Participation for Conservation:

The Role of Social Capital in Multi-level Governance of Small-Scale Fisheries

by

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor of Philosophy
in Marine Science and Conservation
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2015
ABSTRACT

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Abstract

The need for effective multi-level governance arrangements is becoming increasingly apparent because of the high functional interdependencies between biophysical and socioeconomic factors in the realm of natural resource governance. Such arrangements provide a basis for the exchange, discussion, and deliberation of information, knowledge, and data across diverse user groups and entities. Multi-level governance is operationalized by using a microinstitutional analysis that links decision-making arenas across three distinct levels: operational, collective-choice, and constitutional. Within this context, I argue that the effectiveness and success of actors’ participatory processes across these three levels depend on the amount of social capital among actors within the governance system. I assessed the concept of social capital using two different models: (1) a structural approach focused on resources embedded within an individual’s network, and (2) a combined structural-cultural approach that incorporates various aspects of group membership with relations of trust, rules, and norms. To explore the effects of social capital on participatory processes related to the implementation and management of natural resources, I analyzed different small-scale fisheries governance regimes from the Gulf of California, Mexico. I collected data using surveys (n=371), interviews (n=82), and participant observation techniques conducted among the residents of four small-scale fishing communities that live adjacent to marine
protected areas along the Baja California, Mexico, peninsula. Data analysis included both quantitative (logit regression model), and qualitative (narrative analysis) approaches.

Overall, my results suggest that both social capital models reveal the multidimensional nature of social capital where none of its individual types form a consistent and statistically significant relationship with the six outcomes that I measured. However, these types are related in different ways to fishers engagement in participatory processes across the three levels. The extent of fishers’ engagement in participatory processes across different levels was not high. Qualitative analysis revealed that participatory processes related to fisheries conservation and management, although present do not reach their full potential and are stymied by a historical context and a lack of general participatory culture.
Contents

Abstract ................................................................................................................................. iv

List of Tables .......................................................................................................................... xii

List of Figures ....................................................................................................................... xv

List of Abbreviations ............................................................................................................ xvii

Acknowledgements ............................................................................................................ xviii

1. Research problem ............................................................................................................. 1
   1.1 Crisis in fisheries governance ..................................................................................... 1
   1.2 Importance of small-scale fisheries ............................................................................ 2
   1.3 Theoretical concepts .................................................................................................. 7
       1.3.1 Common pool resource ....................................................................................... 8
       1.3.2 Social capital ....................................................................................................... 11
       1.3.3 Multi-level governance arrangements .................................................................. 18
       1.3.4 Participation in natural resource management .................................................... 21
   1.4 Theoretical model ...................................................................................................... 25
   1.5 Description of the Mexican fishery regulatory context .............................................. 29
   1.6 Small-scale fisheries sector in Mexico ....................................................................... 33
       1.6.1 Small-scale fisheries sector in Baja California Sur .......................................... 36
       1.6.2 Small-scale fisheries sector in Baja California .................................................... 37
   1.7 Public participation in fisheries governance in Mexico ............................................ 37
   1.8 Outline of the dissertation ......................................................................................... 40
2. Research design ....................................................................................................................................... 42

2.1 The geographical setting: description of the Gulf of California .................................................... 42

2.2 Study sites ........................................................................................................................................ 45

2.2.1 San Felipe ...................................................................................................................................... 49

2.2.1.1 Upper Gulf of California and Colorado River Delta Biosphere Reserve MPA ....................... 50

2.2.1.2 Research challenges .................................................................................................................. 51

2.2.2 Loreto .......................................................................................................................................... 52

2.2.2.1 Loreto Bay National Park MPA ............................................................................................... 53

2.2.2.2 Research challenges .................................................................................................................. 55

2.2.3 La Paz .......................................................................................................................................... 55

2.2.3.1 Espiritu Santo National Park ................................................................................................. 56

2.2.3.2 Research challenges .................................................................................................................. 59

2.2.4 La Ribera / Cabo Pulmo ............................................................................................................. 60

2.2.4.1 Cabo Pulmo National Park .................................................................................................... 60

2.2.4.2 Research challenges .................................................................................................................. 62

2.3 Data collection .................................................................................................................................. 63

2.3.1 Interviews ...................................................................................................................................... 64

2.3.1.1 Description of the interview instrument .................................................................................. 65

2.3.2 Surveys .......................................................................................................................................... 66

2.3.2.1 Description of the survey instrument .................................................................................... 67

2.3.3 Participant observation .................................................................................................................. 69
2.3.4 Reporting back to the communities ........................................................... 69
2.3.5 Collaborative work ..................................................................................... 70

3. The relationship of social capital and fishers’ participation in multi-level governance arrangements ..................................................................................................................... 71

3.1 Introduction ...................................................................................................... 71
3.1.1 Theoretical grounding ................................................................................... 72
  3.1.1.1 Multi-level governance arrangements ....................................................... 72
  3.1.1.2 Stakeholders’ participation in fisheries governance ................................. 74
  3.1.1.3 Social capital in fisheries governance ...................................................... 76
3.1.2 Research questions ...................................................................................... 80

3.2 Methods ......................................................................................................... 81
3.2.1 Study sites .................................................................................................... 81
3.2.2 Background of fisheries governance in Mexico ........................................... 82
3.2.3 Data collection ............................................................................................. 84
  3.2.3.1 Structured survey ..................................................................................... 84
  3.2.3.2 Semi-structured interviews .................................................................... 86
3.2.4 Variable description ..................................................................................... 87
  3.2.4.1 Response variables ................................................................................ 87
  3.2.4.2 Explanatory variables – social capital .................................................... 89
  3.2.4.3 Explanatory variables – controls ............................................................ 91
3.2.5 Analysis ....................................................................................................... 95

3.3 Results ............................................................................................................. 96
3.3.1 Quantitative results ........................................................................................................96
3.3.1.1 Effects of explanatory variables ..............................................................................98
3.3.2 Qualitative results .........................................................................................................104
3.4. Discussion .......................................................................................................................111

4 The role of fishers’ individual social capital in multi-level governance arrangements: Who participates in and who benefits from fisheries and conservation policies? ......... 119

4.1 Introduction .......................................................................................................................119

4.1.1 Theoretical background .............................................................................................120
4.1.2 Research questions ....................................................................................................127

4.2 Methods ............................................................................................................................128

4.2.1 Study sites ..................................................................................................................128
4.2.2 Data collection ...........................................................................................................130
4.2.3 Data analysis .............................................................................................................132
4.2.4 Variable description ..................................................................................................134

4.3 Results ...............................................................................................................................138

4.3.1 Social capital as a multidimensional concept ..............................................................138
4.3.2 Relationship among social capital domains and participation in multi-level governance arenas ..................................................................................................................141
4.3.3 Relationship among social capital domains and fishers’ goal attainment performance measures .................................................................................................................146
4.3.4 Other variables ..........................................................................................................150

4.3.4.1 Demographics .......................................................................................................150
4.3.4.2 Structure of fishing activities ................................................................................150
5. Effects of fishers participation and government subsidies on adaptive capacity of small-scale fishers from Baja California Sur (BCS), Mexico

5.1 Introduction

5.1.1 Definitions

5.1.2 Civic participation as a method that fosters adaptive capacity of resource users

5.1.3 Government subsidies as a basis for improving adaptive capacity

5.1.4 Civic participation and government subsidies in the Mexican context

5.1.5 Small-scale fisheries of the Baja California Sur and the anthropogenic drivers

5.1.6 Research questions

5.2 Methods

5.2.1 Study site

5.2.2 Data Collection

5.2.2.1 Surveys

5.2.2.2 Interviews

5.2.2.3 Participant observation

5.2.3 Variable description

5.2.3.1 Response variables

5.2.3.2 Explanatory variables

5.2.4 Data Analysis
5.2.4.1 Surveys .................................................................................................................. 179
5.2.4.2 Interviews .............................................................................................................. 180
5.3 Results .......................................................................................................................... 181
  5.3.1 Survey analysis ....................................................................................................... 181
  5.3.2 Interviews analysis ................................................................................................. 192
5.4 Discussion ..................................................................................................................... 199
  5.4.1 Civic participation as a driver for obtaining government subsidies ....................... 199
  5.4.2 Civic participation as a precursor for building adaptive capacity ....................... 201
  5.4.3 Subsidies as a vehicle for building adaptive capacity ............................................ 203
6. Conclusion ....................................................................................................................... 208
  6.1 Review of research questions ..................................................................................... 208
  6.2 Review of findings ...................................................................................................... 209
  6.3 Theoretical relevance ................................................................................................. 211
  6.4 Practical relevance ..................................................................................................... 214
Appendix A: Study information handouts distributed at study sites .................................. 217
Appendix B: List of formal interviews ............................................................................... 218
Appendix C: Interview instrument .................................................................................... 221
Appendix D: Survey instrument ......................................................................................... 225
References .......................................................................................................................... 244
Biography .............................................................................................................................. 280
List of Tables

Table 1: Estimates of employment and catch in small-scale fisheries (including inland and marine environment if not specified otherwise). ................................................................. 4

Table 2: Description of different dimensions of social capital and their components based on the literature review. ............................................................................................. 15

Table 3: Typology of participatory arrangements. ..................................................................................... 25

Table 4: Characteristics of the fisheries sector in Mexico. .............................................................. 34

Table 5. Number of fishers in BCS over the last three decades. ........................................................... 37

Table 6: Characteristics of marine protected areas in the Gulf of California. ............................. 44

Table 7: Description of the small-scale fishing sector of the communities (italics) belonging to each of the four study sites (bold). All data for 2010; obtained from CONAPESCA. .................................................................................................................. 48

Table 8: Description of the surveying effort. ......................................................................................... 67

Table 9: Characteristics of study sites and our surveying effort. ..................................................... 86

Table 10: Summary of variables. .............................................................................................................. 92

Table 11: Results of logistic regression analyses: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01. .............. 97

Table 12: Characteristics of study sites and surveying effort. .......................................................... 131

Table 13: Summary statistics of the continuous variables used in our models. ......................... 135

Table 14: Summary statistics of the nominal variables used in our models. ............................ 137

Table 15: Respondents’ access to particular resources through a specific source. ......... 139

Table 16: Scale characteristics of domain-specific social capital measures. ......................... 140

Table 17: Domain-specific social capital measures and their components. Number refers to a particular resource from Table 15. ......................................................... 140
Table 18: Correlations among social capital measures. All p<0.001. ................................. 141

Table 19: Probability of fishers’ participation in operational arena (i.e. monitoring and surveillance activities and/or filing a complaint): coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01. ............ 143

Table 20: Probability of fishers’ participation in collective choice arena (i.e. engagement with consultative and/or decision-making bodies related to fisheries): coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01. ................................................................................................................................. 144

Table 21: Probability of fishers’ participation in constitutional arena (i.e. participation in the most recent management process related to the local MPA): coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01. ................................................................................................................................. 145

Table 22: Probability of receiving government subsidy: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01. .......................... 147

Table 23: Probability of having a higher earnings than the sample mean: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01. ................................................................................................................................. 148

Table 24: Probability of a fisher holding a valid fishing permit: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01. ................................................................................................................................. 149

Table 25: Summary statistics of the nominal variables used in our model. .................. 182

Table 26: Summary statistics of the continuous variables used in our model. ................ 182

Table 27 Probability (a) of the receiving fisheries subsidy and (b) of conservation subsidy: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01. ................................................................................................................................. 184

Table 28: Probability of fishing being the only employment for two different models: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01. ................................................................................................................................. 185
Table 29: Probability of having a monthly income higher than the mean income for the entire dataset for two different models: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01............................. 186

Table 30: Cross-tabulation of the fisheries and conservation subsidies (N=133)............. 187

Table 31: Reasons for having alternative jobs to fishing................................................. 188

Table 32: Impact of fisheries subsidies distributed during 2008-2012 period in terms of (A) funding, (B) number of financed projects, (C) number of beneficiaries. Amounts in (A) are adjusted for inflation and reported in 2012 USD............................ 189

Table 33: Impact of conservation subsidies distributed during 2007-2012 period in terms of (A) funding, (B) number of financed projects, (C) number of beneficiaries. Amounts in (A) are adjusted for inflation and reported in 2012 USD............................ 191
List of Figures

Figure 1: Schematic representation of relationships among the theoretical concepts applied in this study. ................................................................. 28

Figure 2: Organizational chart of key federal (in bold) and state (in italics) entities involved in fisheries management in Mexico. SAGARPA: The Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food; INAPESCA: The National Fisheries Institute; CONAPESCA: The National Commission of Aquaculture and Fishing; SEMARNAT: The Secretariat of Environment and Natural Resources; CONANP: The National Commission of Natural Protected Areas; PROFEPA: The Federal Attorney for Environmental Protection; SEMAR: Naval Secretariat; FONMAR: Fund for the Protection of Marine Resources. ......................................................................................... 30

Figure 3: Research sites along the Baja California peninsula. From North to South: San Felipe, Loreto, La Paz, and Cabo Pulmo. Loreto and Cabo Pulmo sites contained multiple fishing communities. ........................................................................................................ 47

Figure 4: Theoretical model guiding this study................................................................. 81

Figure 5: Research sites along the Baja California peninsula. From North to South: San Felipe, Loreto, La Paz, and Cabo Pulmo. Loreto and Cabo Pulmo sites contained multiple fishing communities. ........................................................................................................ 82

Figure 6: Predicted probability of participation in operational-level activities by membership in bonding groups. All other values are held at their mean................. 100

Figure 7: Predicted probability of receiving a subsidy by membership in bonding groups. All other values are held at their mean. ...................................................... 101

Figure 8: Predicted probability of holding a fishing permit by membership in bonding groups. All other values are held at their mean. ..................................................... 101

Figure 9: Predicted probability of participation in collective-choice level activities by number of bridging activities. All other values are held at their mean. ................. 102

Figure 10: Predicted probability of holding a fishing permit by number of bridging activities. All other values are held at their mean......................................................... 102
Figure 11: Predicted probability of participation in the operational level activities, above average earnings, and holding a fishing permit as a function of the collective action potential of communities. .................................................................................................................. 104

Figure 12: Research sites along the Baja California peninsula. From North to South: San Felipe, Loreto, La Paz, and Cabo Pulmo. Loreto and Cabo Pulmo sites contained multiple fishing communities. .................................................................................................................. 129

Figure 13: Location of the Espiritu Santo National Park in relation to La Paz................. 173
List of Abbreviations

BC: Baja California
BCS: Baja California Sur
CONANP: National Commission of Protected Areas
CONAPESCA: National Commission of Fisheries and Aquaculture
CPR: Common pool resource
INAPESCA: National Institute of Fisheries
LGEEPA: General Law of Ecological Equilibrium and Environmental Protection
LGPAS: General Law of Sustainable Fisheries and Aquaculture
MPA: Marine Protected Area
PROFEPA: Federal Attorney for Environmental Protection
SAGARPA: Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food
SEMARNAT: Secretariat of Environment and Natural Resources
SSF: Small-scale fisheries
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1. Research problem

1.1 Crisis in fisheries governance

Effective governance of renewable resources such as fisheries is critical for ensuring sustainable resource use and for improving ecosystem health and human well-being (Hughes et al. 2005, Basurto and Nenadovic 2012). However, a rising number of anthropogenic drivers has begun to challenge and undermine many of the existing governance arrangements (Dietz et al. 2003). Part of the problem is that the very nature of fisheries, as a quintessential example of a common-pool resource, makes their governance challenging. Common-pool resources are defined by their difficulty of exclusion and subtractability. Costly exclusion of potential users or beneficiaries generates incentives for free-riding. Subtractability or rivalry in consumption means that once a user extracts resource units from the common pool, i.e., fish from the water, those units are not available to anyone else. In contrast, in non-rival or non-subtractible goods, one user’s consumption of the good does not reduce the supply of the good that remains for others. It follows then, that common-pool resources, which are subtractible goods, are prone to overharvesting. Over the last three decades, we have witnessed a consistent overuse of resources overuse fueled by inadequate property rights regimes, overcapitalization and subsidies, globalized markets, and the neoliberal policies (Myers

At the global level, fisheries are largely in decline and as one of the most recent studies estimate some 63 percent of all the commercial species require rebuilding (Worm et al. 2009). According to the FAO (2009), some 80 percent of the commercially harvested world fish stocks which have been monitored are fully exploited or overexploited. Understanding the effects of these drivers is especially relevant to the small-scale fisheries (SSF) sector given that it employs more than 90% of world’s fishers (Berkes et al. 2001), contributes at lest 50% of the total catch (FAO 2010), and provides a social safety net to a large number of its participants (Allison and Ellis 2001, Béné et al. 2007a). Therefore, there is a need to better understand institutional arrangements that can ensure livelihood stability of SSF communities as well as ecosystem integrity of the environment they depend on.

1.2 Importance of small-scale fisheries

The existence and production from small-scale fisheries, unlike industrial fisheries, have been systematically underestimated in most global assessments. Due to the shortage of funds necessary to provide fisheries managers with adequate monitoring capabilities, due to high spatial heterogeneity and complexity of these fisheries, and due
also to a lack of their uniform definition\(^1\), we have severely deficient information and
data about small-scale fisheries. This situation is particularly problematic given the
importance of small-scale fisheries to millions of people around the world as a source of
(Berkes et al. 2001, Béné 2006) (Table 1).

The recent FAO report on the state of world fisheries and aquaculture (2009),
states that out of 44 million fishers in the world, 38 million are in Asia and most of those
fishers, according to the report, are engaged in small-scale fisheries. However, the true
importance of the small-scale sector lies in its capacity to supply fishery-related jobs and
food to fishers and their dependents. Relying on these figures and more recent FAO
(2012) data, I estimate that approximately 450 million people around the world depend
on the small-scale fishing sector. While this is a considerably higher estimate than what
Delgado et al. (2003) proposed in 2003 (200 million), it is approximately the same what

\(^{1}\) According to Food and Agriculture of the United Nations (2004), there is no universally applicable
definition of small-scale fisheries. Instead, a number of characteristics help to identify a small-scale fishery:
“Small-scale fisheries can be broadly characterized as a dynamic and evolving sector employing labour intensive
harvesting, processing and distribution technologies to exploit marine and inland water fishery resources. The
activities of this sub-sector, conducted full-time or part-time, or just seasonally, are often targeted on supplying fish
and fishery products to local and domestic markets, and for subsistence consumption. Export- oriented production,
however, has increased in many small-scale fisheries during the last one to two decades because of greater market
integration and globalization. While typically men are engaged in fishing and women in fish processing and marketing,
women are also known to engage in near shore harvesting activities and men are known to engage in fish marketing
and distribution. Other ancillary activities such as net-making, boat-building, engine repair and maintenance, etc. can
provide additional fishery-related employment and income opportunities in marine and inland fishing communities.
Small-scale fisheries operate at widely differing organizational levels ranging from self-employed single operators
through informal micro-enterprises to formal sector businesses. This sub-sector, therefore, is not homogenous within
and across countries and regions and attention to this fact is warranted when formulating strategies and policies for
enhancing its contribution to food security and poverty alleviation.”
Berkes et al. (2001) indicated in 2001 (450 million). Regardless of the discrepancies in these results, they all point the importance of this sector to a huge number of people. Furthermore, these estimates could be considered conservative since they do not take into account people who might access fisheries on a need-to basis (Béné 2006).

Table 1: Estimates of employment and catch in small-scale fisheries (including inland and marine environment if not specified otherwise).

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Berkes et al. (2001)</td>
<td>50</td>
<td>150</td>
<td>450</td>
<td>20-30</td>
</tr>
<tr>
<td>Delgado et al. (2003)</td>
<td>28.5 in 1990</td>
<td>60-100</td>
<td>200</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>40² in 2003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pauly (2006)</td>
<td>&gt;12</td>
<td>NA</td>
<td>NA</td>
<td>~30</td>
</tr>
<tr>
<td>Chuenpagdee et al. (2006)</td>
<td>~12³</td>
<td>NA</td>
<td>NA</td>
<td>21</td>
</tr>
<tr>
<td>FAO and WorldFish Center (2008)</td>
<td>25-27</td>
<td>68-70</td>
<td>NA</td>
<td>30</td>
</tr>
<tr>
<td>FAO (2009)⁴</td>
<td>~38</td>
<td>~146</td>
<td>~447</td>
<td>NA</td>
</tr>
</tbody>
</table>

In terms of catch, it is estimated that small-scale fisheries contribute approximately 30 million metric tons annually (Berkes et al. 2001, Pauly 2006, Food and WorldFish 2008). It is important to point out that catch data are incomplete and probably underreported since most of the catch from small-scale fisheries is used directly for

---

² Estimate
³ In 2000
⁴ FAO does not estimate directly the size of SSF. This is my assessment based on the information provided in the report.
subsistence purposes or traded at local markets and therefore, not incorporated into data from official landings. For example, investigating the status of coastal fisheries in the South Pacific, Dalzell et al. (1996) found that close to 80 percent of the total yearly catch, which averaged around 100 thousand metric tons during the early 1990s, was used for subsistence purposes. Considering the projected increase in the human population over the next 60 years (Lutz et al. 2001) and the importance of coastal areas in terms of human settlements (McGranahan et al. 2007), we should expect to see small-scale fisheries expand. This trend might especially be significant in developing countries, given that SSF fisheries do not require large initial capital to enter and can generate food and income faster than other subsistence methods (Béné 2006).

