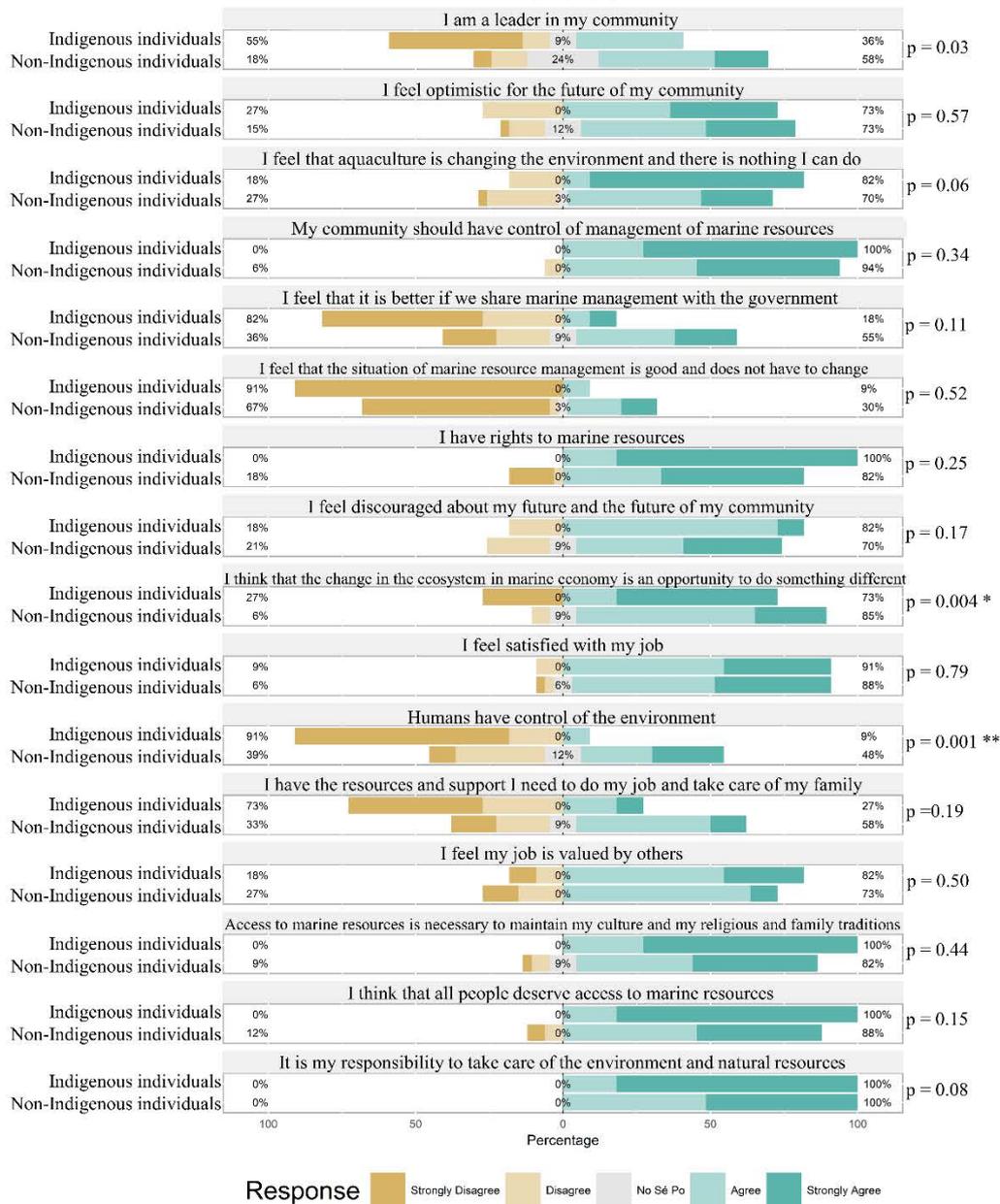
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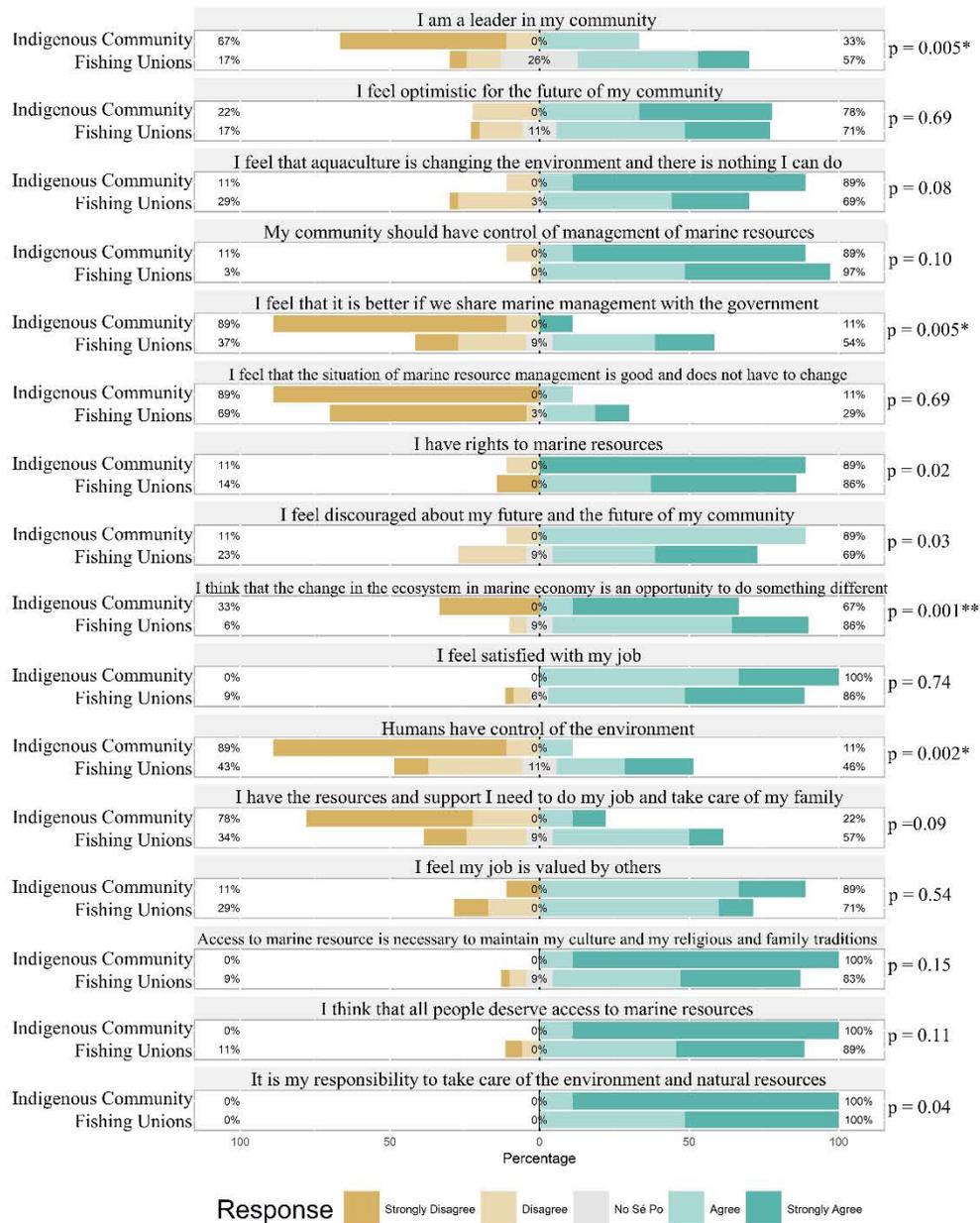
717 Figure 1. Chile's coastal Lakes Region. The community of Carelmapu is encircled in red.