Many small-scale fisheries are either de facto or de jure open access resources, and thus allow any interested party to enter (Andrew et al. 2007, Salas et al. 2007). Even though some authors emphasize the need for an easy access to fisheries for local people since fishing is only one in a set of diversified livelihood strategies and thus contributes to both food and financial security (Allison and Ellis 2001, Béné 2006), high-demand fisheries clearly require some sort of common property regime in order to prevent depletion of the resource. However, it would be wrong to conclude that the small-scale fisheries all have no such regulations and are all experiencing overfishing or decreasing catches. Evidence from Oceania (Johannes 1978, 2002), Mexico (Basurto 2005, 2008), Chile (Defeo and Castilla 2005, Orensanz et al. 2005), Turkey (Berkes 1986a, 1992), and
Brazil (Cordell and McKean 1992) suggests that local fishers are able to devise a broad set of management strategies that allow them to harvest targeted resources sustainably. However, without appropriate governance structures to support regulation by communities, particularly in light of the expected increase in the human population, coastal small-scale fisheries might not be able to continue to provide adequate economic and nutritional security to local communities. There is already evidence that increase in the number of fishers and consequently in fishing pressure results in overfishing of local fish stocks (Ruttenberg 2001, Hawkins and Roberts 2004). Investigating the island coral reef fisheries using data from 49 island countries, Newton et al. (2007) report that 55 percent are exploited unsustainably. Clearly, governance arrangements, presumably of diverse types, are essential to providing long-term food and job security for SSF.

No panaceas exist for solving all the problems in small-scale fisheries governance, especially not in areas where regular monitoring and data are limited or nonexistent. Most of the studies on SSF indicate that small-scale fisheries are both ecologically and socially diverse, making it difficult to develop a uniform fisheries policy that could be applied broadly. Instead, the emphasis should be placed on developing tools that would support and encourage diverse lifestyles and enable communities to develop their own governance regimes based on local needs and local environmental conditions (Allison and Ellis 2001, Andrew et al. 2007). One approach would encourage local people to actively participate in the policy development process.
(Salas et al. 2007, McClanahan et al. 2009), offering a foundation for overcoming collective action problems at the local level. Positive outcomes may ultimately lead to development of institutions that ensure sustainable use of natural resources (Basurto et al. forthcoming).

1.3 Theoretical concepts

Simple uniform solutions to natural resource governance do not exist because each resource system compromises different complex interactions of social and biological factors. The inherent uncertainty of such complex interactions suggests that there are no one-size-fits-all panaceas in institutional design and that any governance structure may fail under certain conditions (Acheson 2006). Studies from natural resource governance have suggested that neither top-down nor bottom-up governance arrangements have been performing adequately, which was especially evident in less developed countries where economic and human management capacity are often lacking (Holling and Meffe 1996, Larson and Soto 2008, Hoffman 2009). An exclusive reliance on a centralized bureaucracy or a simple transfer of decision-making powers to local institutions without consideration of the socio-political and ecological contexts usually fails to produce intended results (Agrawal and Gupta 2005). This argument states that there is no single level, such as local, regional, national, or international, of a governance regime that can address all of the challenges and take advantage of the
opportunities that emerge from the social and ecological interdependencies. Instead, the emphasis needs to shift to understanding and creating effective multi-level governance regimes of CPRs that can effectively take these interdependencies into account (Cash et al. 2006, Brondizio et al. 2009, McCay and Jones 2011).

In this dissertation I rely on four distinct although interrelated theoretical concepts. First, I use the common-pool resource theory to frame the overall problem and to emphasize the role of institutions in natural resource governance. Given that institutions are a product of interactions among different actors, I focus on social capital as a construct that facilitates these interactions and link its effects to the context of multi-level governance arrangements related to small-scale fisheries. I then explore the effectiveness of such arrangements through different levels of participatory processes that permit resource users to participate in diverse governance activities related to local marine resources. I will next elaborate on each of these four theoretical constructs and explain how they structure my research questions.

1.3.1 Common pool resource

Common-pool resource (CPR) theory predicts that local resource users are capable of developing institutions that govern their use of natural resources such as fish, irrigation systems, and forests (McCay and Acheson 1987, Ostrom 1990, Bromley 1992). Institutions in a broad sense are “rules of the game” that humans devise to structure
their interactions and thus reduce uncertainty (North 1990). Rules represent one
category of institutions and can be defined as “prescriptions that define what actions (or
outcomes) are required, prohibited, or permitted, and the sanctions authorized if the
rules are not followed” (Ostrom et al. 1994, p38). They can be divided into rules-in-form
and rules-in-use based on their origin and form (Ostrom 2005). Rules-in-form are formal
laws that are created and enforced by a particular governance entity. Alternatively,
rules-in-use or working rules are usually unwritten rules that actors within a particular
setting would refer to if asked to explain or clarify their actions. While rules-in-use are
often based on rules-in-form, in many instances they differ dramatically from each other
because rules-in-form might be unknown to local actors (Cinti 2010), or simply
nonexistent for a particular context (Acheson 1997), or because rules in form do not
reflect the needs of local actors (Sekhar 2007) or do not fit the local conditions (Ostrom
1992). These examples emphasize the need for effective communication among all the
actors engaged in the resource governance.

A large number of studies, conducted over the last 30 years indicate that resource
users are able to organize themselves and develop institutions that allow them to
sustainably manage natural resources on which they depend (McCay and Acheson 1987,
Dolsak et al. 2003, Basurto 2005). This is especially challenging with common-pool
resources given that they are characterized by low excludability and high subtractability
(Ostrom et al. 1994). Low excludability means that it preventing users from accessing
and harvesting the resource is costly. High subtractability means that each unit of a resource that is harvested by one user becomes unavailable to other users (in contrast, for instance, to public lighting, tranquility, a given level of public safety, or information). In the context of fisheries, these attributes make CPRs vulnerable to depletion, since each fisher has the incentive to appropriate as much of the resource as possible before others do the same (Gordon 1954, Ostrom 1990). Such collective action problems constitute a fundamental challenge to sustainable management of CPRs.

A collective action problem is a social dilemma resulting from the divergence between individual and group interests, causing each individual to increase individual gains at the expense of the societal outcome. Individuals in this situation are trapped in a Pareto-suboptimal state; had the individual resource users cooperated in mutual restraint, they would have achieved a preferred outcome for both the group and for themselves. Social dilemmas drive the use of the resource above the sustainable limits, leading to resource depletion or the “tragedy of the commons” (Hardin 1968). Numerous studies, performed in both laboratory and field, have shown that this model fails to predict a large number of successful cooperative outcomes in collective action dilemmas across diverse settings (Bromley 1992, Ostrom et al. 1994). These and similar findings created a need to reconsider the behavior models based on such a narrow notion of rationality that they ignore institutions, constraints, and context, making them unable to describe and predict accurately the social interactions of resource users outside
of narrowly defined competitive and market-oriented settings. Instead, second-generation models of rational-choice theories that focus on bounded rational and moral behavior were developed (Ostrom 1998).

These bounded-rationality models recognized the limits of human cognition and relevance of emotions in decision-making processes (Conlisk 1996, Jones 1999). Such limitations constrain the ability of individuals and groups to process information and force them to develop and adopt heuristics that simplify available choices and thus facilitate decision-making. Within the context of institutional analysis, bounded rationality models allow for incorporation and further development of the concept of social capital (Ostrom and Ahn 2003). Social capital is a determinant of successful collective action. In other words, it increases community’s ability to self-organize and to successfully manage natural resources (Katz 2000, Cramb 2005, Bouma et al. 2008, Behera 2009) by reducing the incentives of individuals to free-ride and by lowering the transaction costs associated with collective action (Pretty and Ward 2001).

1.3.2 Social capital

During the last three decades, social capital has gained prominence throughout the field of social science. Economists, sociologists, political scientists, and anthropologists started applying and analyzing this concept in various social processes, which inevitably led to the production of a myriad of meanings and theoretical
conceptualizations of social capital. Major theoretical developments of the concept of social capital were made by Bourdieu (1984, 1986), Coleman (1987, 1988), Putnam (1994, 2000), Burt (1992, 2000), Lin (2001, 2008a), and Ostrom (1992, 1994), although important contributions by other authors in further advancing theory and measurement of this concept should also be acknowledged (Fukuyama 1995, Portes 1998, Woolcock and Narayan 2000, Krishna 2002, Grootaert et al. 2004). While all these scholars view social capital as a property of relationships among various actors, they differ in terms of their view of how social capital is embedded within a particular network.

For Bourdieu (1986, p.248), social capital is “the aggregate of the actual and potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition – or in other words, to membership in a group – which provides each of its members with the backing of the collectively owned capital, a ‘credential’ which entitles them to credit, in the various senses of the word.” Coleman (1990) sees social capital as an element in the social structure that facilitate actions of actors that belong to it, while Putnam (2000) extends this societal relations to explicitly include the norms of reciprocity and trustworthiness that arise from them. Burt (1992) and Lin (2001) view social capital as the resources embedded in social networks that can be accessed and used by actors for specific actions, although their views on its origin within the network differ slightly from other scholars. Ostrom (1994, p.529), on the other hand, views social capital as local
institutions which are created in “extended trial and error processes by participants within a larger political structure provided by higher level governments.”

The diversity of definitions of social capital also reflects a mélange of opinions on how social capital as a theoretical concept is constructed, conceptualized, and manifested. Table 2 provides a brief overview of these different dimensions. Overall, there are two distinct schools of thought that developed parallel, and to an extent non-competing, theories of social capital. While the first school, epitomized by Coleman’s and Putnam’s work, sees social capital as a combination of structural (i.e. networks) and cultural components (i.e. trust, norms of reciprocity), the second school pioneered by Burt and Lin sees social capital as a strictly structurally embedded set of resources within a network. For them, social capital has a characteristic of a private good, and thus does not include the concepts of trust and norms of reciprocity given that they are seen as cultural assets. Furthermore, Lin argues that broadening the definition of social capital to include such assets impedes theory testing and development because it creates a tautological argument where the causal proposition is defined by its effect - trust and norms of reciprocity on one hand facilitate the creation and maintenance of relationships while on the other hand are also enabled by those same relationships. Conversely, the first school puts great emphasis on recognizing the importance of cultural attributes, such as trust and norms of reciprocity, in addition to structural (i.e. networks). These attributes, unlike the structural component, have the characteristics of public goods,
given that once they are created the entire community/group benefits from them regardless of whether or not every individual who benefits has participated in their creation. In the context of social dilemmas, Ostrom (1998) points out that trust is what enables individuals to initiate cooperation with the mutual expectation that it will be reciprocated. This characteristic of trust and reciprocity creates a core linkage between social capital and collective action (Ostrom and Ahn 2003).

The analysis of the multidimensionality of social capital provides an opportunity to specifically investigate its relationship with stakeholders’ capacity and ability to participate in the design of rules and norms (i.e., monitoring and enforcement) across different governance levels. Given that participation is a behavioral manifestation of cooperation (Lubell 2004), understanding what builds and affects effective and equitable stakeholders’ participation is important because it is one of the key components of successful governance systems (Ostrom 2005). For example, Ostrom (1994) noted that modernization of irrigation systems by the government agencies in Nepal failed to achieve higher performance because it made one of the essential participatory arenas obsolete. Relationships among farmers deteriorated once they no longer interacted regularly while maintaining irrigation systems and lost the cooperative attitude that made the system effective.
Table 2: Description of different dimensions of social capital and their components based on the literature review.

<table>
<thead>
<tr>
<th>Dimension of social capital</th>
<th>Mutually exclusive components</th>
<th>Explanation</th>
<th>Proponent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epistemological</td>
<td>Rational-choice theory</td>
<td>Value-maximizing individuals making rational decisions about how to improve their situation</td>
<td>Coleman, Lin, Ostrom</td>
</tr>
<tr>
<td></td>
<td>Structuralism</td>
<td>Individual decisions are influenced by cultural values, emotional choices, and needs</td>
<td>Bourdieu</td>
</tr>
<tr>
<td>Functional (aspect I)</td>
<td>Exclusively structural</td>
<td>Structural attribute - resources embedded in social relationships - defines social capital</td>
<td>Lin, Burt</td>
</tr>
<tr>
<td></td>
<td>Structural and cultural</td>
<td>Cultural attributes (i.e. trust, norms of reciprocity) included as components of social capital</td>
<td>Coleman, Putnam, Ostrom</td>
</tr>
<tr>
<td>Functional (aspect II)</td>
<td>Private good</td>
<td>Social capital as a personal resource</td>
<td>Lin, Burt</td>
</tr>
<tr>
<td></td>
<td>Public good</td>
<td>Social capital as a collective asset</td>
<td>Coleman, Putnam, Ostrom</td>
</tr>
<tr>
<td></td>
<td>Club good</td>
<td>Social capital as a privileged (i.e. class) asset</td>
<td>Bourdieu</td>
</tr>
<tr>
<td>Emergent</td>
<td>Micro</td>
<td>Social capital exhibited at the individual level</td>
<td>Lin, Burt</td>
</tr>
<tr>
<td></td>
<td>Meso</td>
<td>Social capital exhibited at the group/organizational level</td>
<td>Coleman, Bourdieau, Ostrom</td>
</tr>
<tr>
<td></td>
<td>Macro</td>
<td>Social capital exhibited at the societal level</td>
<td>Putnam</td>
</tr>
<tr>
<td></td>
<td>Interrelated</td>
<td>Social capital emerges through interaction among different levels</td>
<td>Bourdieu, Coleman</td>
</tr>
<tr>
<td>Justificatory</td>
<td>Instrumental</td>
<td>Individuals driven by self-interest</td>
<td>Burt, Lin</td>
</tr>
<tr>
<td></td>
<td>Normative</td>
<td>Individuals improve/foster societal values and/or societal welfare</td>
<td>Putnam, Ostrom</td>
</tr>
<tr>
<td>Methodological (aspect I)</td>
<td>Individual</td>
<td>Unit of analysis is individual</td>
<td>Bourdieu, Coleman, Lin, Burt</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------</td>
<td>--------------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>Collective</td>
<td>Unit of analysis is a collective</td>
<td>Putnam</td>
<td></td>
</tr>
<tr>
<td>Methodological (aspect II)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal/Institutionalized</td>
<td>Focus on formal network ties</td>
<td>Coleman, Putnam, Bourdieu</td>
<td></td>
</tr>
<tr>
<td>Informal</td>
<td>Focus on informal network ties</td>
<td>Burt</td>
<td></td>
</tr>
<tr>
<td>Formal and informal combined</td>
<td>Focus on both types of network ties</td>
<td>Lin</td>
<td></td>
</tr>
</tbody>
</table>
In the context of natural resource management the presence of social capital within a community increases its ability to self-organize and to successfully manage its resources (Ostrom and Ahn 2003, Pretty and Smith 2004, Gutiérrez et al. 2011). The amount of trust present among community members, community and government entities, and other organizations serves as an indicator of the potential for achieving cooperative arrangements (Ostrom and Ahn 2003). According to Lubell (2004), farmers’ participation in collaborative watershed management depends on the expectation of reciprocity and institutional trust among farmers and local government agencies. Similarly, by combining experimental and field data, Bouma et al. (2008) found that the level of trust within a community is correlated with participation in resource management activities. Connectedness across various networks and groups allows actors to share knowledge and information about the resource itself as well as the rules and norms that are in place, and to avoid or resolve conflicts. For example, Sekhar (2007) found that the existence of networks within and among fishing groups (bonding and bridging social capital) facilitated the creation and maintenance of a locally designed rule system in the Chilika Lake fishery, India. On the other hand, lack of appropriate connections may result in overuse and collapse of a resource collapse (Cudney-Bueno and Basurto 2009). However, it is important to note that even when social capital exists within a community, the sustainable use of resources is not ensured (Baland and Platteau 1996). Furthermore, social capital has a “dark side” that may allow powerful
actors to marginalize other members within a community, excluding them from
decision-making and/or receiving benefits (Adger et al. 2005). These findings suggest
that local conditions matter and that social capital analysis needs to be aptly situated
and pay attention to the nature of the relationships that exist within a particular locality.

1.3.3 Multi-level governance arrangements

Successful natural resource governance arrangements, defined as those that
permit long-term sustainability of resources, in the broadest terms depend on the scale
at which the governance system is designed and more importantly, on the cross-scale
linkages that allow for exchange of knowledge and information among different levels
(Cash et al. 2006).

Recent findings from the natural resource literature suggest that there is no
single level and structure of governance system that is immune to failure (Holling and
top-down centralized governance arrangements have been largely ineffective,
particularly in less developed countries where economic and human management
capacity are often lacking (Holling and Meffe 1996, Larson and Soto 2008). On the other
hand, bottom-up governance arrangements may lead to elite capture or to power
findings suggest that there is no single scale, such as local, regional, national, or
international, of governance regime that can address all of the challenges and take advantage of the opportunities that emerge from the social and ecological interdependencies. Thus we must consider socio-political and ecological contexts, and some authors argue that our emphasis must shift to understanding and creating effective multi-level governance regimes of CPRs (Brondizio et al. 2009, Jones et al. 2011).

The conceptualization of multi-level governance has taken different forms depending on the specific approach. Within the realm of political science, such conceptualization is broadly divided between structural and functional forms (Hooghe and Marks 2003). Structural form emphasizes a clear delineation of jurisdictional boundaries at different levels (i.e. local, regional, national). This can be further separated depending on the power-sharing arrangements in place on systems that centralize the power at a particular level and those that distribute the power across the levels. Functional form, on the other hand, is task-specific oriented and is composed of overlapping and flexible jurisdictions. For the purposes of this study multi-level governance is defined as “institutional arrangements that facilitate the coproduction, mediation, translation, and negotiation of information and knowledge within and across levels” (Brondizio et al. 2009,p255). Different levels, in this sense refer to horizontal and vertical linkages among community and other entities such as government agencies and non-government organizations (García-López 2013). Therefore, effective multi-level
governance arrangements of renewable resources rely on capture and sharing of information among a diversity of actors from local users, regional and state governments to non-governmental organizations and other stakeholders.

There are many different ways to conceptualize multi-level linkages and arrangements (Poteete 2012). In this study, I use a framework of micro-institutional analysis that links decision-making arenas across three distinct levels (operational rules and choice, collective rules and choice, and constitutional rules and choice). These different arenas and types of rules or choice exist within a single simple group of individuals, but I use this framework to diagnose and operationalize multi-level governance arrangements (Kiser and Ostrom 2000). This framework allows researchers to distinguish among three types of decisions or arenas that are sequentially nested based on rule-making authority (Ostrom 2005). Operational rules guide day-to-day actions of the actors in actual harvesting; they are created in the collective-choice arena; collective-choice rules are the rules for making operational rules. Finally, collective-choice rules are established in the constitutional arena; constitutional rules determine who is eligible to participate in making the collective-choice rules for making operational rules. These arenas differ according to the kinds of activities governed and the type of rules made. They do not correspond to hierarchies in government, least of all to municipal, state/provincial, and national levels of actual governments. It is also important to recognize that the rule-making process at each level can be formal or
informal, depending on the circumstances and organizational requirements.

Furthermore, the theoretical conceptualization of the ‘nestedness’ of rules is not limited to three levels (Diermeier and Krehbiel 2003, Ostrom 2005). Pinkerton (2003) argues that effective fisheries co-management is predicated on the cross-scale linkages across these levels. Without the access of local actors or their representatives to higher levels, multi-level arrangements lose their function, which leads to the next concept – participation.

1.3.4 Participation in natural resource management

The concept of participation by public in general and resource users in particular has been considered a cornerstone of natural resource management (Wells and Brandon 1993, Michener 1998). Since the reconfiguration of the dominant natural resource governance model in 1980s, which until that time relied on state control and centralized systems that failed, and since the consequent gradual shift towards community-based and co-management models, public participation has become a main component of these alternative governance models that was predicated on devolution of power to local government levels or communities (Larson and Soto 2008, Berkes 2010). This idea was supported by a growing body of literature that argued that local actors, who interact with a resource on a daily basis, have important ecological and social knowledge as well as the incentive or motivation to manage and use their resources effectively (Ostrom 1990, Bromley 1992, McKean 1992). Furthermore, the Common-pool resource theory also
pointed out that resource users are capable of self organizing and devising effective governance strategies to sustain resource use over time (Berkes 1986b, Acheson 1987, Basurto 2008). In these localized governance systems, ability of users to freely participate in decision making activities where ideas could be easily exchanged among the group, allowed for the emergence of collective action (Futemma et al. 2002, Ostrom 2007).

Participation is an important ingredient not because it is democratic and sounds philosophically satisfying to many authors and policymakers, but because it is the only way to harness local knowledge and give local resource users the motivation to make and enforce rules (their own rules, that they make with their own interests in mind) aimed at sustainable outcomes. It is no guarantee of success. But for a higher authority to make the rules without involving local people clearly guarantees failure, as we have seen for decades in top-down systems that fishers have no incentive to go along with. International donors, such as the World Bank and Global Environmental Facility, thus began to insist that public participation be integrated in their funded projects (The World Bank 1996, Mansuri and Rao 2004). This shift had major implications for both local communities and natural resources, albeit not always positive.

There is no single definition of participation, given that it can take various forms that can differ both structurally and functionally among each other (McCay and Jentoft 1996, Michener 1998) (Table 3). For example, Cohen and Uphoff (1980) postulate that participation is a complex concept composed of multiple dimensions and contexts that
interact among each other to give participation a particular meaning. They distinguish among types of participation (i.e. in decision-making, in implementation, in evaluation), diversity of participants (i.e. local residents, local leaders, government organizations, non-governmental organizations), and mechanisms of the participatory process. From the perspective of local actors, a meaningful participation “requires involvement by relevant stakeholders in all decision-making phases and throughout the programme cycle (i.e. from design to implementation to evaluation)” (Kapoor 2001, p247). In this way active participation reinforces cooperation and strengthens the creation of positive outcomes through the development of ownership in regards to the participatory process itself (Cavalcanti et al. 2013). As McCay and Jentoft (1996) point out, involving fishers more directly into the decision-making process and bringing the management process closer to the affected fishers enhances their willingness to come to agreement and comply with rules and regulations of their own making. For example, Ostrom (1994) noted that modernization of irrigation systems by the government agencies in Nepal failed to achieve higher performance because it made one of the essential participatory arenas obsolete. Relationships among farmers deteriorated once they no longer interacted regularly while maintaining irrigation systems and lost the cooperative attitude that made the system effective.

However, implementation and application of this concept in natural resource conservation are far from reaching its full potential and are often undermined by
differing world-views, knowledge systems, and/or power relations among the actors (Campbell and Vainio-Mattila 2003). Furthermore, one cannot automatically assume that fishers will be willing to participate in governance activities, given that there might be social norms and/or economic and political views warning that participation is dangerous or a waste of time (Shortall 2008). Some authors suggest that participation is often used as a pretext by centralized government entities to further their own goal and agenda masked as a democratic process (Cooke and Kothari 2001, Berkes 2007). Others point out that participatory arenas can be captured by particular groups or individuals, leading to unequal distribution of benefits among the actors (Singleton 2000).
Table 3: Typology of participatory arrangements\(^1\).

<table>
<thead>
<tr>
<th>Dimension of participatory arrangements</th>
<th>Participatory input</th>
<th>Management type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empowerment</td>
<td>Citizen control</td>
<td>User management</td>
<td>Self-governance with minimal involvement of government</td>
</tr>
<tr>
<td></td>
<td>Delegated power</td>
<td>Informative</td>
<td>Users make decisions and inform government</td>
</tr>
<tr>
<td>Partnership</td>
<td>Advisory</td>
<td></td>
<td>Users advise government of decisions and government endorse them</td>
</tr>
<tr>
<td></td>
<td>Cooperative</td>
<td></td>
<td>Co-operate together as equal partners in decision-making</td>
</tr>
<tr>
<td>Assistencialism</td>
<td>Placating</td>
<td>Conciliatory</td>
<td>Governments consult users to make them feel engaged</td>
</tr>
<tr>
<td></td>
<td>Consulting</td>
<td>Consultative</td>
<td>Governments consult users but make the decisions</td>
</tr>
<tr>
<td>Domestication</td>
<td>Informing</td>
<td>Instructive</td>
<td>Minimal exchange of information between government and users</td>
</tr>
<tr>
<td></td>
<td>Therapy</td>
<td>Government management</td>
<td>Governments counsels users through the process</td>
</tr>
<tr>
<td></td>
<td>Manipulation</td>
<td>Government management</td>
<td>Governments manipulates users through the process</td>
</tr>
<tr>
<td>Disenfrachisement</td>
<td>Disregard</td>
<td>Government management</td>
<td>No dialogue between the parties</td>
</tr>
</tbody>
</table>

\(^1\) Adapted and modified from Deshler and Sock (1985), McCay (1993), Sen and Nielsen (1996), and Bene and Neiland (2006).

1.4 Theoretical model

This study will confine its examination of social capital, multi-level governance, and participation to the study of common-pool resources. Analyzing the multidimensionality of social capital provides an opportunity to investigate specifically...
the relationship between social capital and stakeholders’ capacity and ability to participate in the design of rules and norms across different governance levels. Participation is a behavioral manifestation of cooperation (Lubell 2004), so understanding what builds and affects effective and equitable stakeholders’ participation is important because it is one of the key components of successful governance systems (Ostrom 2005).

The relationships among these different concepts are represented in figure 1 and also offer a basis for the research questions that guided this study:

1. What is the role of two different conceptualizations of social capital (A and B) in fisheries multi-level governance?

2. What is the link between the two conceptualizations of social capital (A and B) and individual outcomes particular to small-scale fisheries?

3. Does fishers’ participation in processes related to governance and management of marine resources relates to the generation of specific outcomes necessary for achieving sustainable livelihoods?

I conducted the empirical analysis in small-scale marine fisheries in northwestern Mexico. This region is the core area for Mexican fisheries and it combines the challenge of conducting sustainable fishing while protecting biodiversity. Furthermore, because so much of the fishing is done through SSF it is perfect for guaranteeing variety in fishing methods and social organization in different fishing communities. Therefore, interaction
among fishers, government and non-government entities, as well as researchers in
fisheries management is diverse and complex in this region, allowing me to investigate
these relationships.
Figure 1: Schematic representation of relationships among the theoretical concepts applied in this study.
1.5 Description of the Mexican fishery regulatory context

All natural resources, including marine, that are within the Mexican land, coastal or continental shelf territory (from 0 to 200 nautical miles) are considered property of the nation (Mexican Constitution 1917 art. 27). As such, the governance of marine resources in Mexico involves a number of federal and state government agencies (Figure 2). The Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) oversees all aspects of fishery related issues. Its two decentralized entities, the National Commission for Aquaculture and Fishing (CONAPESCA) and the National Fisheries Institute (INAPESCA) are in charge of managing and enforcing fisheries regulations, and of collecting and analyzing fisheries and biological data, respectively. The Secretariat of Environment and Natural Resources (SEMARNAT) regulates the use of at risk species and also establishes and manages protected areas, through the National Commission of Natural Protected Areas (CONANP). The enforcement body of SEMARNAT is the Federal Attorney for Environmental Protection (PROFEPA). The Naval Secretariat provides enforcement support to both CONAPESCA and PROFEPA. However, the structure of cooperation among these different federal entities at the local level varies considerably due to local circumstances and politics.

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* Parts of this and the following section, including the figure 2, were initially written/developed for the Leslie et al. paper, accepted for publication in PNAS.
Figure 2: Organizational chart of key federal (in bold) and state (in italics) entities involved in fisheries management in Mexico. SAGARPA: The Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food; INAPESCA: The National Fisheries Institute; CONAPESCA: The National Commission of Aquaculture and Fishing; SEMARNAT: The Secretariat of Environment and Natural Resources; CONANP: The National Commission of Natural Protected Areas; PROFEPA: The Federal Attorney for Environmental Protection; SEMAR: Naval Secretariat; FONMAR: Fund for the Protection of Marine Resources.
Commercial exploitation of marine resources is granted by the national government in the form of permits or area-based concessions. However, such property rights can be limited by the national government in order to secure public interest such as resource conservation, equitable development and social wellbeing (Mexican Constitution 1917 art. 27). The most common fisheries management measures include gear restrictions, size limits, and time and area-specific closed areas. All are determined and promulgated by CONAPESCA, the federal fisheries management agency. Furthermore, each permit indicates specific species (e.g. octopus, clams) or groups of species (e.g. escama, which includes 271 species of finfish distributed across 61 families; or shark, which includes 45 species of elasmobranchs) that can be harvested within a defined region (often based on the political boundaries of one or more municipalities) using a particular gear type (DOF 2010).

The National Institute of Fisheries (INAPESCA) monitors fishing effort and provides recommendations for the issuance of new permits. The most recent analyses indicate that many of the fisheries are exploited at or above the maximum sustainable levels and that fishing effort should not be increased (DOF 2010, 2012). This has limited the issuing of new permits for a number of species, but has not prevented distribution of permits for new or underexploited fisheries. Moreover, as current permits are renewable, the current system functions as a license limit regulation program (Hernández and Kempton 2003). Only permit holders can legally sell catch, although
high transaction costs of obtaining permits and poor compliance monitoring encourages widespread illegal fishing. *De facto* open access conditions are common.

State agencies, such as the Secretariat of Fisheries (SEPESCA) in Baja California and Baja California Sur, also play an important role in fisheries governance. Their role particularly increased after the passage of the 2007 General Law of Sustainable Fisheries and Aquaculture (*Ley General de Pesca y Acuacultura Sustenables*), which gave greater autonomy to state and local entities (DOF 2007c). While neither of the two states has enacted its own fisheries law, SEPESCA has been active in promoting organization of the fishing sector and providing subsidies to the fishers. In the case of Baja California Sur, it is the only state in Mexico that entered in the agreement with the federal government to establish the Fund for the Protection of Marine Resources (FONMAR), which allows them to participate in fisheries monitoring, enforcement and research activities. These funds are generated from the sale of recreational fishing permits in the state. Municipal governments have no authority over fisheries in Mexico, but in BC and BCS, they play varied supporting roles. The 2007 General Law of Sustainable Fisheries and Aquaculture enables creation of municipal subcommittees to aid in the regionalization of fisheries management. All municipalities in BC and BCS have such subcommittees, although they varied greatly in effectiveness and foci.
1.6 Small-scale fisheries sector in Mexico

The fisheries sector is highly variable in terms of the employment and size of the fleet (Table 4). While estimating the actual effort used by Mexico’s small-scale fishing fleets effort is a challenge due to limits on governmental funds and technical and human capacity in Mexico (OECD 2006), there is no dispute about the importance of small scale fishing in the coastal areas. The OECD estimates that more than 90% of the fishers participate in the small-scale fisheries sector (OECD 2006, DOF 2008). Although the overall contribution of the fisheries sector to the Mexican Gross Domestic Product is rather small (Table 1), its social and economic importance to some of the coastal states and especially coastal communities is considerable (Contreras 2002, Fraga Berdugo et al. 2006, OECD 2006, Basurto et al. 2013). For example, small-scale fisheries of the Gulf of California region, including the Pacific coast along Baja California peninsula, contribute 71% of the catch volume and 57% of value of the total landings in Mexico and more than 93% of the boats engaged in fishing activities within this region belong to the SSF sector (OECD 2006). The small-scale fisheries sector contributed 5% to the GDP of the state of Baja California Sur in 1996 (OECD 2006).
Table 4: Characteristics of the fisheries sector in Mexico.

<table>
<thead>
<tr>
<th>Characteristics/Year</th>
<th>2004⁷</th>
<th>2006⁸</th>
<th>2012⁹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment in the fisheries sector¹⁰</td>
<td>297,422</td>
<td>306,000</td>
<td>197,737</td>
</tr>
<tr>
<td>Number of boats (small-scale)</td>
<td>102,807</td>
<td>90,000</td>
<td>NA</td>
</tr>
<tr>
<td>Landings (million metric tones)</td>
<td>1.45</td>
<td>1.40</td>
<td>1.43</td>
</tr>
<tr>
<td>Fisheries contribution to GDP (%)¹¹</td>
<td>0.15</td>
<td>0.38</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Small-scale fishers in northwest Mexico typically use 6-8 m fiberglass boats (pangas) powered with outboard motors, although some portion of them fishes without the boat either by snorkeling or by fishing from the shore. Fishers usually work together in teams of two or three people using a diverse fishing gear. A gillnet (chinchorro) is most common for catching finfish (escama) and some of the elasmobranchs. A hook and line (piola con anzuelo) is also used for catching finfish, whereas benthic species like gastropods (e.g. abalone) and bivalves (e.g. clams, pen shells) are retrieved by diving (buceo), mainly using hookah rigs. Traps (trampas) also are used for some taxa, such as lobster and octopus. Longline (cimbra), or its derivative simplera (2-3 hooks on a single line which one end is anchored and the other one is tied to a buoy), is used to catch sharks and some of the pelagic species such as tuna. Most small-scale fishing activities

⁷ OECD (2006)  
⁸ DOF (2008)  
⁹ DOF (2013)  
¹⁰ This includes employment in fisheries, aquaculture, and processing activities. In 2004, there were 255,248 fishers. This data is not available for other years.  
¹¹ This includes fisheries and aquaculture contribution to the annual GDP.
are confined to near shore waters, although some of the fisheries in the northwest Pacific are known to occur up to 80 kilometers (E. Finkbeiner, personal communication). The catch is either sold directly in town to a fish buyer (comprador) or transported to retail market or to a fish buyer in another location (Basurto et al. 2013).

SSF fishers in Mexico are organized as cooperative members, individual permit holders (permisionarios or armadores), or independent fishers (pescadores libres). These groups were codified in the 1947 Fisheries Law and have since changed very little. The goal of cooperatives is to provide legal structure for groups of people to voluntarily unite and to pool and share necessary resources for their social and/or economic betterment (LGSC 1994). Fishing cooperative formation in Mexico began in the 1930s with a mandate from President Lázaro Cárdenas that provided incentives for fishermen to organize by granting them exclusive rights to lucrative species such as abalone, lobster, shrimp, oysters, totoaba, mullet, and octopus (McGoodwin 1980, Rojas-Coria 1982, OECD 2006). The next wave of formation came in the 1970s when President Echeverría provided economic incentives for coastal ejidos to form fishing cooperatives (Ramírez Sánchez et al. 2011). The latest wave of formation, starting in 1992, is largely a result of the need to be part of a cooperative to access more easily fishing permits and government subsidies (Ramírez Sánchez et al. 2011). Unlike cooperative members, permisionarios are private individuals or corporate entities that have a permit that grants them right to catch and sell to the open market particular species. Historically,
permisionarios were not able to harvest species for which cooperatives held exclusive rights, but since 1986 this is no longer the case (Young 2001, Espinoza-Tenorio et al. 2011). Lastly, pescadores libres do not hold a permit to commercially sell catch but have rights to fish local fishing grounds with particular gear types for subsistence purposes (Young 2001). Contemporary practices involve pescadores libres fishing for permisionarios or cooperatives as hired labor or for a predetermined share of the total earnings (Cinti et al. 2010c, Basurto et al. 2013).

1.6.1 Small-scale fisheries sector in Baja California Sur

In 2010, 471 owners owned 1,605 fishing permits in Baja California Sur, Mexico (CONAPESCA dataset). A majority of the permit holders belonged to the cooperative sector, which was comprised of 4,163 members. The small-scale fishing fleet consisted of 2,758 pangas, of which 73% belonged to the cooperative sector. Out of the 20 different groups of resources for which the fishing permit could be obtained in this region, fish (escama) permit were the most numerous one and it comprised 26% of all the permits that were active in 2010. The number of people who declared themselves to be fishers increased by 26% over the last three decades (Table 5).
Table 5. Number of fishers in BCS over the last three decades.

<table>
<thead>
<tr>
<th>State (Municipality)/Year</th>
<th>1990¹</th>
<th>2000²</th>
<th>2010³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baja California Sur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comondu</td>
<td>1510</td>
<td>2263</td>
<td>1655</td>
</tr>
<tr>
<td>Mulege</td>
<td>1500</td>
<td>1421</td>
<td>2239</td>
</tr>
<tr>
<td>La Paz</td>
<td>1060</td>
<td>1165</td>
<td>1273</td>
</tr>
<tr>
<td>Los Cabos</td>
<td>250</td>
<td>571</td>
<td>246</td>
</tr>
<tr>
<td>Loreto³</td>
<td>NA</td>
<td>257</td>
<td>460</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4320</td>
<td>5677</td>
<td>5873</td>
</tr>
</tbody>
</table>

1.6.2 Small-scale fisheries sector in Baja California

In 2014 there were 1,658 registered pangas in the state of Baja California. Some 18% of them were located in the port of San Felipe (CEDO 2012). Unfortunately, no other official statewide data were available for this state.

1.7 Public participation in fisheries governance in Mexico

The right to participate in the governance processes, either through voting or through engagement in the creation and elaboration of development programs, is granted to every Mexican by their constitution (Mexican Constitution 1917 art. 26, § A; art. 35, § I). Mexico goes through democratic revisions of national development every six years (sexenio) with the election of a new President and national legislature⁴. This process encompasses broad participation of different social sectors with the goal of

¹ Data from IMPUMS-International, Minnesota Population Center.
² Ibid.
³ In 1990 Loreto did not have municipality status.
⁴ After the 30-year dictatorship of Porfirio Diaz, Mexico adopted the requirement that all politicians serve only one term in each office.
incorporating demands and aspirations of civil society into development programs (Mexican Constitution 1917 art. 26, § A). Once finalized and approved by the legislature, development programs are implemented by federal agencies.

Within fisheries governance, there are two main laws that structure fishing activities and practices. One is the General Law of Sustainable Fisheries and Aquaculture (LGPAS), the principal act that regulates fishing activities, and the other is the General Law of Ecological Equilibrium and Environmental Protection (LGEEPA), which restricts fishing through the creation of marine protected areas and the designation of species under special protection.

LGPAS was historically not amenable to the engagement of the public in governance activities, although that changed with the latest revision of the law in 2007, which further encourages the participation of state and local entities in fisheries management. Specifically to public participation, LGPAS specifies that one of its principal objectives is to determine and establish the basis for the creation, operation, and functioning of participatory mechanisms for people dedicated to fishing and aquaculture activities (LGPAS 2007 art 2. sect. VII). Furthermore, the law dictates the creation of the federal fisheries and aquaculture council that would promote and stimulate the active participation of the communities and other interested parties in fisheries management (LGPAS 2007 art 8. sect XXXV; art 22). The nature of the law allows for considerable devolution of power to the individual states in regards to
fisheries management, which would further work to promote local participation (LGPAS 2007 art 13. sect. V). The development of fishery management plans should specifically include, among other things, the form in which the area under the plan will be organized and administered and the participatory mechanisms for the people and communities living in that area (LGPAS 2007 art 39. sect. III). Similarly, reauthorization of LGEEPA in 1996 firmly established the role of society in environmental policy indicating that it “ensures co-responsible participation of people, individually or collectively, in the preservation and restoration of ecological balance and in the environmental protection” (LGEEPA 1996 art.1. sect VII). For the purposes of protected areas in general and marine in particular the law stipulates that “the Federal Government should promote co-responsible participation of society in planning, implementation, evaluation and monitoring of the environmental policy and natural resources” (LGEEPA 1996 art. 157).

Even though the role and importance of public participation in fisheries management is considerable, the law does not define the methods and processes to guide its implementation. Besides public comment that is available as a general participatory mechanism, neither LGEEPA nor LGPAS (including their regulatory components) provide clear guidance on what public participation should look like in these various administrative and management stages. This situation allows for ample interpretation on the side of managers and public officials of the form and nature of
public participation. While this flexibility provides for an opportunity to tailor participatory processes to the local context, it is fundamentally top-down in limiting participation to the administrator’s personal beliefs, inclinations, and abilities.

1.8 Outline of the dissertation

Chapter 1 defines the scope and purpose of this study. In chapter 2, “Research design,” I present the methods for data collection and analysis, which combine qualitative and quantitative techniques such as interviews, surveys, participant observation, and archival research. This chapter begins with a description of the study area and the justification for selecting the sites for research. The next section provides general characteristics of study sites, including the specific research challenges encountered at each of them. Then the chapter presents techniques for collecting data. Chapters 3, 4, and 5 are prepared as stand-alone manuscripts to be submitted for publication in peer-reviewed journals. Although I tried to minimize repetition among chapters in the dissertation, each chapter repeats some material describing the research site and research methods. In chapter 3 analyzes the relationship between social capital and fishers’ participation in multi-level governance arrangements, using a combined structural-cultural approach for measuring social capital. This chapter is a product of my collaboration with Graham Epstein from the Vincent and Elinor Ostrom Workshop in Political Theory and Policy Analysis at Indiana University. Chapter 4, “The role of fishers’ individual social capital in multi-level governance arrangements: Who
participates in and who benefits from fisheries and conservation policies?” utilizes a structural approach of assessing social capital, which focused on resources embedded within a fishers’ network. Chapter 5, “Effects of fishers’ participation and government subsidies on adaptive capacity of small-scale fishers from Baja California Sur (BCS), Mexico” incorporates over-time data (from 2006 and 2012) to assess these relationships. This chapter is based on a collaborative effort with Xavier Basurto, Amy Hudson Weaver, and Constanza Santa Ana from a Mexican NGO Niparajá. The concluding Chapter 6 reviews the research question and major findings and discusses their theoretical and practical relevances.
2. Research design

2.1 The geographical setting: description of the Gulf of California

The Gulf of California, also known as the Sea of Cortés or Mar Bermejo, has been recognized as one of the tropical marine biodiversity hot spots (Roberts et al. 2002). It is 110 km long and 20-80 km wide, with a surface area of 258,593 km² (Brusca et al. 2005). Its geophysical and oceanographic characteristics produce year-round upwellings that drive high primary productivity as well as species high diversity (Lluch-Cota et al. 2007). Its extensive north to south gradient leads to diverse sets of habitats, including coral reefs, rocky reefs, mangrove forests, alluvial plains, and sandy beaches. Within these habitats, there are 5,969 marine macrofaunal species, 36 marine mammal species, 26 marine bird species, and 5 out of 7 existent marine turtle species (Brusca et al. 2005, Lluch-Cota et al. 2007). Fourteen percent of all the taxa in the Gulf are endemic species (855 species: 2 marine mammals, 87 fish fauna, and 766 marine invertebrates) (Brusca et al. 2005). At least 200 species of fish and invertebrates are commercially harvested in the Gulf (Erisman et al. 2011).

Fisheries in this region represent one of the main income generating activities within the primary sector. The Gulf of California with the adjacent northern Pacific coast region contributes 71% of the catch volume and 57% of value of the total landings in Mexico, and more than 93% of the boats engaged in fishing activities within this region
belong to the SSF sector (OECD 2006). Thus the Gulf of Baja California is both a biodiversity hot spot and the core of Mexico’s fishing. Whether correct or not, many observers consider fishing in general and small-scale fishing in particular to be one of the primary threats to marine biodiversity, in addition to (i) pollution, (ii) alteration and degradation of habitat (including damming of tributary rivers), and (iii) the introduction of exotic and invasive species (Brusca et al. 2005, Lluch-Cota et al. 2007).

One of the major management instruments to protect biodiversity in the Gulf has been the use of marine protected areas (MPAs) and since 2012 the use of fisheries refuges. Out of 33 protected areas in all of Mexico, 12 of them have been established in the Gulf, covering approximately 7.8 % of its area (Table 6). The first one, Cabo San Lucas Wildlife Protection Area was created in 1973. One out of two existing clusters of fishing refuges in Mexico is located in this region.
Table 6: Characteristics of marine protected areas in the Gulf of California.