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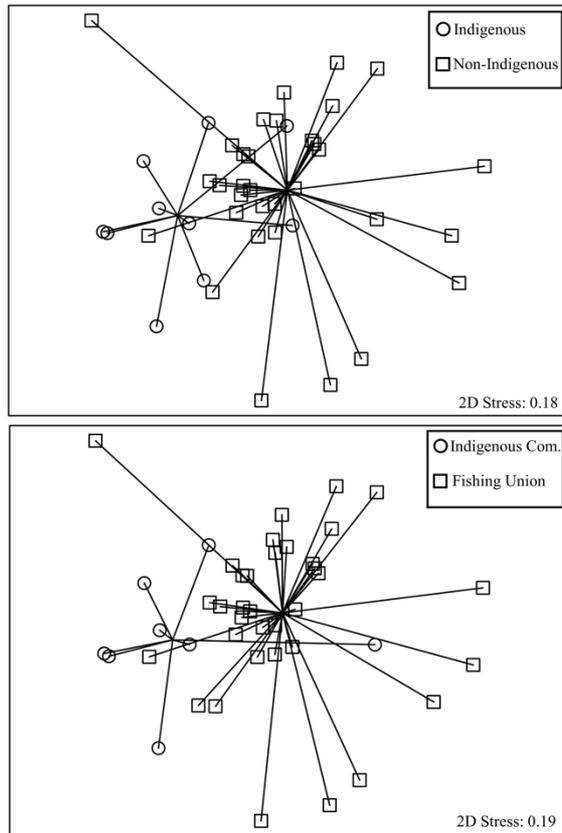
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720 Figure 2. Likert ranked responses of self-identified Indigenous individuals and non-
 721 Indigenous individuals to statements associated with Schwartz et al. (2012)
 722 values. Significant differences in Likert ranked responses between indigenous
 723 individuals and non-indigenous individuals, identified by Kruskal–Wallis
 724 analysis, are denoted as follows: *p < 0.01, **p < 0.005, ***p < 0.001