<table>
<thead>
<tr>
<th>MPA name</th>
<th>Protection category</th>
<th>Creation date</th>
<th>Management plan in place</th>
<th>Total area (ha)</th>
<th>Marine zone (ha)</th>
<th>No-take zone (ha)</th>
<th>% No-take</th>
<th>Ecosystems Protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabo San Lucas</td>
<td>Flora and Fauna Protection Area</td>
<td>1973</td>
<td>No</td>
<td>3,996</td>
<td>3,875</td>
<td>3,875</td>
<td>100</td>
<td>rocky reef</td>
</tr>
<tr>
<td>Upper Gulf of California and Colorado River Delta</td>
<td>Biosphere Reserve</td>
<td>1993</td>
<td>Yes</td>
<td>934,756</td>
<td>560,853</td>
<td>80,000</td>
<td>14.2</td>
<td>sandy bottoms and mudflats</td>
</tr>
<tr>
<td>Cabo Pulmo</td>
<td>National Park</td>
<td>1995</td>
<td>Yes</td>
<td>7,111</td>
<td>7,023</td>
<td>2,556</td>
<td>35.5</td>
<td>coral reef</td>
</tr>
<tr>
<td>Loreto Bay</td>
<td>National Park</td>
<td>1996</td>
<td>Yes</td>
<td>206,580</td>
<td>181,997</td>
<td>6,200</td>
<td>3.4</td>
<td>rocky reef</td>
</tr>
<tr>
<td>Marias Islands</td>
<td>Biosphere Reserve</td>
<td>2000</td>
<td>No</td>
<td>641,284</td>
<td>617,257</td>
<td>9,540</td>
<td>1.49</td>
<td>rocky reef</td>
</tr>
<tr>
<td>San Pedro Martir Island</td>
<td>Biosphere Reserve</td>
<td>2002</td>
<td>Yes</td>
<td>30,165</td>
<td>9,876</td>
<td>821</td>
<td>2.6</td>
<td>rocky reef</td>
</tr>
<tr>
<td>Vaquita</td>
<td>Reserve</td>
<td>2005</td>
<td>NA</td>
<td>126,385</td>
<td>126,385</td>
<td>126,385</td>
<td>100</td>
<td>Vaquita habitat</td>
</tr>
<tr>
<td>San Lorenzo Archipelago</td>
<td>National Park</td>
<td>2005</td>
<td>No</td>
<td>58,442</td>
<td>58,442</td>
<td>8,805</td>
<td>15</td>
<td>rocky reef</td>
</tr>
<tr>
<td>Los Angeles Bay, Whale Channel, and Salsipuedes</td>
<td>Biosphere Reserve</td>
<td>2007</td>
<td>No</td>
<td>387,957</td>
<td>387,957</td>
<td>207</td>
<td>0.05</td>
<td>wetlands and mangroves</td>
</tr>
<tr>
<td>Marine Zone of Espiritu Santo Island</td>
<td>National Park</td>
<td>2007</td>
<td>No</td>
<td>48,655</td>
<td>48,655</td>
<td>666</td>
<td>1.4</td>
<td>rocky reef</td>
</tr>
<tr>
<td>Revillagigedo Archipelago</td>
<td>Biosphere Reserve</td>
<td>2007</td>
<td>No</td>
<td>636,685</td>
<td>620,904</td>
<td>189,715</td>
<td>30.55</td>
<td>rocky reef</td>
</tr>
<tr>
<td>Marietas Islands</td>
<td>National Park</td>
<td>2008</td>
<td>No</td>
<td>1,383</td>
<td>1,311</td>
<td>5</td>
<td>0.38</td>
<td>rocky reef</td>
</tr>
<tr>
<td>Balandra</td>
<td>Flora and Fauna Protection Area</td>
<td>2012</td>
<td>No</td>
<td>2,512</td>
<td>NA</td>
<td>309</td>
<td>12.3</td>
<td>sandy bottoms, wetlands and mangroves</td>
</tr>
</tbody>
</table>
2.2 Study sites

I used a comparative case study design (Kaarbo and Beasley 1999) to select four communities that differ in approaches to participation by users in fisheries management in general and in the implementation and management of MPAs in particular. This type of purposive sampling increases analytical power by capturing variation in the values of the dependent variable (Kaarbo and Beasley 1999, Poteete et al. 2010). I conducted fieldwork in four locations along the Baja California peninsula (Figure 3, Table 7). Each location represents one or more small-scale fishing community. A majority of the fishers employ more than one fishing gear, such as hookah diving, gill nets, long-lines, traps, and/or hook and line, using a 6-8-meter fiberglass boat with an outboard engine. They fish close to the shore, within couple of kilometers, and rarely go on multi-day trips. The catch produced by the small-scale fisheries in these locations is composed on average of 50 species, ranging from finfish and elasmobranchs, to gastropods, bivalves, and crustaceans (Erisman et al. 2011). Each location has a marine protected area (MPA) within its fishing grounds. Furthermore, each MPA has a designated no-take zone within which extraction of marine resources is prohibited. The majority of the MPAs in the region were established as a response to unsustainable fishing practices (CONANP website), which have been recognized as one of the major threats to stability and health of the Gulf of California ecosystem (Sala et al. 2004, Saenz-Arroyo et al. 2005). The
interaction of fisheries and conservation policies across distinct federal and state
government agencies facilitates study of multi-level governance arrangements within
this region. The variability in dependent variables was achieved through document
review analysis (e.g. Cudney-Bueno 2007, Ramirez-Sanchez 2007, CONANP website,
Aburto-Oropeza et al. 2011) as well as through communication with individuals
knowledgeable about the marine governance and ecology of the region.

The origins of the MPAs at the four study sites can be viewed as a mélange of
government and community’s efforts to protect the marine environment from a variety
of disturbances and threats. On one hand, Loreto and Cabo Pulmo National Parks can be
broadly characterized as bottom-up processes, initiated by the local people or particular
groups within a community to exclude outsiders and prevent damaging fishing
extraction activities from the area. However, the local political and social conditions in
these two places resulted in substantially different approaches to the creation and
management of these parks. On the other hand, Espiritu Santo National Park and Upper
Gulf Biosphere Reserve were created through what can be viewed as top-down
processes, although considerably different in terms of the government’s interest and
ability to engage local actors in the process. More than 20 years have elapsed between
the creation of Loreto, Cabo Pulmo, and Upper Gulf parks, providing suggestive
differences about the maturation of democratic processes and the development of an
informed and engaged civil society in Mexico.
Figure 3: Research sites along the Baja California peninsula. From North to South: San Felipe, Loreto, La Paz, and Cabo Pulmo. Loreto and Cabo Pulmo sites contained multiple fishing communities.
Table 7: Description of the small-scale fishing sector of the communities (italics) belonging to each of the four study sites (bold). All data for 2010; obtained from CONAPESCA.

<table>
<thead>
<tr>
<th>Sites/Communities</th>
<th>Population size(^{16})</th>
<th># fishing permits</th>
<th># of coops</th>
<th># of permit holders</th>
<th># of pangas belonging to coops</th>
<th># of pangas belonging to permit holders</th>
<th>Total pangas</th>
<th># of registered fishers</th>
<th># of independent fishers(^{17})</th>
<th>Total # of fishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Felipe(^{18})</td>
<td>16,702</td>
<td>547</td>
<td>20</td>
<td>8</td>
<td>NA</td>
<td>NA</td>
<td>305</td>
<td>329</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Loreto</td>
<td>15,222</td>
<td>40</td>
<td>13</td>
<td>8</td>
<td>61</td>
<td>17</td>
<td>78</td>
<td>118</td>
<td>34</td>
<td>152</td>
</tr>
<tr>
<td>Ensenada Blanca</td>
<td>255</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>20</td>
<td>1</td>
<td>21</td>
<td>17</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>Loreto</td>
<td>14,724</td>
<td>29</td>
<td>9</td>
<td>6</td>
<td>39</td>
<td>14</td>
<td>53</td>
<td>83</td>
<td>28</td>
<td>111</td>
</tr>
<tr>
<td>Juncalito(^{19})</td>
<td>40</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>La Paz</td>
<td>215,178</td>
<td>187</td>
<td>34</td>
<td>35</td>
<td>295</td>
<td>96</td>
<td>391</td>
<td>585</td>
<td>192</td>
<td>777</td>
</tr>
<tr>
<td>La Ribera/ Cabo Pulmo</td>
<td>2,109</td>
<td>21</td>
<td>6</td>
<td>8</td>
<td>31</td>
<td>14</td>
<td>45</td>
<td>59</td>
<td>28</td>
<td>87</td>
</tr>
<tr>
<td>La Ribera</td>
<td>2,050</td>
<td>10</td>
<td>3</td>
<td>5</td>
<td>14</td>
<td>7</td>
<td>21</td>
<td>26</td>
<td>14</td>
<td>40</td>
</tr>
<tr>
<td>Cabo Pulmo</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Los Frailes(^{20})</td>
<td>9</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Agua Amarga</td>
<td>382</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>11</td>
<td>16</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>Boca del Alamo</td>
<td>100</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>12</td>
<td>17</td>
<td>0</td>
<td>17</td>
</tr>
</tbody>
</table>

\(^{16}\) Data from the 2010 population census (INEGI).

\(^{17}\) Estimate based on the average fishing crew size (two fishers) multiplied by the number of pangas belonging to permit holders.

\(^{18}\) Data reported for San Felipe was based on CEDO (2012) and on my work.

\(^{19}\) Fishers from Juncalito were registered in Loreto.

\(^{20}\) Los Frailes is a temporary fishing camp that is most frequently used by fishers from Agua Amarga and Boca del Alamo.
2.2.1 San Felipe

San Felipe is located in the northwestern part of the Gulf, approximately 200 km south of the US-Mexican border. Its origins are closely tied to fishing. A report in the National Geographic Magazine from 1942 describes San Felipe as a “a mere hurdle of huts… exists only to handle colossal catches of fish often made here. Hauled north by truck, they cross the line at Mexicali, Mexico, and Calexico, California, below sea level in Imperial Valley” (Simpich 1942: 262). These colossal catches were of totoaba (*Totoaba macdonaldi*), an endemic species of croaker which the Mexican government designated for protection in 1975, due to overfishing and loss of habitat. Recent rebounds in the population, coupled with increase in demand and global trade, have made this species a highly sought after commodity on the black market (Galván 2013).

In 2011, there were 305 registered small-scale fishing boats and 547 fishing permits, most of which were for shrimp (220), finfish (239), crabs (36), shark (32), clams (11) and octopus (6) (CEDO 2012) (Table 2). Although the number of active fishers is unknown, in 2012 there were approximately 329 fishers divided among 20 fishing cooperatives (Table 2). These fishing cooperatives formed part of two federations. Outside of the cooperatives, 8 individuals also held permits. In the period from 2001 to 2005, fishers targeted a mean of 36 taxa and produced a mean annual catch of 2,538 metric tonnes (Erisman et al. 2011). The most important species included corvina,
Spanish mackerel, bigeye croacker, shrimp, rays, and sharks (Rodríguez-Quiroz et al. 2010). Fishing was divided in three overlapping seasons: from August to March for shrimp, from February to April for shark, and from December to April for corvina. In addition, May to July was Spanish mackerel season, although fishing activities were greatly reduced during this time (Moreno-Báez et al. 2012). The most prominent fishing method included nets, although there was limited use of diving, traps, and long-lines (CEDO 2012). According to Rodríguez-Quiros et al. (2010), 100% of small-scale fishers form San Felipe fish for shrimp, which also generates the greatest portion of their yearly income.

2.2.1.1 Upper Gulf of California and Colorado River Delta Biosphere Reserve MPA

The Upper Gulf of California And Colorado River Delta Biosphere Reserve was officially decreed on June 10, 1993, as a government response to the urgent need of protecting totoaba and vaquita (an endemic porpoise), preventing further reductions in fishing yield, and fostering sustainable resource use (DOF 1993, CONANP 2007). The process of designation and establishment of this protected area was entirely driven by technical committees and scientific research findings (Barrera-Guevara and Campoy-Favela 1992). Its marine portion covers almost 561,000 ha and spans the states of Baja California and Sonora (Table 1). There are two distinct management zones in the reserve: the buffer (82.5 % of the total area) and the core (no take; 17.5 %) areas.
Management plan was implemented in 1995 and its principal objective was to maintain and foster economic activities of the region through sustainable use of natural resources (CONANP 2007). Vázquez and Fermán (2010) concluded from the two studies they conducted in 1994 and in 2002 that the reserve did not produce any benefits to the small-scale fisheries sector of San Felipe. Due to a continued high incidence of interaction of fishing nets with the vaquita porpoise, government created a vaquita refuge in 2005, which 80% of the area is within the Biosphere Reserve. Estimates of declining population for this porpoise resulted in a complete ban on nets and an expansion of the refuge that went into effect on March 31, 2015 (SEMARNAT 2015).

2.2.1.2 Research challenges

Data collection proceeded from May 2013 to August 2013. The heightened tension between the government authorities and environmental non-government organizations on one side, and the small-scale fisheries sector on the other, due to the gear restriction proposals resulted in a very challenging working environment. Leaders of the fishing sector requested an official letter from my supervisor that would specify the nature and the intent of the study. After they obtained this letter, our working relationship improved but it was never completely open. This was especially the case with independent fishers, who rejected to participate in the survey in much greater
numbers. On the other hand, most of the identified key informants eagerly participated in interviews.

### 2.2.2 Loreto

Loreto was the first capital and the first permanent settlement of the Californias, founded in 1697 by the Jesuit priests. In 1829, after it was hit by a hurricane, it became politically marginalized as the administrative and government offices were moved 300 km south to the growing port of La Paz (Martínez 2005, Cariño and Leal Dominguez 2007). It regained some independence in 1992, when Loreto was declared a fifth municipality of the State of Baja California Sur (Martínez de la Torre 2007).

Throughout its history, Loreto and its inhabitants had a strong connection with the marine environment. It was and it continues to be a source of food and income for a large number of people from Loreto and the surrounding communities (Figure 1). The small-scale fishing fleet composition in 2010 consisted of 78 boats and some 150 fishers (Table 2). The majority of the fishers (78%) belong to one of the 13 cooperatives from the region. The remaining fishers either work for permit holders (8 of them) or independently. According to Erisman et al. (2011) annual catch averages around 540 metric tones and consists of 47 targeted species. Most of fishing occurs in adjacent coastal waters and around the five nearby islands that form the MPA.
2.2.2.1 Loreto Bay National Park MPA

The Loreto Bay National Park was officially decreed on July 19, 1996, as a result of a community’s interventions and efforts to protect and preserve local marine environment. However, the creation of the Park cannot be fully understood without taking into account wider political and social processes during late 1980s and early 1990s. After the first post-revolution municipal government was formed in 1992, which in terms of party affiliation differed from the dominant Institutional Revolutionary Party at both federal and state levels, one of its first action plans was to act on the will of its people and push for the protection of a local marine area (Martínez de la Torre 2007, Morales 2012). This desire to protect the neighboring marine environment was spurred by an effort to remove shrimp draggers from the Bay. The majority of commercial and recreational fishers considered these reckless shrimp draggers a threat to their future because they were harvesting such a large bycatch of juvenile commercial fish species. This community effort, with help and support from international environmental non-governmental organizations and some high-ranking federal officials, took more than two years to produce the intended goal – creation of the MPA (Morales 2012). Peterson (2011) observes that even though the process of creating the MPA was highly participatory, it excluded some portion of local actors from equal access to information and from the process for establishing procedural guidelines (e.g., on the nature and the
structure of the meetings), and for considering cultural issues (selection of terminology, language, and norms of presentations).

The publication of the first management plan in 2003 established six management zones: four types of restricted use zones that vary in terms of permitted fishing gear, natural resource sustainable management zone, and protection zones in which all commercial and sport fishing is prohibited (CONANP 2002). In the period from 2007 to 2009, Loreto Bay National Park was the first protected area in the country to undergo actualization of its management plan (Nenadovic, personal communication with the director of LBNP). The process was led by the non-governmental organization, Center for Civic Collaboration, experienced in building and establishing environment for peaceful dialogue (CCC 2008). They divided the process of consensus development into three stages (Eraso et al. 2010). During the initial evaluation, the CCC identified all major actors and implemented a survey to obtain information on local visions and necessities in relation to the MPA. In the second stage the CCC divided actors in 7 groups (academics, environmentalists, ecotourism operators, sport fishers, commercial fishers, developers, and hotel industry representatives), identified common threats to the park, elaborated goals of the process, and established a structure of the participatory process. The last stage consisted of a series of sectorial and inter-sectorial meetings. The outcome of this process resulted in the development of legitimate agreements accepted by all user groups (Eraso et al. 2010). Even though completed and elaborated in 2009, the
National Commission of Protected Areas (CONANP) still has not published a new management plan, a failure that disappointed the local community and generated distrust from the community toward the overall process and toward the government itself.

2.2.2.2 Research challenges

Data collection in the Loreto region proceeded from November 2012 to January 2013. We did not encounter any problems in engaging with local fishers. They were more than willing to participate in the survey and ready to assist us in locating additional fishers. Local fisheries leaders and cooperative presidents were especially accommodating in finding time to meet with us and discuss past and present challenges of the fishing sector.

2.2.3 La Paz

The city of La Paz is the capital of the BCS and thus the administrative and economic center of this state. Its SSF sector, even though small in relation to city’s population, is an important component of local tradition and history (Anaya Reyna et al. 2005a, Leslie et al. Forthcoming) (Table 2). Major fishing areas for SSFs from La Paz are the nearby islands of Espiritu Santo, Cerralvo, San Jose, and the La Paz Bay. Fishers catch approximately 80 species of fish and invertebrates in this region (Díaz-Uribe et al. 2007), mostly using nets and hook and line, although other forms of fishing, such as
hookah diving and seining are also practiced (Arreguin-Sánchez et al. 2004). The small-scale fishing fleet consisted of 391 boats and more than 700 fishers (Table 2). The majority of the fishers (75%) belong to one of the 34 cooperatives from the city. However, some of the cooperatives focus on fishing in the Pacific waters, readily available around the tip of Baja California where La Paz is located.

2.2.3.1 Espiritu Santo National Park

Espiritu Santo National Park is located approximately 20 kilometers north of the city of La Paz, Baja California Sur, Mexico (Figure 1). The marine portion of the Espiritu Santo National Park in 2007 was created through a collaborative process among government entity, CONANP, and a local nongovernmental institution, Niparajá. Together they organized an inclusive participatory process that brought together actors with diverse and disparate interests. The process was also informed by the past conservation initiatives in the region, most notably the implementation of the terrestrial portion of the same national park which happened a few years earlier.

The Espiritu Santo insular complex consists of 8 islands of various sizes and four rocky outcrops (CONANP 2003). It has been protected since 1978, first as a Migratory Birds and Wild Fauna Refuge together with all the other islands in the Gulf of California. After the reauthorization of LGEEPA in 1996, the Gulf of California island system was reclassified as Wildlife Protected Area in 2000 (CONANP 2003). The
elaboration of the management plan for the terrestrial protected area, which was
ultimately published in 2001, gave way to the creation of the marine protected area that
surrounds the island. However, the publication of the initial preliminary study that
justifies the creation of this MPA in the Official Journal of the Federation (Diario Oficial
de la Federación) was followed by public protests because a public consultation process
in which the local users could express their views and opinions did not accompany the
creation of the preliminary study (CONANP 2006a). Ultimately, this process was stalled
until 2004 when CONANP decided to update the preliminary study with the long-
delayed input from local stakeholders.

This process was conducted with the assistance from a local environmental
nongovernmental organization Niparajá. Since its creation in 1990, Niparajá has been
active in both terrestrial and marine conservation efforts within the BCS (Niparajá 2010).
Such efforts were underpinned by a constant promotion of participatory processes
across both sectoral and governmental levels. Niparajá’s engagement in marine
conservation was substantially reinforced by its relationship with CONANP which was
especially relevant for the process of creation of the Espiritu Santo National Park. In
2004, just prior to the restart of the initially failed preliminary study process, the first
executive director of Niparajá became the director of the CONANP’s regional office
(Niparajá 2010). Later that same year, the two institutions signed a written agreement
that specified each group’s roles and a timetable for the process (Anaya Reyna et al.
Niparajá ensured to promote and organize the meetings while CONANP agreed to support and officially endorse any outcome that resulted from this process.

The planning and participatory process that led to the adoption of the preliminary study lasted one year (August 2004 – July 2005) and was divided into three phases: (1) completion of the baseline survey with main sectors and informal meetings with key actors; (2) a series of sectorial meetings; and (3) a series of inter-sectorial meetings (Anaya Reyna et al. 2005e). The ultimate goal of this three-staged process was to reach a consensus among all the sectors on a design of the proposed MPA in a participatory fashion. This process accounted for the views and opinions of all the sectors and was equally accessible to all individuals interested in contributing. Any person or organization who interacted in any way with the Espiritu Santo Island or its adjacent waters was able to participate. Actors were divided in one of the 6 sectors (commercial fishers, tourism operators, recreational fishers, conservation organizations, academics, and various government entities) to facilitate logistical arrangements and reduce friction/tension that existed among some of these sectors from previous activities in this region. A third-party professional moderator led all the meetings and was in charge of mediating any resulting disagreements. Niparajá organized a total of 29 sectorial and 2 inter-sectorial meetings during the phases two and three respectively (Anaya Reyna et al. 2005e). The result of this participatory process was a joint set of recommendations that was presented to the CONANP in a group meeting. CONANP
acted on these recommendations and included most of them into the final proposal for the creation of the MPA. Espiritu Santo National Park was established on May 10, 2007, by a presidential decree (DOF 2007a).

2.2.3.2 Research challenges

Data collection proceeded from June 2012 to October 2012. This was my first study site, which resulted in the steepest learning curve and probably the highest number of unintended mistakes. The work in this site was a part of the collaboration with a local non-governmental organization Niparajá. We encountered considerable opposition from fishers throughout the study due to a number of factors. First, the involvement of Niparajá polarized the fisheries sector because of past disagreements that were rooted in the creation of the local MPA. Those fishers who viewed Niparajá negatively based on earlier experience declined to participate in the survey. Second, our surveying efforts overlapped considerably with the final stretch of the federal election season. This period created a period of uncertainty during which people were reluctant to give comments or actively participate in any type of a study, regardless of the full confidentiality we granted each participant before the survey. Third, our surveying efforts also coincided with the final elaboration of the marine refuges network in the nearby area, which caused a lot of discussion and controversy and pushed some fishers away from any form of participation in activity related to research on marine issues.
Lastly, our lack of coordination with the leaders of the fisheries sector prior to the implementation of the survey created confusion among the fishers about the nature of the survey and how the information would be used.

2.2.4 La Ribera / Cabo Pulmo

The Eastern Cape region encompasses communities that fish in the proximity of the Cabo Pulmo National Park and in a close proximity to the shore (Table 2). The small-scale fishing fleet in 2010 consisted of 45 boats and some 90 fishers (Table 2). The majority of the fishers (68%) belong to one of the 6 cooperatives from the region. Most of the remaining fishers work for one of the 8 permit holders. Given that fishers from this region report their catch in two different municipalities, determining yearly catch is challenging without access to data reported at a finer scale (e.g., catch at each landing port). Based on estimates by Erisman et al. (2011) we can conclude that average annual catch was at least 172 metric tonnes and consists of 24 targeted species.

2.2.4.1 Cabo Pulmo National Park

The Cabo Pulmo National Park was officially decreed on June 6, 1995, as the outcome of a local community’s effort to protect the northernmost coral structure in the eastern Pacific (Weiant 2005, Alvarez-Filip et al. 2006). The community of Cabo Pulmo has been instrumental in the protection and enforcement of this MPA since its creation (Aburto-Oropeza et al. 2011). The outcomes of this ad-hoc and spontaneous community-
based management arrangement resulted in an eleven-fold increase in biomass of the
top predator species here over a 15-year time frame, making it one of the most-
successful MPAs in the world (Aburto-Oropeza et al. 2011). The transition from an 
extractive to a service-based economy for the residents of Cabo Pulmo proved to be 
lucrative, increasing their per-capita income to USD 18,000 in 2006, which is 
considerably higher than USD 8,600 gross domestic product per-capita income for the 
same year (Martínez de la Torre 2008, The World Bank 2015). However, benefits of 
alternative employment strategies (i.e. ecotourism) do not seem to be equitably 
distributed, neither among the residents of Cabo Pulmo, nor among the communities 
interacting with this MPA (Weiant 2005, Nenadovic personal observation). This 
disparity is also visible in levels of community members’ engagement in MPA’s 
management activities. Communities adjacent to the MPA, especially fishers from La 
Ribera and Los Frailes, indicated that they had never been invited to participate in any 
meetings related to the MPA’s formation or management plan development (Weiant 
2005, Nenadovic personal observation). They also complained about unequal 
distribution of benefits that stem from the MPA, which created considerable 
disagreement and strife among the fishers from these communities. Part of the problem 
stalks from the government’s interpretation of the zoning regulations. 

The marine portion of the MPA, which encompasses 99% of its total area, is 
divided into a preservation subzone and a subzone for sustainable use of natural
resources. While fishing is prohibited in the preservation subzone, it is allowed in the sustainable use subzone, although only to provide for the residents’ own domestic consumption (CONANP 2006b). The park’s administration that took charge of management in 2008 prohibited all fishing within the park except those practices that followed rules regulating domestic consumption (LGPAS 2007, Regulations-Chapter 6). This was the first time since the creation of the park that the entire area was effectively managed as a no-take zone (Nenadovic, personal communication with CONANP authorities). Fishers interpreted this move as a personal insult because it precluded them from accessing fishing grounds important in times of bad weather during a windy season. Overall, no fishers except for the residents of Cabo Pulmo currently interact, formally or informally, with park authorities.

2.2.4.2 Research challenges

Data collection proceeded from February 2013 to April 2013. We did not encounter any problems in engaging with local fishers. They were more than willing to participate in the survey and ready to assist us in locating additional fishers. Furthermore, fishers who visited a fishing camp in Los Frailes helped us arrange surveys and interviews with fishers from their native communities who were not present at the time of our visit but otherwise use this camp for part of the fishing season.
The relatively frequent turnover rate of fishers in this camp, due to migratory nature and patchy presence of target species along this coast, further helped us survey more fishers.

2.3 Data collection

I used a mixed methods approach, collecting data through semi-structured interviews, surveys, and participant observation. Joint application of qualitative and quantitative research instruments produces more robust findings by allowing better understanding of research problems that would not be possible if either approach were used alone (Creswell and Clark 2007). Data collection techniques and procedures were approved by the Duke University’s IRB (permit #B0259).

Due to challenges I experienced at the initial site (La Paz), I developed the following steps that my team and I implemented prior to initiating data collection at each of the remaining three study sites:

1. Through established connections we generated a list of potential local contacts and informed them about the study. We identified which contacts were willing to provide us with the information about the local social-ecological context.

2. Using these identified local contacts, we started to generate a list of users (names, nicknames, and contact information) that we could use as an estimate of the target population size. We relied on publicly available information about cooperatives and their official members as a starting point. But we generated
information about independent fishers (*pescadores libres*) using key informants, and constantly updated this information.

3. We identified and informed all the presidents of the cooperatives in the study area about the study, providing information in both written and verbal form on the nature of the study, how the study would be carried out, what type of information we would collect, and how we would use the results/information. We did this either through a group meeting (preferably) or in a series of individual meetings. We prepared one-page handouts containing all the aforementioned information about the study for these occasions (Appendix A).

4. We identified key actors in the fisheries sector who were not presidents of cooperatives and repeated the same process with them.

5. We informed CONANP and CONAPESCA about the study, the process of data collection, analysis, types of information that will be generated, and ways it would be disseminated in the community. We asked them if they would like to receive findings from the study and which form (oral presentation or report) they preferred.

### 2.3.1 Interviews

I conducted semi-structured interviews at each study site with key informants using standard ethnographic procedure (Johnson 1990). I relied on the contacts that I
developed during my previous trips to the region to assist me in selecting the informants who had access to and detailed knowledge about the local fishing practices. Key informants allowed me to gain in-depth knowledge about the local community, to understand contextual information, and to establish rapport with the fishers (Bernard 2011). In total, I conducted 82 interviews with fishers, government officials in charge of implementing and managing MPAs, nongovernmental organizations’ representatives who were involved in fisheries management and marine conservation efforts in the region, and academics (Appendix B). With informants’ permission, I recorded the interviews using a digital audio recorder (Maloney and Paolisso 2001). In addition to recording, I took detailed notes relevant to the conversation including gestures and other non-verbal cues provided by the informants. With the help of seven assistants (all of whom spoke Spanish as a native language), I transcribed all of the interviews over a year and a half. Using the transcriptions, I coded the interviews using the qualitative data analysis software NVivo (version Mac, QSR International).

2.3.1.1 Description of the interview instrument

The interview protocol that I used for semi-structured interviews was a modified version of International Forestry Resources and Institutions protocol specifically tailored for marine environment and institutions (Mascia et al. 2011) (Appendix C). Using this protocol I was able to capture and explore rules-in-use that would be otherwise difficult
to obtain using structured survey instruments since in many instances resource users consider their the rules-in-use a “social habit” and not explicitly as rules (Ostrom 2011).

2.3.2 Surveys

Using the publicly available registrar of fishing cooperatives, information from earlier studies, and local contacts, I was able to estimate the total number of active fishers (Table 8) in each study site. My goal was to survey as many fishers as possible, thus approaching a census. I employed a structured in-person questionnaire which allowed me to collect information in a systematic manner (Dillman et al. 2009). At each location I hired between 4 and 6 local assistants per site with knowledge of the fisheries sector (Table 8). These assistants had at least an undergraduate degree and went through a 2-day intensive training course learning about methods of data collection, getting acquainted with the survey instrument, and practicing data collection. Prior to initiating the survey, I conducted a focus group at each locality with fisheries leaders (no more than 10) to contextualize some of the survey questions and verify or clarify the meaning if needed. The first survey stage was a pretest, which I used to detect problematic questions and to resolve any of the lingering inconsistencies. Assistants stored all data in an Access database (Microsoft Office). Upon return form the field a team of three Duke University undergraduate students reviewed all data entries to identify and correct any potential errors in data entry.
Table 8: Description of the surveying effort.

<table>
<thead>
<tr>
<th>Study Sites</th>
<th>Localities using the MPA</th>
<th># of assistants</th>
<th># of identified fishers(^{21})</th>
<th># of total surveys</th>
<th># of surveys with active commercial fishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Felipe</td>
<td>San Felipe</td>
<td>4</td>
<td>197</td>
<td>86</td>
<td>79</td>
</tr>
<tr>
<td>Loreto</td>
<td>San Felipe</td>
<td>4</td>
<td>197</td>
<td>86</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>Juncalito</td>
<td>6</td>
<td>229</td>
<td>227</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>Ligui</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Ensenada Blanca</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>La Paz(^{22})</td>
<td>La Paz</td>
<td>6</td>
<td>161</td>
<td>71</td>
<td>63</td>
</tr>
<tr>
<td>La Ribera / Cabo Pulmo</td>
<td>La Ribera</td>
<td>4</td>
<td>177</td>
<td>160</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Cabo Pulmo</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Los Frailes(^{23})</td>
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<td></td>
<td>Agua Amarga</td>
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<td></td>
<td>Boca del Alamo</td>
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<td></td>
</tr>
<tr>
<td>GRAND TOTALS:</td>
<td></td>
<td>764 (100%)</td>
<td>544 (72.20%)</td>
<td>371 (48.56%)</td>
<td></td>
</tr>
</tbody>
</table>

2.3.2.1 Description of the survey instrument

The survey consisted of 11 sections (Appendix D). Most questions were multiple-choice with an open-ended option. We measured key variables using either a dichotomous choice or a 5-point Likert scale with a neutral midpoint. Participation was voluntary and those who agreed to participate in the survey always had the option to skip questions or terminate the survey prior to completion. The first section of the

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\(^{21}\) Total number of fishers (active and inactive) is based on my work. There were no records that included both fishers with a permit and fishers without a permit.

\(^{22}\) I focused our surveying effort to identify fishers who exclusively use or used fishing area within the local MPA.

\(^{23}\) Fishing community of Los Frailes consists of fishers that migrate from other locations within Baja California Sur to this area to fish during a fishing season. Most prominent are fishers from Agua Amarga and Boca del Alamo.
survey contained questions on basic demographic information. The second section consisted of questions about fishing experience, involvement in fishing activities, and access to permits, boats, and fishing gear. In the third section I collected information on seasonal fishing patterns and types of species caught. I also inquired about any change in fishing locations over time. The fourth section dealt with threats to fisheries and perceived changes in the abundance of targeted resources. In the fifth section I explored the structures really in use for governing fisheries, including knowledge about formal fisheries rules established by the government. This section covered issues related to fishers’ understanding of formal regulations affecting them as well as any informal regulations that they might have in place governing their activities. The sixth section explored fishers’ organizational strategies: how they collectively organize and function. The seventh section dealt with fishers’ perceptions about potential costs and benefits associated with the local MPA and their use of fishing grounds contained within it. In the eight section I focused on fishers’ participation in formal decision-making processes related to the fisheries management and to the protected area activities. The ninth section explored the concept of social capital such as relationships of trust, potential for collective action, affiliation to different organizations and groups, and level of access to different resources (person with a car, with a knowledge of computers, rules and regulations, and more). The tenth section dealt with economic issues: average income, income from fishing, alternative sources of income, household size and
employment status of household members. The eleventh section included questions on information about different programs for subsidies as well as fishers’ access and uses of subsidies. In the closing section I embedded questions that helped me identify other fishers from the respondents network.

2.3.3 Participant observation

I participated in fishing activities with commercial fishers in three out of four locations (excluding San Felipe). While in Loreto, I spent almost three months as an apprentice to a local small-scale fisher. I also participated in numerous state and municipal meetings and forums with a diversity of stakeholders where fisheries-related issues were presented, discussed, and debated.

2.3.4 Reporting back to the communities

After I completed preliminary data analysis I returned to the field (January of 2014) to present the findings in each of the four study sites. I created a four-page handout with the main findings and invited all participants in the survey and a broader community to assist a meeting at a predetermined location. I circulated invitations to the meeting at least two weeks prior to my arrival. This undertaking had a dual purpose: (1) to provide findings to the local communities and (2) to discuss some of the results. This was especially valuable for receiving feedback on some of the results and for obtaining interpretations of the same. Following some of the suggestions from the
literature on participatory processes in this region (Anaya Reyna et al. 2005e, Eraso et al. 2010), I decided to conduct separate meetings with government and non-governmental organization’s personnel on one side and fishers on the other, because of potentially high levels of tension among these groups, which can result in low community engagement, emergence of conflict, or otherwise unproductive outcomes. I wanted to maximize the likelihood of hearing candid and honest views without self-censorship by informants who might otherwise worry about being herd by a group they distrusted.

2.3.5 Collaborative work

During the course of this study my advisor and I collaborated with two different organizations for the purposes of data collection. Data collection efforts at the La Paz study site were a product of a joint effort with a local environmental NGO, Niparajá. Their role and expertise are described in chapter 5. Our work at all other sites -- La Paz, La Ribera/Cabo Pulmo, and San Felipe -- was in collaboration with Heather Leslie and Leila Sievanen from Brown University. We joined efforts after realizing that we would be conducting research within the same communities and with the same population segment (i.e. fishers) at similar times. This approach allowed us to increase sampling intensity while minimizing chances of exposing local communities to surveying fatigue.
3. The relationship of social capital and fishers’ participation in multi-level governance arrangements

3.1 Introduction

Common-pool resource (CPR) theory predicts that local resource users are capable of sustainably managing their resources such as fish, irrigation systems, and forests (McCay and Acheson 1987, Ostrom 1990, Bromley 1992). A large number of studies conducted over the last 30 years strongly support this argument (Dolsak et al. 2003, Basurto 2008, Chhatre and Agrawal 2008). However, because of the high functional interdependencies between biophysical and socioeconomic factors across multiple scales and levels due to the nature of human interactions with resources and ecosystems, we need for better understanding of successful governance regimes that take into consideration these interdependencies (Cash et al. 2006, Brondizio et al. 2009). Since there is no single level (local, regional, national, or international) of governance that can address all of the challenges and take advantage of the opportunities that emerge form the social and ecological interdependencies, the emphasis needs to shift to understanding and developing effective multi-level governance arrangements of CPRs (Brondizio et al. 2009, Jones et al. 2011).

Such arrangements are especially relevant to marine fisheries management, given high uncertainty and complexity of fisheries (Wilson 2006, 2007), making conventional tools inadequate for managing them (Crowder 2005, Degnbol et al. 2006).
Conventional tools -- spatial/temporal fishing restrictions, catch limits, and gear limits – cannot be applied uniformly across large areas without consideration of potential differences in local ecological and social conditions. By structuring fisheries governance as multi-level arrangements, we can disperse rule-making authority across multiple jurisdictions, although the actual organization of such a system may take many different forms (Hooghe and Marks 2003). Regardless of the form adopted, it is crucial for multiple actors to be actively involved in decision-making processes related to natural resource management (Eckerberg and Joas 2004, Ho et al. 2012). Considering that such arrangements may involve a large number of different actors, we hypothesize that the cooperation and ultimately the effectiveness of such interactions depends on the level of social capital within the group. The importance of social capital, or some of its components, in the sustainable management of marine resources has already been recognized (Gilmour et al. 2011, Marín et al. 2012). This study further contributes to this literature by operationalizing the institutional component of social capital, assessing its relevance in the multi-level context, and thereby expanding our understanding of the role of social capital in participatory governance of marine fisheries.

3.1.1 Theoretical grounding

3.1.1.1 Multi-level governance arrangements

Multi-level governance is defined as “institutional arrangements that facilitate the coproduction, mediation, translation, and negotiation of information and knowledge
within and across levels” (Brondizio et al. 2009,p255). Different levels, in this sense refer to horizontal and vertical linkages among community members and other entities such as government agencies and non-government organizations (García-López 2013). Because no single entity on its own can address all of the issues emerging from coupled social and ecological systems (Brondizio et al. 2009, Jones et al. 2011), effective multi-level governance arrangements for renewable resources rely on capture and sharing of information among a diversity of actors from local users, regional and state governments, to non-governmental organizations and other stakeholders.

Multi-level governance arrangements for fisheries, such as co-management, appear to facilitate power-sharing, to build trust and institutions, and to improve problem-solving (Pomeroy and Berkes 1997, Singleton 2000, Yandle 2003, Carlsson and Berkes 2005, Pinkerton 2007). For example, effective institution building and robust arrangements depend on mutual recognition and coordinated action from both government entities and local organizations or actors (Pomeroy and Berkes 1997, Yandle 2003). When such cross-scale linkages are not present, institutional arrangements quickly collapse, as in the well documented case of a local shellfish fishery in the Gulf of California (Cudney-Bueno and Basurto 2009). One approach to creating multi-level governance is to apply micro-institutional analysis linking three distinct arenas and types of decisions: operational, collective-choice, and constitutional (Kiser and Ostrom 2000). Pinkerton (2003) argues that effective fisheries co-management is predicated on
the cross-scale linkages across these levels. When local actors or their representatives do not have access to higher levels, multi-level arrangements obviously fail to operate.

The relationship among the operational, collective-choice, and constitutional levels is based on the nestedness of rulemaking authority (Ostrom 2005). At the operational level where rules concern actual harvesting, each fisher makes individual decisions on how much, where, and with what fishing gear to appropriate a particular resource. At the collective-choice level, those same fishers or their representatives (including government officials) collectively agree on the type and structure of rules that will limit catch, gear types used, and specify entry requirements for the participants at the operational level. This is mostly conducted within a formal setting, such as a council meeting, although it can also occur in an informal one, such as a local bar or a fisher’s home. At the constitutional level, resource users or their representatives determine who the harvesting community includes and how to organize and structure rule-making bodies such as councils or informal meetings. Creating and modifying rules gets more challenging as one moves from operational to constitutional level (Kiser and Ostrom 2000, Ostrom 2005).

3.1.1.2 Stakeholders’ participation in fisheries governance

Cooperation among actors across the three levels is essential to achieving outcomes desired by the group. In this study we focus on participation as a proxy for
cooperation given that it is considered “the behavioral manifestation of cooperation” (Lubell 2004, p343). Participation of local actors in marine governance initiatives has been associated with improved community cooperation and enhanced compliance with rules (Pollnac et al. 2001, Dalton et al. 2012). However, while strengthening stakeholders’ participation can lead to improved ecological resilience and higher social acceptance of fishery-related policies (Lopes et al. 2013), it can also stymie the process as the diversity of views within the group grows (Suárez de Vivero et al. 2008). Given that fisheries management deals with diverse issues, we can anticipate that any particular outcome will benefit one stakeholder group more than another. With asymmetries of power and information, as well as societal inequalities, participatory processes may continuously favor a certain subgroup or entity (Singleton 2000, Cooke and Kothari 2001, Berkes 2007). Thus the literature emphasizes the importance of building effective participatory processes and open dialogue that give inherently disadvantaged groups an opportunity to participate too (Jentoft and McCay 1995, Mikalsen and Jentoft 2008, Stohr et al. 2014).

Empirical research has found that many economic, social, and ethical factors influence stakeholders’ participation in resource management (Brzezinski et al. 2010, Chen 2010, May 2013). Chen (2010) reports that the ethic of resource stewardship might improve fishers’ participation in fisheries management even when economic incentives alone are not enough. Brzezinski (2010) found that voluntary participation in fisheries management is favoring those individuals that live geographically closer to meeting
venues and those that are financially better off. Social norms, such are in the case of a traditional Padu fisheries management system in India, can limit participation to only certain actors, which in the presence of rapidly changing demographic and ecological factors may reduce system’s robustness (Coulthard 2011). Another important factor in participatory governance is social capital.

3.1.1.3 Social capital in fisheries governance

Research on social capital has shown that it increases stakeholders’ participation in natural resource management across different systems, such as forests, watersheds, agricultural land, and fisheries (Gong et al. 2010, Ohno et al. 2010, Morrison et al. 2011, Yandle et al. 2011). For example, Djamhuri (2008) argues that social capital fosters community participation in forestry programs in Indonesia. Furthermore, research by Ohno et al. (2010) found that social capital should not be treated as a unidimensional construct since its components have different role in affecting participatory behavior at two different levels of governance.

In this study we define social capital as a multidimensional concept that if present increases the ability of the group that owns it to self-organize and to successfully manage natural resources (Ostrom and Ahn 2003, Pretty and Smith 2004, Gutiérrez et al. 2011). Social capital represents characteristics of individuals and their social relationships that strengthen the likelihood of cooperative outcomes. Such
characteristics include: (1) relations of trust, (2) reciprocity and exchanges, (3) shared institutions, such as rules, norms, and sanctions, and (4) connectedness in networks and groups (Pretty and Smith 2004). This multidimensionality of social capital can be organized into two related components: structural and normative (Grootaert et al. 2004).

The structural component of social capital refers to a social network that depicts the relationships among people within a given system. Relationships among individuals with similar demographic characteristics, such as family members, neighbors, and friends, are referred to as “bonding” social capital; relationships among individuals that differ in these characteristics but live in proximity to each other are referred to as “bridging” social capital (Grootaert et al. 2004). Furthermore, networks that emphasize the relationships among individuals that differ in their positions of authority, for example between local fishers and local, regional, or national public officials, are referred to as “linking” social capital (Grootaert et al. 2004). On the other hand, normative, or cognitive, social capital is comprised of trust, trustworthiness and shared institutions.

The presence of structural and normative components of social capital has been suggested to play an important role in the sustainable management of marine resources. In a Chilean co-management system of benthic fisheries, organizations with higher bridging and linking social capital were correlated with higher management capacity and more diversified livelihood strategies (Marín et al. 2012). In India, Sekhar (2007)
found that the existence of networks and trust within and among fishing groups facilitated the creation and maintenance of a locally designed rule system in the Chilika Lake fishery. However, in this case, a lack of linking social capital prevented coordination between state agencies and informal governance entities. The absence of such coordination did not impact the resource negatively because the compliance with locally designed rules was high, but the case demonstrates that as the costs of noncompliance rise, the importance of such linkages increases. In contrast, a network of community-based MPAs in the Gulf of California collapsed as a result of poor relationships between resource users and state management agencies (Cudney-Bueno and Basurto 2009). Social capital may also impact fisheries economic performance. Holland et al. (2013) found small and large boat fleets, engaged in groundfish fishery in the Northeast US, have different structures of bonding and bridging social capitals which may determine their corresponding performance objectives. The role of a normative component has also been linked to improved fisheries governance outcomes. Grafton (2005) argued that trust and trustworthiness in fishing communities are associated with a reduction in fishery management costs because there is less need for constant enforcement and monitoring. An analysis of five Australian abalone fisheries suggests that the success of industry-led resource management initiatives depended on the level of trust present among the fishing groups (Gilmour et al. 2011).