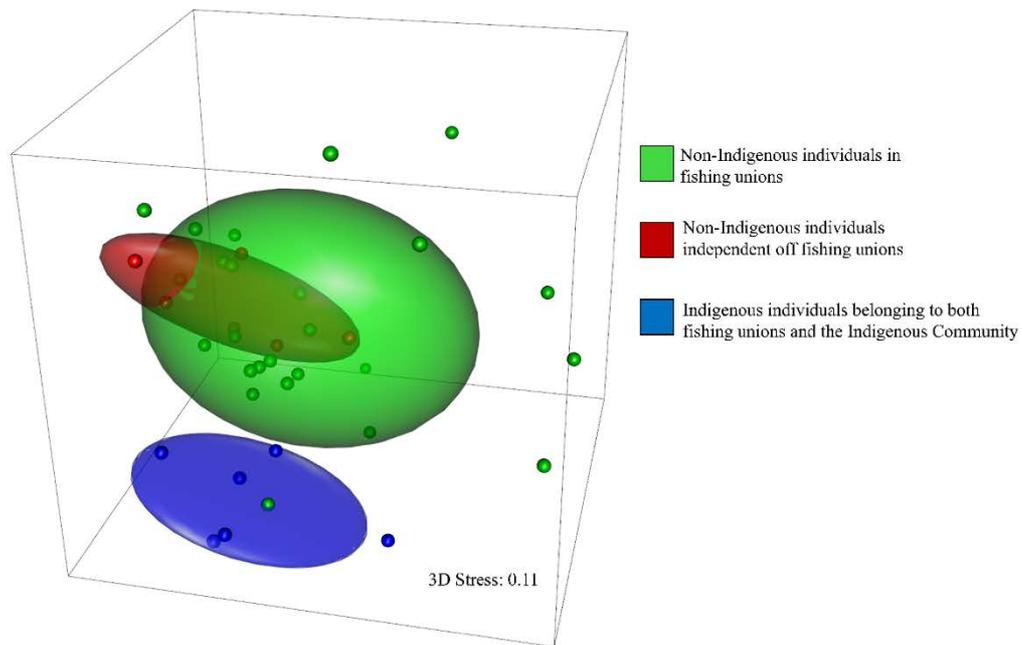
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726 Figure 3. Likert ranked responses of the Indigenous Community and the fishing unions
 727 to statements associated with Schwartz et al. (2012) values. Significant
 728 differences in Likert ranked responses between the Indigenous Community
 729 and the fishing unions, identified by Kruskal–Wallis analysis, are denoted as
 730 follows: *p < 0.01, **p < 0.005, ***p < 0.001



731

732 Figure 4. Multidimensional scaling (MDS) ordination of Euclidean distance similarities
733 from Likert ranked responses of all statements associated with Schwartz et al.
734 (2012) values. The top plot shows similarity in the compositions of Likert
735 ranked responses of indigenous individuals and non-indigenous individuals
736 and the bottom plot shows individuals who are members the Indigenous
737 Community and fishing unions. Spider plots are overlaid to highlight group
738 centroids and variability. For these analyses the vegan package within R
739 software version 3.3.2 was used.



740

741 Figure 5. 3D Multidimensional scaling (MDS) ordination of Euclidean distance
742 similarities from Likert ranked responses of all statements associated with
743 Schwartz et al. (2012) values. Ellipsoid clusters are delineated at the 50 %
744 level of similarity for non-indigenous individuals in fishing unions, non-
745 Indigenous individuals independent of fishing unions, and all Indigenous
746 individuals belonging both to the Indigenous Community and fishing unions.
747 For these analyses the vegan and rgl packages within R software version 3.3.2
748 was used.

749