The importance of institutions as an independent component of social capital has
not received adequate attention in the literature (Ostrom and Ahn 2003). Institutions are prescriptions that specify what actions are required, prohibited, or permitted, and the corresponding sanction that is enacted if the prescription is not followed (Ostrom 2005). In this sense institutions are humanly devised rules of the game (North 1990). Given that rules require time and effort to be created and modified, and that they structure human interactions, rules represent social capital of a group that is bounded by them (Ostrom 1992, 1994, Brondizio et al. 2009). Within this context, social capital represent local institutional capacity by capturing a community’s ability to organize, which, in the context of resource governance, allows development, monitoring, and enforcement of a particular set of rules (Ostrom and Ahn 2003). In other words, high social capital can lower the costs associated with group work and governance.

However, it is important to point out that even if social capital is present within a community, sustainable use of resources is not ensured (Portes and Landolt 2000, Singleton 2000). High levels of social capital within a group can lead to institutional arrangements that result in rapid and potentially unsustainable exploitation of resources (Baland and Platteau 1996, Pretty and Smith 2004). In addition, the existence of social capital does not always benefit all community members or those outside of the community. In the presence of power asymmetries, dominant groups can use social capital to their advantage and develop rules that exclude other groups from managing or benefiting from the resource (Adger et al. 2005, Ray and Bijarnia 2007). Therefore,
social capital should be measured relative to achieving a specific set of goals and targets and within a particular social and ecological context.

3.1.2 Research questions

In our case we focus on the effects of social capital in multi-level governance arrangements and individual outcomes related to a small-scale fishery in the Gulf of California, Mexico (Figure 4). The interaction of fisheries and conservation policies across distinct federal and state government agencies facilitates study of multi-level governance arrangements within this region. Research questions that guided this study are as following:

• What is the role of social capital in fisheries multi-level governance?
  o Does social capital affect fishers’ participation in operational situations?
  o Does social capital affect fishers’ participation in collective-choice situations?
  o Does social capital affect fishers’ participation in constitutional situations?

• What is the link between social capital and individual outcomes specific to small-scale fisheries?
  o Does social capital affect fishers’ access to government subsidies?
  o Does social capital affect fishers’ access to permits?
  o Does social capital affect fishers’ income?
3.2 Methods

3.2.1 Study sites

We conducted fieldwork in four locations along the Baja California peninsula (Figure 5). Each location represents one or more small-scale fishing community. Majority of the fishers employ more than one fishing gear, such as hookah diving, gill nets, long-lines, traps, and/or hook and line, using a 6-8-meter fiberglass boat with the outboard engine. They fish close to the shore, within couple of kilometers, and rarely go on multi-day trips. Small-scale fisheries catch in these locations is composed on average of 50 species, ranging from finfish and elasmobranchs, to gastropods, bivalves, and crustaceans (Erisman et al. 2011). Each location has a marine protected area (MPA) within its fishing grounds. Furthermore, each MPA has a designated no-take zone within which extraction of marine resources is prohibited. Majority of the MPAs in the region were established as a response to unsustainable fishing practices (CONANP website), which have been recognized as one of the major threats to stability and health of the Gulf of California ecosystem (Sala et al. 2004, Saenz-Arroyo et al. 2005).
Figure 5: Research sites along the Baja California peninsula. From North to South: San Felipe, Loreto, La Paz, and Cabo Pulmo. Loreto and Cabo Pulmo sites contained multiple fishing communities.

3.2.2 Background of fisheries governance in Mexico

The Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) is in charge of fishery management through its two decentralized
entities, the National Commission for Aquaculture and Fishing (CONAPESCA) and the National Fisheries Institute (INAPESCA). CONAPESCA focuses on managing and enforcing fisheries regulations, while INAPESCA collects and analyzes fisheries and biological data, which are then used to further modify regulations. Apart from these agencies, Mexican fisheries are also directly impacted by regulations enacted by the Secretariat of Environment and Natural Resources (SEMARNAT). It regulates the harvest of at risk species and through the National Commission of Natural Protected Areas (CONANP) establishes and manages marine protected areas. In addition to the federal entities, the state agencies and stakeholders (i.e. fishers) contribute to the fisheries management through participation in public hearings, councils and committees. Stakeholders’ right to participate in the processes related to fisheries governance is defined by two laws: the General Law of Ecological Equilibrium and Environmental Protection (LGEPPA 1988) and the General Law of Sustainable Fisheries and Aquaculture (LGPAS 2007). The close coupling among the two secretariats and the state entities and stakeholders requires them to cooperate in and coordinate management efforts related to fisheries.

Some 97% of all registered fishing boats in Mexico belong to the small-scale fisheries sector (OECD 2006). Fishers within this sector primarily operate as members of fishing cooperatives or as individual permit holders and are usually engaged in targeting more than one species using more than one type of fishing gear (Basurto et al.)
2013, Leslie et al. Forthcoming). In addition, there is a large number of undocumented fishers (*pescadores libres*) who either fish illegally, or under the fishing permit of the permit holder/cooperative (Leslie et al. Forthcoming).

### 3.2.3 Data collection

We used a mixed methods approach, collecting data through structured surveys and semi-structured interviews. Joint application of qualitative and quantitative research instruments produces more robust findings by allowing better understanding of research questions that would not be possible if either approach were used alone (Creswell and Clark 2007). Structured surveys form quantitative portion while semi-structured interviews form qualitative aspect of the analysis. Data collection techniques and procedures were approved by the Duke University's IRB (permit #B0259).

#### 3.2.3.1 Structured survey

We used a structured in-person survey questionnaire to collect information in a systematic manner (Dillman et al. 2009). Although there is a publicly available registrar of fishing cooperatives, it is often incomplete, out-of date and is missing a substantial portion of fishers, especially within the independent fishers (*pescadores libres*) group. For these reasons, by using information available from earlier studies and local contacts, we strived to develop a comprehensive list of fishers in each location. Although not a census, we tried to survey as many fishers as possible (Table 9). In each location we
trained at least two field assistants to help with data collection. Training consisted of a 2-day intensive course on how to systematically collect data using a survey instrument. It was divided in a theoretical (data collection methods) and practical component (getting acquainted with the survey instrument and practicing data collection). Field assistants were members of the community with knowledge of and/or ties to the fishing community. This approach greatly facilitated identification of active fishers and a rapport with the community.

Responding to the survey took 80 minutes on average. We stored survey data in Access (version 2010, Microsoft Office), which an independent team of three assistants reviewed for entry errors prior to the analysis.
Table 9: Characteristics of study sites and our surveying effort.

<table>
<thead>
<tr>
<th>Study site</th>
<th>Locality</th>
<th>Population$^{24}$</th>
<th># of enumerators</th>
<th># of identified fishers$^{25}$</th>
<th># of total surveys</th>
<th># of surveys with active commercial fishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>La Paz</td>
<td>La Paz</td>
<td>215,178</td>
<td>6</td>
<td>161</td>
<td>71</td>
<td>63</td>
</tr>
<tr>
<td>Loreto</td>
<td>Loreto</td>
<td>14,724</td>
<td>6</td>
<td>229</td>
<td>227</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>Juncalito</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Ligui</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Ensenada Blanca</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabo Pulmo</td>
<td>La Ribera</td>
<td>2,050</td>
<td>4</td>
<td>177</td>
<td>160</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Cabo Pulmo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Los Frailes$^{26}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Felipe</td>
<td>San Felipe</td>
<td>16,702</td>
<td>4</td>
<td>197</td>
<td>86</td>
<td>79</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>764</td>
<td>544</td>
</tr>
</tbody>
</table>

3.2.3.2 Semi-structured interviews

We conducted 82 in-depth interviews with fishers; government officials from a number of federal institutions that regulate fishing activities or manage protected areas (i.e. CONAPESCA, INAPESCA, CONANP, and PROFEPA); NGO staff that was active in the creation and implementation of the local MPA; and other key informants that were knowledgeable about present and historic fishing practices, and the origins of the

$^{24}$ Data from the 2010 population census, INEGI
$^{25}$ Total number of fishers (active and inactive) is based on our work. There were no records that included both fishers with a permit and fishers without a permit.
$^{26}$ Fishing community of Los Frailes consists of fishers that migrate from other locations within Baja California Sur to this area to fish during a fishing season.
local MPA. The interviews were semi-structured, allowing the interviewer to collect information on the main issues but also to explore other relevant fishing and conservation aspects that were raised during the interview (Johnson and Weller 2002). We transcribed the interviews and analyzed them using NVivo (version Mac, QSR International).

3.2.4 Variable description

As discussed earlier we focus on the effects of social capital in multi-level governance arrangements and individual outcomes related to a small-scale fishery. To achieve this we organized our variables in the following way:

3.2.4.1 Response variables

All the response variables were binary coded (Table 10). We operationalized each of the three governance levels based on their theoretical construct (Kiser and Ostrom 2000, Ostrom 2005). For the operational level, we used fishers’ participation in surveillance activities during the prior year and their past activity in regards to filing a complaint after witnessing an illegal activity. Although the nature and structure of the enforcement is created at the collective-choice level, the actual participation in such activities is voluntary and therefore subject to the operational level decision-making. Complaints could be filed in writing or by calling the appropriate authority. The responses for these two components were merged into a single variable. We used
fishers’ participation in various councils and committees that deal with fisheries issues as a proxy for the collective-choice level. These bodies either propose the creation of new rules or suggest the modification of existing ones. For the constitutional level, we used fishers’ participation in the most recent process that either led to the establishment of the local MPA or to its development of the management plan. Given that these policy processes lead to the creation of some of the councils and committees operating at the collective-choice level, we treated them as constitutional in nature. While we realize that some of the distinctions among the levels used in this study are not as clear as they are in theory, we are confident that the selected variables capture their relationship appropriately.

We operationalized three of the individual outcomes that describe a successful small-scale fisher, at least within the Mexican context. These are: access to government subsidies, income level, and ownership of a fishing permit (Table 10). We asked each fisher whether or not he received any type of government subsidy over the course of five years. Federal and state subsidies are the most important contributor to fleet modernization (in terms of new boats, motors and fishing equipment). We defined income level as a weekly income relative to the sample mean. In other words, it is a dichotomous representation of a fisher’s income during a good week of fishing when compared to the overall sample mean (higher or lower than the sample mean). The third
variable, ownership of fishing permit indicates low transaction costs, given that it is required to legally capture and market seafood products.

3.2.4.2 Explanatory variables – social capital

We divided social capital into two broad components, structural and cognitive (see Introduction), and operationalized each component based on the three distinct aspects: bonding, bridging, and linking social capitals (Ohno et al. 2010). By including institutional aspect of social capital (Ostrom 1994), this approach gave us seven theoretically distinct components of social capital (Table 10).

Structural component is related to fishers’ participation in different informal and formal organizations, as well as in general election. The difference between types and nature of participation is used to distinguish among the following three aspects. Structural-bonding aspect consists of fishers’ membership to informal fishing groups and to fishing cooperative. This aspect of social capital indicates relatively stable social networks among fishers. Structural-bridging aspect refers to fishers’ participation in capacity building and research project activities over the prior year and indicates more variable social networks. Structural-linking aspect, on the other hand, indicates fishers’ participation in the last general election (held on July 1, 2012), and here is used as a proxy for fishers’ interaction with actors with power and authority.
Cognitive component of social capital is based on fishers’ trust in a particular entity or organization. We used a five-point Likert scale to assess the following question: “There are many different organizations involved in fisheries and fisheries management, ranging from the federal government to your neighboring cooperatives and NGOs. In general, when thinking about each listed organization, would you say you completely trust them, trust them, distrust them, completely distrust them, or are you somewhere in between?” Trust is one of the most widely used measurements of social capital and is included in many standardized survey instruments, such as the General Social Survey, the World Values Survey, or the Eurobarometer Survey (Putnam 2000, Glaeser et al. 2002, Menzel et al. 2013). Cognitive-bonding aspect measures fishers’ level of trust towards his/her coworkers (either within cooperative or outside of it). Cognitive-bridging aspect of social capital refers to fishers’ trust in fish buyers, tourism operators, and federations of cooperatives. We divided cognitive-linking aspect into two variants; the first one applies to fishers’ trust in government agencies that engage in fisheries management (CONAPESCA, PROFEPAL, local government). The second variant refers to fishers’ trust in non-government entities such as academics and universities.

Institutional component of social capital measures collective action potential of a community, as a prerequisite for rule creation, common understanding of rules, compliance with rules, and enforcement effectiveness. Measurement of collective action potential consisted of two questions: (1) “If there was a water supply problem in your
community, how likely is that people will cooperate to try to solve this problem?” and (2) “Fishers can work together to solve a problem related to fishing.” Fishers’ perceptions of rule compliance and monitoring effectiveness were assessed using the agreement with the following statements: “How much do you agree with the following statements: (A) Most fishers follow the rules of the local MPA; (B) Enforcement in the local MPA works well” by using a five-point Likert scale (range from strongly agree to strongly disagree).

3.2.4.3 Explanatory variables – controls

We controlled for site, years of education, household size, and a number of income-generating activities that each respondent engages in. In addition to these we included a number of variables related to fishing practices. Years fishing to age ratio is a proxy for respondents’ experience as a fisher. Number of resources fished and number of fishing gear types used indicate respondents’ potential for diversification within a fishery. Principal fishing gear, on the other hand, represents respondents’ preferential mode of harvesting. Although multi-gear and multi-species, small-scale fishers’ practices are constrained by customs and individual moral values and worldviews. For example, some fishers refrain from using nets altogether, due to their nonselective nature, or only under specific circumstances, such as reef fishing (Nenadovic, personal observation).
Table 10: Summary of variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Operationalization</th>
<th>Measure</th>
<th>Mean (SD)</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-Operational level</td>
<td>Participation in operational level activities</td>
<td>Respondents (A) participation in surveillance activities during the prior year and (B) file a complaint after witnessing an illegal activity. Responses pooled.</td>
<td>Binary: (Yes/No)</td>
<td>0.25 (0.43)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>P-Collective-choice level</td>
<td>Participation in collective-choice level activities</td>
<td>Respondents participation in various councils and committees that deal with fisheries issues</td>
<td>Binary: (Yes/No)</td>
<td>0.28 (0.45)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>P-constitutional level</td>
<td>Participation in constitutional level activities</td>
<td>Respondents participation in the development of a new regulatory framework related to a local MPA</td>
<td>Binary: (Yes/No)</td>
<td>0.12 (0.33)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Subsidy</td>
<td>Reception of a government subsidy</td>
<td>Respondents reception of a government subsidy related to a small-scale fisheries sector</td>
<td>Binary: (Yes/No)</td>
<td>0.79 (0.41)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Earnings</td>
<td>Earnings on a good week of fishing</td>
<td>Respondents weekly income relative to the sample mean</td>
<td>Binary: (Higher/Lower)</td>
<td>0.27 (0.45)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Permit</td>
<td>Possession of a fishing permit</td>
<td>Respondents possession of a fishing permit</td>
<td>Binary: (Yes/No)</td>
<td>0.76 (0.43)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Explanatory variables</td>
<td>Explanation</td>
<td>Description</td>
<td>Type</td>
<td>Value 1</td>
<td>Value 2</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------</td>
<td>-------------</td>
<td>------</td>
<td>---------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Structural-bonding</td>
<td>Indicates relatively stable social networks among fishers</td>
<td>Consists of fishers’ membership to (A) informal fishing groups and to (B) fishing cooperative. Responses pooled.</td>
<td>Binary: (Member/Not member)</td>
<td>1.13 (0.74)</td>
<td>0 2</td>
<td></td>
</tr>
<tr>
<td>Structural-bridging</td>
<td>Indicates variable and fluid social networks among fishers</td>
<td>Consists of fishers’ participation in (A) capacity building and (B) research project activities. Responses pooled.</td>
<td>Binary: (Participated/Did not participate)</td>
<td>0.38 (0.62)</td>
<td>0 2</td>
<td></td>
</tr>
<tr>
<td>Structural-linking</td>
<td>Indicates interactions with actors with power and authority</td>
<td>Respondents participation in the last general election (held on July 1, 2012).</td>
<td>Binary: (Voted/Did not vote)</td>
<td>0.85 (0.36)</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>Cognitive-bonding</td>
<td>Indicates level of trust towards coworkers</td>
<td>Respondents trust in (A) cooperative members and (B) independent fishers. Response averaged.</td>
<td>Ordinal: 5-point Likert scale (Completely trust/Completely distrust)</td>
<td>0.34 (0.16)</td>
<td>0 0.92</td>
<td></td>
</tr>
<tr>
<td>Cognitive-bridging</td>
<td>Indicates level of trust in associated professions</td>
<td>Respondents trust in (A) fish byers, (B) tourism operators, and (C) federations of cooperatives. Response averaged.</td>
<td>Ordinal: 5-point Likert scale (Completely trust/Completely distrust)</td>
<td>0.41 (0.18)</td>
<td>0 0.92</td>
<td></td>
</tr>
<tr>
<td>Cognitive-linking type (A)</td>
<td>Indicates level of trust in government agencies that engage in fisheries management</td>
<td>Respondents trust in (A) CONAPESCA, (B) PROFEPA, and (C) local government bodies. Response averaged.</td>
<td>Ordinal: 5-point Likert scale (Completely trust/Completely distrust)</td>
<td>0.44 (0.20)</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>Cognitive-linking type (B)</td>
<td>Indicates level of trust in non-government entities</td>
<td>Respondents trust in universities.</td>
<td>Ordinal: 5-point Likert scale (Completely trust/Completely distrust)</td>
<td>0.29 (0.19)</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>Institutional-type (A)</td>
<td>Assessment of the collective action potential</td>
<td>Respondents opinion on their ability to solve (A) a water supply issue, and (B) a problem related to fishing. Response averaged.</td>
<td>Ordinal: 5-point Likert scale (Strongly agree/Strongly disagree)</td>
<td>0.27 (0.22)</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td>Institutional-type (B)</td>
<td>Assessment of the institutional context</td>
<td>Respondents opinion about the (A) rule compliance and (B) enforcement performance in the local MPA. Response averaged.</td>
<td>Ordinal: 5-point Likert scale (Strongly agree/Strongly disagree)</td>
<td>0.44 (0.24)</td>
<td>0 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------------------------------------------------</td>
<td>--------------------------</td>
<td>----</td>
<td>----</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td>Respondents years of formal education.</td>
<td>Continuous</td>
<td>6.88</td>
<td>0</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td><strong>Household size</strong></td>
<td>Respondents household size.</td>
<td>Continuous</td>
<td>4.14</td>
<td>1</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td><strong>Number of income-generating activities</strong></td>
<td>Respondents income-generating activities in addition to fishing.</td>
<td>Continuous</td>
<td>1.33</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Years fishing to age ratio</strong></td>
<td>Fishing experience</td>
<td>Respondents ratio of years fishing to age.</td>
<td>0.60</td>
<td>0.04</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td><strong>Number of resources fished</strong></td>
<td>Diversity of catch</td>
<td>Respondents list of resources fished.</td>
<td>3.92</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>Number of fishing gear types used</strong></td>
<td>Diversity of fishing techniques</td>
<td>Respondents list of fishing gear types used.</td>
<td>1.47</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
3.2.5 Analysis

We constructed each social capital component by composing two or more variables as it was described in the variable description section in methods (with the exception of the structural linking component). We conducted variable grouping based on the theoretical and empirical relationships, and we assessed internal consistency reliability of each component using Cronbach’s $\alpha$. The coefficient $\alpha$ is an indicator of how well different variables measure the same issue (i.e. concept) (Eisinga et al. 2013). While the results for some of the variables were considerably lower than the generally accepted 0.7 threshold level (Numally 1978), we decided to include them given that this reliability test was not the principal guiding factor for the variable grouping. It is also worth pointing out that lower thresholds are also accepted in literature depending on the discipline and the nature of the study (Santos 1999).

We conducted analysis using a logistic regression. Logistic regressions were used to estimate the likelihood that fishers participate in six distinct operational, collective-choice and constitutional activities. Logistic regression can be used to evaluate the relationship between a vector of independent variables and a binary, ordered or categorical response, or dependent variable (Long 1997). Binary logistic regression estimates the likelihood of a dichotomous outcome such as participation in operational or collective-action level activities, or holding a fishing permit as a function of the independent variables in the model using maximum-likelihood estimation. Although
the resulting coefficients indicate the relationship between each individual variable and an outcome of interest, the probability of that outcome depends upon the values of the other variables included in the model. Therefore in addition to reporting the model coefficients we include figures to demonstrate the relationship between different types of social capital and the likelihood of particular outcomes, while holding all other variables at the sample mean. Moreover this type of analysis allows us to evaluate the effects of forms of social capital on these activities while controlling for a number of potentially intervening factors, including other forms of social capital.

3.3 Results

3.3.1 Quantitative results

The results of the six logistic regressions are presented in table 11. There is a statistically significant relationship across all six models. The models correctly classify between 76% of cases for the operational level activities model and 88% of cases for the constitutional level activities model. The r-squared values, which offer a general but imperfect measure of the explanatory capacity of a model, suggest that the models explain between 13% and 30% of the total variance. Finally, multicollinearity does not appear to be a major concern with an acceptable mean variance inflation factor of 2.22 across all models.
Table 11: Results of logistic regression analyses: coefficients and standard errors (in parenthesis). Significance: * p-value ≤ 0.10, ** p-value ≤ 0.05, *** p-value ≤ 0.01.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Operational level</th>
<th>Collective-choice level</th>
<th>Constitutional level</th>
<th>Subsidy level</th>
<th>Earnings level</th>
<th>Permit level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural bonding</td>
<td>0.857***</td>
<td>0.344</td>
<td>-0.027</td>
<td>2.162***</td>
<td>0.252</td>
<td>1.899***</td>
</tr>
<tr>
<td>Structural bridging</td>
<td>0.266 (0.289)</td>
<td>0.816***</td>
<td>0.299</td>
<td>-0.102</td>
<td>0.136</td>
<td>0.806**</td>
</tr>
<tr>
<td>Structural linking</td>
<td>0.596 (0.318)</td>
<td>1.253</td>
<td>-0.014</td>
<td>0.216</td>
<td>-0.110</td>
<td></td>
</tr>
<tr>
<td>Cognitive bonding</td>
<td>-0.064 (1.441)</td>
<td>0.974</td>
<td>-0.021</td>
<td>0.653</td>
<td>-0.376</td>
<td></td>
</tr>
<tr>
<td>Cognitive bridging</td>
<td>1.418 (1.105)</td>
<td>2.814</td>
<td>-1.096</td>
<td>-0.546</td>
<td>-0.154</td>
<td></td>
</tr>
<tr>
<td>Cognitive linking A</td>
<td>0.577 (0.427)</td>
<td>-3.939***</td>
<td>1.792</td>
<td>-0.306</td>
<td>-0.957</td>
<td></td>
</tr>
<tr>
<td>Cognitive linking B</td>
<td>1.467 (0.931)</td>
<td>4.083***</td>
<td>-0.031</td>
<td>-0.118</td>
<td>1.156</td>
<td></td>
</tr>
<tr>
<td>Institutional bonding A</td>
<td>-2.189**</td>
<td>-0.140</td>
<td>-2.053</td>
<td>-0.892</td>
<td>1.955**</td>
<td>-1.884*</td>
</tr>
<tr>
<td>Institutional linking B</td>
<td>1.112 (1.040)</td>
<td>1.393</td>
<td>1.173</td>
<td>1.118</td>
<td>1.148</td>
<td></td>
</tr>
<tr>
<td>Institutional A</td>
<td>0.270 (0.794)</td>
<td>2.174**</td>
<td>-0.274</td>
<td>0.794</td>
<td>1.467</td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years</td>
<td>2.239*</td>
<td>-0.901</td>
<td>0.312</td>
<td>1.210</td>
<td>-1.886</td>
<td>-0.683</td>
</tr>
<tr>
<td>fishing to age ratio</td>
<td>(1.245)</td>
<td>(1.067)</td>
<td>(1.560)</td>
<td>(1.308)</td>
<td>(1.200)</td>
<td>(1.211)</td>
</tr>
<tr>
<td>Education</td>
<td>-0.029</td>
<td>-0.026</td>
<td>-0.140</td>
<td>0.068</td>
<td>-0.034</td>
<td>-0.063</td>
</tr>
<tr>
<td>(0.072)</td>
<td>(0.066)</td>
<td>(0.095)</td>
<td>(0.080)</td>
<td>(0.072)</td>
<td>(0.077)</td>
<td></td>
</tr>
<tr>
<td>Household size</td>
<td>0.054</td>
<td>0.000</td>
<td>0.162</td>
<td>0.049</td>
<td>0.097</td>
<td>0.104</td>
</tr>
<tr>
<td>(0.092)</td>
<td>(0.094)</td>
<td>(0.122)</td>
<td>(0.109)</td>
<td>(0.094)</td>
<td>(0.105)</td>
<td></td>
</tr>
<tr>
<td>Number of income-generating</td>
<td>0.317</td>
<td>-0.510</td>
<td>0.423</td>
<td>0.608</td>
<td>-0.105</td>
<td>-0.399</td>
</tr>
<tr>
<td>activities</td>
<td>(0.346)</td>
<td>(0.355)</td>
<td>(0.455)</td>
<td>(0.418)</td>
<td>(0.368)</td>
<td>(0.375)</td>
</tr>
<tr>
<td>Number of resources fish used</td>
<td>-0.055</td>
<td>0.006</td>
<td>-0.075</td>
<td>0.119</td>
<td>-0.165</td>
<td>-0.050</td>
</tr>
<tr>
<td>(0.130)</td>
<td>(0.121)</td>
<td>(0.190)</td>
<td>(0.170)</td>
<td>(0.145)</td>
<td>(0.161)</td>
<td></td>
</tr>
<tr>
<td>Number of fishing gear types</td>
<td>-0.051</td>
<td>0.495*</td>
<td>-0.083</td>
<td>-0.468</td>
<td>0.215</td>
<td>0.312</td>
</tr>
<tr>
<td>used</td>
<td>(0.293)</td>
<td>(0.260)</td>
<td>(0.362)</td>
<td>(0.355)</td>
<td>(0.326)</td>
<td>(0.400)</td>
</tr>
<tr>
<td>Principal fishing gear</td>
<td>-0.531</td>
<td>-0.119</td>
<td>-0.537</td>
<td>0.113</td>
<td>0.360</td>
<td>0.706</td>
</tr>
<tr>
<td>------------------------</td>
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<td>--------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>[Nets]</td>
<td>(0.934)</td>
<td>(0.774)</td>
<td>(1.202)</td>
<td>(1.145)</td>
<td>(1.028)</td>
<td>(1.097)</td>
</tr>
<tr>
<td>Principal fishing gear</td>
<td>0.586</td>
<td>0.358</td>
<td>-0.472</td>
<td>-0.679</td>
<td>1.031</td>
<td>0.172</td>
</tr>
<tr>
<td>[Hook and line]</td>
<td>(0.738)</td>
<td>(0.645)</td>
<td>(0.952)</td>
<td>(1.002)</td>
<td>(0.873)</td>
<td>(0.968)</td>
</tr>
<tr>
<td>Site [La Paz]</td>
<td>-0.858</td>
<td>1.283</td>
<td>0.112</td>
<td>-0.074</td>
<td>-3.442***</td>
<td>-1.253</td>
</tr>
<tr>
<td></td>
<td>(0.891)</td>
<td>(0.810)</td>
<td>(1.121)</td>
<td>(1.043)</td>
<td>(0.961)</td>
<td>(0.988)</td>
</tr>
<tr>
<td>Site [Loreto]</td>
<td>-1.230</td>
<td>1.336*</td>
<td>-0.878</td>
<td>0.147</td>
<td>-3.180***</td>
<td>1.264</td>
</tr>
<tr>
<td></td>
<td>(0.819)</td>
<td>(0.745)</td>
<td>(1.070)</td>
<td>(0.891)</td>
<td>(0.827)</td>
<td>(0.909)</td>
</tr>
<tr>
<td>Site [Cabo Pulmo]</td>
<td>-1.094</td>
<td>-0.176</td>
<td>-1.253</td>
<td>0.689</td>
<td>-2.927***</td>
<td>0.918</td>
</tr>
<tr>
<td></td>
<td>(0.790)</td>
<td>(0.737)</td>
<td>(1.101)</td>
<td>(0.880)</td>
<td>(0.810)</td>
<td>(0.906)</td>
</tr>
<tr>
<td>Constant</td>
<td>-3.612**</td>
<td>-1.833</td>
<td>-4.052**</td>
<td>-2.292</td>
<td>0.658</td>
<td>-0.598</td>
</tr>
<tr>
<td></td>
<td>(1.642)</td>
<td>(1.396)</td>
<td>(2.053)</td>
<td>(1.772)</td>
<td>(1.548)</td>
<td>(1.732)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N</th>
<th>241</th>
<th>241</th>
<th>241</th>
<th>241</th>
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<tbody>
<tr>
<td>Pseudo R-squared</td>
<td>0.127</td>
<td>0.164</td>
<td>0.186</td>
<td>0.272</td>
<td>0.234</td>
<td>0.299</td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-117.038</td>
<td>-119.12</td>
<td>-72.106</td>
<td>-89.558</td>
<td>-107.676</td>
<td>-93.294</td>
</tr>
<tr>
<td>p-value</td>
<td>0.0249</td>
<td>0.0007</td>
<td>0.0340</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>AIC</td>
<td>276.075</td>
<td>280.24</td>
<td>186.212</td>
<td>221.117</td>
<td>257.352</td>
<td>228.588</td>
</tr>
<tr>
<td>BIC</td>
<td>349.256</td>
<td>353.421</td>
<td>259.393</td>
<td>294.298</td>
<td>330.532</td>
<td>301.769</td>
</tr>
<tr>
<td>Correctly Predicted</td>
<td>75.93%</td>
<td>76.76%</td>
<td>87.97%</td>
<td>83.40%</td>
<td>79.67%</td>
<td>83.40%</td>
</tr>
<tr>
<td>VIF</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
<td>2.22</td>
</tr>
</tbody>
</table>

### 3.3.1.1 Effects of explanatory variables

Our results indicate that the effects of social capital vary across different types of situations. More specifically, none of the individual types of social capital form a consistent and statistically significant relationship with any of the six outcomes. For example, the likelihood of participating in collective-choice level activities increases with increased structural bridging, while participation in the constitutional level activities is enhanced by increased levels of cognitive linking social capital with universities.
Furthermore, social capital components can either act supportively or antagonistically within the same model suggesting complex relationships among social capital components depending on the particular outcome. Owning a fishing permit is positively related to both structural bonding and bridging components. On the other hand, probability of fisher’s participation in collective-choice level activities is positively associated with structural bridging component and negatively associated with institutional componentet related to the perception of rule compliance and enforcement effectiveness. Lastly, the one commonality among the models is that structural linking and cognitive bonding and bridging components of social capital have no impact on the likelihood of participation across the three levels or on the likelihood of being a successful fisher.

Structural bonding and bridging components of social capital have a positive relationship with all six outcomes, although only three for bonding and two for bridging component are statistically significant. Specifically, as the level of participation of an individual in bonding activities increases, the likelihood of participation in operational level activities (Figure 6), reception of subsidies (Figure 7), and of holding a fishing permit (Figure 8) increase. For each additional bonding activity an individual is approximately 2.3 times more likely to participate in operational level activities, 8.5 time more likely to have received a subsidy, and 6.9 times more likely to hold a fishing permit than individual that participated in no bonding activities. Similarly, as the level of
participation of an individual in bridging activities increases, the likelihood of participation in collective-choice level activities (Figure 9) and of holding a fishing permit (Figure 10) increase. An individual that participated in 2 bridging activities is approximately 2.3 times more likely to participate in collective-choice level activities and to hold a fishing permit than individual that participated in no bridging activities.

Figure 6: Predicted probability of participation in operational-level activities by membership in bonding groups. All other values are held at their mean.
Figure 7: Predicted probability of receiving a subsidy by membership in bonding groups. All other values are held at their mean.

Figure 8: Predicted probability of holding a fishing permit by membership in bonding groups. All other values are held at their mean.
Figure 9: Predicted probability of participation in collective-choice level activities by number of bridging activities. All other values are held at their mean.

Figure 10: Predicted probability of holding a fishing permit by number of bridging activities. All other values are held at their mean.
Cognitive linking social capital is, as mentioned earlier, measured by focusing on links and levels of trust in two different types of groups; government organizations (type A) and research institutions (type B). It forms both positive and negative relationships with the outcomes, although the only one of these that is significant relates to participation in the constitutional level activities. In fact, individuals that have full trust in all of the government organizations are approximately 9% less likely to participate in the constitutional level activities than individuals that have no trust in these organizations. In general, as trust in universities increases individuals become increasingly likely to participate in the constitutional level activities.

The two institutional components of social capital, one that is measured using fishers perception of their community’s collective action potential (type A) and the other using fishers perception of rule compliance and enforcement effectiveness. (type B), form both positive and negative associations across our models. For example, community collective action potential is positively associated with earnings but negatively with holding a fishing permit and participating in operational level activities. On the other hand, rule compliance and enforcement effectivenes forms a positive association with participation in the constitutional level activities, but a negative association with participation in collective-choice level activities. Furthermore, complex interactions among the variables can be seen in figure 11 where as community collective action potential increases individuals become less likely to participate in the operational
level activities and to have a fishing permit, while they become more likely to have above the average earnings.

Figure 11: Predicted probability of participation in the operational level activities, above average earnings, and holding a fishing permit as a function of the collective action potential of communities.

3.3.2 Qualitative results

Qualitative analysis revealed that the relationship between social capital in general, and trust in particular, and multi-level participatory processes, within the small scale fishery context in Mexico, is shaped by historical circumstances, as well as social identities and characteristics.
Almost all informants (91%) indicated that there are ways to engage in fisheries management. However, 52% of them pointed out that these spaces are not fully potentialized or are lacking effectiveness and/or credibility. First limitation is due to the historical context that shaped Mexican politics during the 20th century. One academic explained:

It is an 80-year-old tradition of lacking democracy. And you know, you can’t change much in 10 years of imposed democracy. People have a lack of knowledge about the value of any type of public participation. (A01)

Many of the informants viewed that paternalistic government attitude during these times suppressed the view that civic engagement in decision-making is a viable option. As one of the government officials pointed out (emphasis added):

In the context of (early) community participation and social participation, people’s involvement used to be strange. People used to say: “These are government acts, and authority acts, and that’s how it is. Why should the public be invited to participate? It is solely and exclusively an issue of the government.” (On the other hand, we said) “No, no, wait a minute, it’s not just the government decision anymore. These are natural resources and the Constitution tells us that they belong to the nation; and the nation consists of the Mexican state, the people, the government and everything else. So we all have to participate.” (G06)

In the context of natural resource management all of the interviewed active and inactive government officials recognized that the approach in which policies are enacted changed considerably over the past 20 years. One of the officials stated:

Everything used to be decided in Mexico City. In 1973 there was a proclamation of the (Protected Area of Flora and Fauna) Cabo San Lucas. Anyone was informed? Nobody. In 1978 there was a proclamation of the
(Protected Area of Flora and Fauna) Islands of the Gulf of California. Anyone was informed? I was a University professor and I didn’t know. I found out six months later… (The problem is that) people still believe that decisions are solely being made in the central offices. Maybe this is what happened in the thirties, forties, fifties, sixties, seventies and eighties. But in more recent times the process is more open with more participation, more transparency and above all with a requirement to include as many stakeholders as possible. The politics of community participation today sounds like a normal exercise… We can do absolutely nothing anymore without social participation. (G14)

The level and quality of civic participation in governance activities is further complicated by societal characteristics and legal clarity. According to one informant, participatory processes are stymied due to a lack of civic and governments’ capacity and maturity to engage in such forums:

It’s the lack of the culture of participation and of being nosy. And on the other hand it is a lack of government’s promotion of, invitation to, and cooperation in (participatory activities)... Lack of these features is a defect; the fact that we don’t know how to participate, we don’t have good organization and representation. Because of that these and any new participatory spaces will hardly have an optimal or adequate social participation. In the end it has to do with being educated and accustomed to participate and to know how to do it. (G27)

Furthermore, the regulatory framework does not seem to give adequate guidance on participatory processes. While all government officials, academics, and NGO representatives agree that there are laws and regulations in place that demand government seek societal input in natural resource management, they point out that procedural guidance on how to implement and conduct participatory processes is lacking. One NGO representative engaged in participatory processes related to fisheries
management said:

Actually, (the law) isn’t clear. It simply mentions that there needs to be participation, but it doesn’t say what it is, and doesn’t provide clear indications about how to promote it. (There is no information about) how to do a wide participation process, or what a participation process means. (N02)

Lack of clear regulatory guidelines and standards, according to a government official, is partially a product of discontinuation between successive governments:

Every six years our county suffers from change (in government). I believe that society in general is the one that is affected the most because due to having these sexennial changes and alteration of personnel government institutions suffer change in their staff. But you as an institution already invested in human capital, in building it and training your staff. In the moment when you lose that, there can come other people who are knowledgeable and good but you have to re-invest in forming it. Therefore, when you lose human capital as an institution, what you see as a byproduct is a general lack of follow-up with the ongoing activities. Because of this I believe that something we need to work on in our country is to develop procedural manuals for all of the government institutions which will clearly state what each of us should be doing and how it should be done. So in the moment when staff changes, activities continue seamlessly. (G13)

Furthermore, lack of expertise on the side of government employees on how to design and conduct such participatory processes limits their effectiveness. One of the former protected area managers stated:

Obviously we didn’t have much experience at the beginning. My experience was based only on books, but I didn’t have any practical experience. You, as a director didn’t even have support within CONANP for the processes of social participation. It was you and three co-workers, with your two cars, trying to organize a public consultation process.
without any professional assistance on how to facilitate meetings or do conflict resolution. (G26)

Another government official described his early work as a resource manager in the following way:

I became engaged with these processes (public participation) without knowing how to do them. I stepped in a public process where the first 100 things I did were mistakes, I think. If I tried to do them today after taking so many courses about public participation, conflict resolution, participation planning, involvement methods, I would be much more careful: “No, not like that.” But in that moment I just needed to do things. They had to be done. (G14)

On the other hand, some of the informants pointed out that successful participatory processes require not only trained government but also informed and capacitated citizenry.

If you have a fishery sector with illiterate majority, the illiteracy or poverty and marginalization of these groups is an obstacle. It doesn’t allow them to be empowered and know about and how to use these tools. So, it is not enough to just say: “Oh, you can participate, your voice can be heard, you can contribute”, if you do not have those capabilities. (G27)

Lack of experience in participatory processes coupled with generational societal distrust in government was considered a biggest challenge of the current system/approach. One of the informants aptly summarized the overall sentiment:

In Mexico … it is very hard to trust government, to trust the institutions because there is always someone who wants to exploit others… Almost nobody trusts government around here. (N02)

For this reason, one of the initial steps that government officials need to
undertake when approaching the fisheries sector is the process of trust building. Many
government officials recognize the importance of having mutual trust in order to
advance policy-making processes:

(The first issue was to) recover people’s trust, as an institution, as
government. Because the government was gone for eight years. So I had
to go back and they didn’t trust me; not as a person but as a government
official. It was hard to recover people’s trust in the institution to be able to
develop the management plan. (G02)

One of the government officials explained his approach in trust building in the
following way:

From my experience it (building trust) is rooted in a personal interaction.
There are certainly many laws but there is also friendship, cordiality, and
closeness with the resource user. The goal is to get to know their feelings…
And once they do not see you as a public servant, trust is expressed in a
different way. Because it is not the same to say “this article says that…”
That does not build confidence. I am giving them confidence not only as a
public servant but as a person who goes and talks and helps. You need to
get your hands dirty: you help then clean their boats and fish, you have
coffee with them. These are informal rules within their culture (that one
needs to get accustomed to). In that way you start creating relationship
with them and that is when they start to reciprocate. (G09)

Some of the trust building occurs through the programs that government
implements throughout fishing communities. One example is the community watch
programs. Such programs are funded by the government and are focused on
encouraging direct participation of local people in surveillance activities developed to
protect and preserve natural resources (CONANP website). According to one
government official who was in charge of such programs, they serve as the “eyes on the
ground” for the enforcement body, which facilitates their work and creates connections between government and local communities (G29). However, some of the informants thought that such programs also lead to conflict within the community. One manager pointed out:

It is a very sensitive issue because many problems emerge when you boost the participation of society to monitor [natural resources]. Milder problems are those that result in a loss or boat engines. The harsher ones have to do with disrupting family relationships because many [of the folks involved] are cousins, brothers, sons, parents, uncles, grandparents etc. This generates a lot of conflict. (G27)

Similarly, one of the fishers who was engaged in a community watch program explained that conflict stems from irresponsible fishing practices which occur to some extent in all fishing communities:

The problem that we have in the community is that the people, our relatives, do not want to stop diving (illegally at night) which generates conflict since we do not want to let them fish in that way… we want to promote responsible fishing practices. (F17)

On the other hand, one of the local fisheries leaders pointed out that a strong emphasis on monitoring, without thinking about and promoting alternative livelihood opportunities and environmental education, is an endless process which does not solve the current situation:

(Community) monitoring creates social problems, conflict, war… [those things will] never go away and will always be present. It is going to be a constant thing, like a chemotherapy that is used to treat cancer. (F12)
3.4. Discussion

Our findings suggest that there is a general relationship between social capital and fishers’ participation in multi-level governance arrangements, but that this relationship is complex and differs among various levels of participation. Furthermore, social capital can affect the outcomes fishers’ achieve. Perhaps most interestingly, the models indicate that the effects of individual social capital components are not always positive and can in fact undermine cooperation and fishers performance. Lastly, by combining the statistical data with qualitative interviews it would seem that low levels of participation in multi-level fisheries governance arrangement might be linked to the social and historical context of public participatory processes in Mexico.

Before we discuss these findings, it is important to recognize some of the limitations of this study and how those might have affected our results. First, none of our inferences are explicitly causal; instead, all of our models indicate correlations among the response and explanatory variables. Considering that we relied on cross-sectional data and lacked strong instruments to estimate parameters in our models, we did not account for potential endogeneity and thus recognize this limitation when interpreting our results (Nakamura and Nakamura 1998, Yandle et al. 2011). This might, for instance, explain why some components of social capital have a negative relationship with participation. This is especially relevant for our study given that we treat social capital as a multidimensional concept. While this is consistent with literature on social
capital that incorporates both cognitive and structural components (Grootaert et al. 2004, Sekhar 2007, Ohno et al. 2010), there is a risk of constructing a concept that includes diverse and unrelated social phenomena (Lin and Erickson 2008b). This issue is also related to measurement instrument’s reliability and validity. To address reliability, we used measures of social capital that are consistent with previous studies (e.g. Grootaert et al. 2004). We assessed content validity by systematic review of the instrument by researchers who have extensive knowledge of the subject matter and by selected groups of fishers (i.e. focus groups) (Litwin 1995). However, since we constructed all of our social capital component measures as indices, the question becomes whether they adequately capture the targeted theoretical latent construct, i.e. construct validity? While this is potentially an issue in our study, we strived to minimize construct validity by relying on a theoretically based construction of indices instead on simply applying an empirically based approach (see the Analysis subsection). With this in mind we will move on to discuss some of the major findings.

Although different components of social capital seem to be relevant across the three levels of participation in multi-level governance arrangements and success, no single component of social capital was consistently influential across the four outcomes. This is consistent with findings from previous studies (Ohno et al. 2010, Albarracin and Valeva 2011, Jicha et al. 2011) that emphasize the multidimensionality and complexity of social capital. For example, Ohno et al. (2011) found that stakeholders’ participation in
two types of watershed management activities were depended upon different aspects of social capital. The fact that social capital is neither a unidimensional construct, nor synergistic in its effects means that each component should be examined independently.

The results of our analysis suggest that participation in multi-level fisheries governance is related to structural bonding at the operational level, structural bridging at the collective choice level, and cognitive linking at the constitutional level. These findings are intuitive and consistent with the theory. Operational level activities in the context of small-scale fishing in Mexico are mostly done within groups that are based on close kin-relationships (i.e. relatives fishing together). According to Basurto et al. (In review) approximately 70% of cooperative members in this region are kin, indicating a high potential for bonding social capital within these groups. In contrast, structural bridging social capital, which refers to linkages across dynamic social networks, is more prevalent in collective-choice level activities. These activities usually require participation of individuals beyond kin groups as they seek to resolve problems that often occur over larger spatial scales with more fluid membership (Ostrom 2005, Ohno et al. 2010). Investigating participation in watershed management in Japan, Ohno et al. (2005) found that the structural bonding component was more prominent in local management groups, while structural bridging was more as the scale of organization increased. Similarly, Marín et al. (2012) concluded that the successful fisheries co-management arrangements in Chile were correlated with bridging and linking social
capitals. This finding emphasizes the fact that the success of multi-level governance
depends on having good connections with other cooperatives (horizontal linkages) and
with the government (vertical linkages).

In our study, while the social network component of the linking social capital
was not relevant to participatory processes, the cognitive component of the linking
social capital (i.e. trust in governmental and non-governmental organizations) was
relevant to constitutional level processes. However, the two types of cognitive linking
social capital that we measured in our study form both positive and negative
relationships with the outcome. While those that trust government participate less in the
constitutional level activities, those that have trust in non-governmental entities (i.e.
universities) are more likely to participate in the constitutional level activities. Although
somewhat surprising, it is possible that those individuals with high levels of trust in
government organizations feel that their interests would be represented by these
organizations regardless of their physical presence. This finding is consistent with
Yandle et al. (2011), who report that high levels of trust are associated with lower
stakeholder participation in the New Zealand Commercial Rock Lobster fishery due to
their overall satisfaction with government actions. It is worth noting that we were
unable to assess the relationship between NGOs and fishers participation because we
did not have necessary response rate on that question to include it into analysis. This
would be important given that environmental NGOs often play a considerable role in
fisheries governance and in shaping public opinion (Weiant 2005, Basurto et al. *In review*). Therefore, within the multi-level governance context, both structural and normative components of social capital, although to a varying degree, shape interactions across different levels (Brondizio et al. 2009).

Whereas the three types of social capital appear to have a strong influence on fisheries governance; cognitive bonding and bridging forms of social capital, appears to have no impact on the likelihood of participation in multi-level governance arrangements. This finding is surprising because relationships between trust among resource users, are a crucial form of social capital that affects participation (Bennett and Clerveaux 2003, Grafton 2005, Sekhar 2007, Gilmour et al. 2011). It is, however, possible that the effects of these forms of social capital might be seen as less influential in a model because they are mediated by other components of social capital. One explanation for such a discrepancy could be that our survey respondents did not reveal their true sentiments, biasing the results. Another possible explanation is that the other studies failed to control for different types of social capital.

Finally, institutional forms of social capital, measured as a collective action potential of a community, had a mixed relationship with the outcomes. On one hand, as community collective action potential increases, individuals become less likely to participate in operational level activities, such as community monitoring (Figure 11). According to the interviews with key informants, monitoring the activities of your peers
leads to tension and conflict within a community. This might be because the working rules are externally imposed and thus lack legitimacy among the resource users (Ostrom 1990), or because government supported monitoring challenges existing power relations (Agrawal and Gupta 2005). On the other hand, community collective action potential had a positive relationship with the fisher’s earnings, which might suggest that fishers are more likely to engage in collective action if their average earnings are higher. Some of the fishing communities in BCS were very successful in self-organizing to protect the resources (mainly lobsters and abalone) that bring them high profits (McCay et al. 2013), suggesting there might be a positive relationship between higher earnings and individual’s interest to engage in activities that would protect the source of his/her future earnings.

Additional measures of fishers’ success, such as the receipt of a subsidy and the ownership of a fishing permit, are strongly related to structural bonding component of social capital. This finding is not surprising given that fishers who are members of a cooperative or who have a consistent fishing team are more likely to own a fishing permit or to have received a government subsidy because the Mexican government has been supporting and promoting efforts of fishers to organize (Nenadovic personal observation). However, the reason that we labeled such relationships as bonding is because a majority of the fishing cooperatives in our study sites are composed of relatively stable social networks such as kinship relations (Basurto et al. In review).
Findings from the qualitative component of our study reveal a systematic problem of participatory engagement that may hamper public contributions to governance activities. The apparent lack of a participatory culture in both political and non-political activities has been well documented in the literature (Klesner 2003, 2007, Albarracin and Valeva 2011). For example, Mendoza-Botelho (2013) estimates that participatory engagements in political parties, professional associations, and community improvement organizations are among the lowest in Mexico when compared to five other Latin-American countries. Some of the authors attribute this to the seven-decade rule of the Institutional Revolutionary Party (PRI), which encouraged clientelistic behavior and corruption (Cornelius 1975, Whitehead 1994). However, even though low when compared to other countries in the region, there seems to be an increase in non-electoral participation activities over the last thirty years in Mexico (Somuano Ventura 2005).

Lack of participation, or as some of our informants indicated the lack of a tradition and experience, in natural resource management continues to be low, despite a number of structural and regulatory changes over the last two decades that have tried to foster public participation in it (LOAP 1994, Cejudo 2008). In regards to the fisheries management, as Hernandez and Kempton (2003) conclude, such changes did not substantially increase fishers participation in the long run. Part of the problem could be a pervasive feeling of distrust in government by the Mexican people, which was evident
from our interviews. However, the same distrust was not as pronounced in the survey results, considering that cognitive linking component related to trust in government was not significant across two of the three levels of participation. Given that some forms of social capital are created, transformed, and transmitted by government agencies and their policies (Rothstein and Stolle 2002), the relationship between them should be taken into account. For example, lack of public trust in government agencies and the perception of government corruption are, according to Morris and Klesner (2010), interrelated and mutually reinforced thus creating a vicious cycle that is difficult to break. Furthermore, the existing government apparatus is weakened by a presidential succession that occurs every six years, which without the possibility of the incumbent’s re-election impedes stability and continuity of government policies (Whitehead 1994). As Hernandez and Kempton (2003) point out, sexennial changes result in a discontinuation and subsequent re-invention of governmental fisheries programs without any evaluation processes of prior programs and activities. Such loss of continuity within the fisheries sector most likely leads to waste of financial and human resources and to increase in fishing capacity, something that was observed in recent evaluations of Mexican fisheries polices (OECD 2006).
4 The role of fishers’ individual social capital in multi-level governance arrangements: Who participates in and who benefits from fisheries and conservation policies?

4.1 Introduction

Effective governance of common-pool resources (CPR) such as fisheries is critical for ensuring sustainable resource use and for improving ecosystem health and human well-being (Hughes et al. 2005, Basurto and Nenadovic 2012). Over the last three decades, we have witnessed a chronic resource overuse fueled by inadequate property rights regimes, overcapitalization and subsidies, globalized markets, and the neoliberal policies (Myers and Worm 2003, Mansfield 2007, Costello et al. 2008, Sumaila et al. 2010, Mansfield 2011). Understanding the effects of these drivers beyond solely ecosystemic aspects is especially relevant to the small-scale fisheries (SSF) sector. It contributes at least 50% of the total catch (FAO 2010), employs more than 90% of world’s fishers (Berkes et al. 2001), and is a principal source of protein and income for a large number of people, especially in the global south (FAO 2009). Therefore, there is a need to better understand institutional arrangements that can ensure livelihood stability of SSF communities as well as ecosystem integrity of the environment they depend on. Given that no single governance level is apt to appropriately capture and respond to social and ecological interdependencies, the emphasis needs to shift to understanding and creating
effective multi-level governance regimes of CPRs (Brondizio et al. 2009, Jones et al. 2011).

In this study we explore the effects of individuals’ social capital on participation in and on goal attainment from multi-level governance of marine natural resources. We specifically contribute to the advancement of the CPR theory by using institutional analysis tools (levels of action) to explicitly define and link concepts of participation and social capital in the context of multi-level natural resource governance literature. We approach examining these issues by using a novel analytical approach, resource generator (Van Der Gaag and Snijders 2005), which measures social capital as individual-level access to specific resources within a particular context. In the remaining of the introduction section we provide a theoretical background for our study. In the following section, we describe a data collection and analysis approach and then we present the main results of the study. We finish with discussing relevance of our findings in the small-scale fisheries context in Mexico.

4.1.1 Theoretical background

Studies from the broader literature in in natural resource management and conservation have suggested that top-down management of renewable resources by centralized governments has been largely ineffective, particularly in less developed countries where economic and human management capacity are often lacking (Holling
and Meffe 1996, Agrawal and Ostrom 2001, Larson and Soto 2008). On the other hand, while bottom-up management allows local users and institutions to take responsibility for and ownership in the governance of local resources, a simple transfer of decision-making powers to local institutions without consideration of the socio-political and ecological contexts may not lead to the intended results (Wollenberg et al. 2006, Hoffman 2009). The lack of panaceas to the natural resource governance problems suggests that instead of focusing on governance structure a greater emphasis needs to be placed on the processes through which knowledge and information could be shared and exchanged across multiple governance levels (Brondizio et al. 2009, Berkes 2010).

One of the principal components of such an approach is a broad participatory engagement of diverse actor groups in decision-making and planning processes (The World Bank 1996, Hernandez and Kempton 2003). Actors’ participation in natural resource management has been associated with improved community cooperation and with sustainable resource use (Cudney-Bueno and Basurto 2009, Guidetti and Claudet 2010, Cavalcanti et al. 2013). However, it is important to recognize that the outcomes of participatory processes do not only depend on the mere involvement of local actors but also on the nature and quality of their engagement with this process (Menzel et al. 2013). For example, fishers’ provision of ecological information about the specific resource in a public forum led to the creation of a regulation that appeared to be suitable to local resource conditions (Nenadovic et al. 2012).
On the other hand, there are plenty of examples where participatory process failed to achieve desired objectives, either due to a lack of organizational capacity or to a deliberate cooption by a particular actor group (Campbell and Vainio-Mattila 2003, Béné and Neiland 2006).

There is no single definition of participation, given that it can take various forms that can differ in their structure and function among each other (McCay and Jentoft 1996, Michener 1998). One approach to distinguish and systematically analyze different aspects of participation is the multiple level of analysis proposed by Ostrom and colleagues (Ostrom 1999, Kiser and Ostrom 2000). This approach provides a conceptual framework where one can distinguish among four levels of arenas based on rule-making authority that are sequentially nested. Operational rules that guide day-to-day actions of the actors in operational situations are constituted in the collective-choice arenas. These situations in turn are governed by collective-choice rules that are established in the constitutional arenas. Constitutional rules determine who is eligible to participate and the type of rules to be used in devising the collective-choice rules. Ultimately, such rules are established in the metaconstitutional arenas. It is important to recognize that rulemaking process at each level can be formal or informal, depending on the circumstances and organizational requirements (Diermeier and Krehbiel 2003, Ostrom 2005).
For example, every fisher at the operational level makes individual decisions on how much, where, and with what fishing gear to appropriate a particular resource. Their decisions/actions are constrained by the set of rules (e.g. minimal size of harvested resource, no-take zones, entry requirements for the participants at the operational level) negotiated at the collective-choice level by those same fishers or their representatives (including government officials). This may happen within a formal setting, such as a council meeting, or in an informal one, such as a local bar or a fisher’s home.

Institutional arrangements that govern a process of selecting and changing collective-choice rules are determined at the constitutional level. At that level resource users or their representatives determine how to organize and structure rule-making bodies such as councils or informal meetings. Constitutional level, although it can take various forms, is usually formalized process that embodies the principal rule-making authority, which should not always be equated to a written national constitution. Instead, it also represents a principal set of rules of a private firm that determine the rights and duties of its leaders in establishing particular policies or of a family that determine how its policies are devised (Ostrom 2005).

Regardless of the entity - fisheries cooperative, a family, or a firm - it is assumed that changes of the higher-level rules are more difficult and more costly to achieve (Ostrom 1999). However, all changes/modifications of existing rules or creation of new ones require overcoming collective action dilemmas of a particular group of actors.
Therefore, successful collective action is dependent on cooperation, which if achieved leads to beneficial outcomes for the entire group. In our study, we use participation as a proxy for cooperation given that, according to Lubell (2004), it is its behavioral manifestation. Participation in rule development or change at each of these levels in natural resource management is found to be mediated by social capital (Ohno et al. 2010, Ho et al. 2012, Menzel et al. 2013).

Since the early developments of the social capital concept in the late 1980s, one aspect of it that remains undisputed is social capital’s existence as a result of relationships among actors (Bourdieu 1986, Coleman 1988, Burt 1992, Putnam et al. 1994, Lin 2001). While all scholars agreed on the permanence of this structural (i.e. networks) aspect of social capital, some of them dismissed and/or questioned the value of its cultural aspect (i.e. trust, social norms such as reciprocity). For Lin, Cook, and Burt (Lin et al. 2001), cultural aspect is a collective asset and thus is not theoretically compatible with a relational asset such as networks. While the authors do not disregard the importance of social capital for the collective, as the aggregation of valued resources that individual actors hold within a network, they treat it mostly as a private good (although sometimes it resembles a club good when it benefits members of a closed network (Lin 2001)). On the other hand, trust and norms of reciprocity, unlike structural component have a public good characteristic to it: once they are created, the entire
community/group benefits from them, regardless of whether they participated in their creation or not (see also Lin and Erickson 2008b).

This multidimensionality of conceptual and operational aspects of social capital led some scholars to challenge its utility and appropriateness (Portes 1998, Lin and Erickson 2008b, Bebbington 2009). Concerns exist about social capital’s explanatory power (Ishihara and Pascual 2009), operationalization (Schuller et al. 2000, Lin 2001), theoretical grounding, (Arrow 2000, Solow 2000), and naïveté given that it often ignores or simplifies the role of political economy and local political relationships such as gender, class, or power dynamics (Harriss and De Renzio 1997, Fine 2002). Recognizing these critiques and diversity of viewpoints, we firmly ground our study using a micro level approach that is founded on relationships. From this perspective, social capital can be defined as the collection of an individual’s network members’ resources that can be potentially accessed and used to attain specific goals (in addition to personal resources that individual possesses) (Van Der Gaag and Snijders 2005). Conceptualized as such, social capital does not belong to an individual, but rather to his/her network members. However, it becomes mobilized by individual’s desire to achieve certain goals in life and thus is seen as a characteristic of an individual. This approach, even though prominent in sociology, such as studies of occupational prestige (e.g. Lin 1999, Flap and Boxman 2001), gender and ethnic stratification (e.g. Erickson 2004, Noguera Mendez et al. 2008), and of various social inequalities (e.g. Song and Lin 2009), has not been applied to
natural resource or conservation management literature. Instead, most of the empirical research focused on this literature treats social capital as a public good, where trust, shared norms and rules, once created are beneficial to the entire community or a group (Ostrom 1994, Putnam et al. 1994).

The fisheries sector in Mexico, although contributing less than 1% to the national GDP (Diario Oficial 2013), is an important sector both socially and economically in coastal areas throughout the country (Contreras 2002, Fraga Berdugo et al. 2006, Cinti 2010, Basurto et al. 2013). The majority of this sector is composed of small-scale fishers who can be characterized as resource users that engage in multispecies resource harvesting using a diverse fishing gear with or without a boat (OECD 2006, Leslie et al. In review). Fishers are organized in fishing cooperatives and as individual permit holders, although there is a large number of independent fishers who do not have a valid fishing permit and tend to fish either illegally or under a permit of a permit holder as labor (Cinti et al. 2010a, Basurto et al. 2013). Fisheries are managed by a decentralized federal entity, the National Commission of Fishing and Aquaculture (CONAPESCA), which is in charge of developing and enforcing regulations, collecting landings data, and issuing permits, concessions, and subsidies. There is a strong incentive for a fisher to acquire a fishing license since it allows him/her to legally sell the catch in the market and to obtain support from government programs designed to modernize fishing fleet, to increase production value, and to promote alternative production opportunities.
Given that Mexican government actively fosters civic participation, although sometimes with a limited success, in various aspects of public policy, there is enough opportunity for a fisher to engage in participatory processes at various governance levels (sensu Ostrom 2005). By participating in some of these levels, such as resource monitoring and surveillance teams, fisheries and protected areas committees, and other formal venues, fishers may influence policy, make personal connections, and/or access resources that can help them improve their occupational standing. As Marshall (2008) points out, individual actors participate in environmental governance as much as is needed for them to reap benefits from the participation itself. In the Mexican context, this can translate into better earnings, greater access to government subsidies, and ownership of a fishing permit.

4.1.2 Research questions

In this study we will explore the effects of social capital on participation in and on individual goal attainment from multi-level governance of marine natural resources using a resource generator methodology, which has not been applied before. Research questions that guided this study are as following:

1. What is the link between social capital and users’ participation at three different levels of governance?

2. What is the link between social capital and goal attainment specific to SSF?
4.2 Methods

4.2.1 Study sites

Small-scale fisheries on the Baja California peninsula represent one of the main income generating activities within the primary sector. This region contributes 71% of the catch volume and 57% of value of the total landings in Mexico and more than 93% of the boats engaged in fishing activities within this region belong to the SSF sector (OECD 2006). There were approximately 4,200 registered boats in Baja California Norte and Sur in 2013 (CONAPESCA 2014). In BCS alone, almost 99% of the registered fishing vessels in the state belongs to the small-scale fisheries sector (Ortiz et al. 2006).

We conducted fieldwork in four locations along the Baja California peninsula (Figure 12). Each location represents one or more small-scale fishing community. We spent 13 months in the field (June 2012-August 2013), and stayed at each of the sites between 2 and 4 months. Majority of the fishers across all our study sites employ more than one fishing gear, such as hookah diving, gill nets, long-lines, traps, and/or hook and line, using a 6-8-meter fiberglass boat with the outboard engine. They fish close to the shore, within couple of kilometers, and rarely go on multi-day trips. Small-scale fisheries catch in these locations is composed on average of 50 species, ranging from finfish and elasmobranchs, to gastropods, bivalves, and crustaceans (Erisman et al. 2011). Each location has a marine protected area (MPA) within its fishing grounds. Furthermore, each MPA has a designated no-take zone within which extraction of marine resources is
prohibited. Majority of the MPAs in the region were established as a response to unsustainable fishing practices (CONANP website), which have been recognized as one of the major threats to stability and health of the Gulf of California ecosystem (Sala et al. 2004, Saenz-Arroyo et al. 2005). The interaction of fisheries and conservation policies across distinct federal and state government agencies facilitates study of multi-level governance arrangements within this region.

Figure 12: Research sites along the Baja California peninsula. From North to South: San Felipe, Loreto, La Paz, and Cabo Pulmo. Loreto and Cabo Pulmo sites contained multiple fishing communities.
4.2.2 Data collection

We collected data using structured survey, interviews, and participant observation but for this paper we will focus exclusively on the data collected with the survey instrument. We conducted 371 surveys with active fishers from these locations. Fifty-eight of them we had to exclude from the analysis either because the data were incomplete or because we did not have an adequate representation of some of the groups with particular gear types. Table 12 shows a brake-down by location. In each location we trained between 2 and 6 local enumerators who were familiar with small-scale fisheries within this region and had knowledge about local fishers. Since there were no lists that systematically collected information of local fishers, having members on our team who knew movements and residences of local fishers was especially valuable. Given that we could not proceed with a random sampling, we decided to identify and survey all the fishers in each of the locations.
Table 12: Characteristics of study sites and surveying effort.

<table>
<thead>
<tr>
<th>Study site</th>
<th>Locality</th>
<th>Population(^27)</th>
<th># of enumerators</th>
<th># of identified fishers(^28)</th>
<th># of total surveys</th>
<th># of surveys with active commercial fishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>La Paz</td>
<td>La Paz</td>
<td>215,178</td>
<td>6</td>
<td>161</td>
<td>71</td>
<td>63</td>
</tr>
<tr>
<td>Loreto</td>
<td>Loreto</td>
<td>14,724</td>
<td>6</td>
<td>229</td>
<td>227</td>
<td>129</td>
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<tr>
<td></td>
<td>Juncalito</td>
<td>40</td>
<td></td>
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<tr>
<td></td>
<td>Ligui</td>
<td>203</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Ensenada Blanca</td>
<td>255</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabo Pulmo</td>
<td>La Ribera</td>
<td>2,050</td>
<td>4</td>
<td>177</td>
<td>160</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Cabo Pulmo</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Los Frailes(^29)</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Felipe</td>
<td>San Felipe</td>
<td>16,702</td>
<td>4</td>
<td>197</td>
<td>86</td>
<td>79</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>764</td>
<td>544</td>
<td>371</td>
</tr>
</tbody>
</table>

We trained all the enumerators during a 2-day intensive course on how to systematically collect data using a survey instrument. The course consisted of theoretical (data collection methods) and practical component (getting acquainted with the survey instrument and practicing data collection). We also conducted focus groups with local fishers and pretested the survey prior to starting with data collection to identify any questions that were not applicable to the local context or were unclear due to regional differences in fishing practices.

\(^{27}\) Data from the 2010 population census, INEGI

\(^{28}\) Total number of fishers (active and inactive) is based on our work. There were no records that included both fishers with a permit and fishers without a permit.

\(^{29}\) Fishing community of Los Frailes consists of fishers that migrate from other locations within Baja California Sur to this area to fish during a fishing season.
Themes covered in the survey include: (1) basic demographic information; (2) general information about fishing history and fishing activities; (3) seasonal fishing patterns; (4) perceived threats to fisheries; (5) knowledge of existing governance structures related to fishing activities; (6) fishers organizational strategies; (7) perceptions and use of the MPA; (8) participation in decision making related to the fishing sector and protected area related activities; (9) social capital; (10) economic issues; and (11) information about subsidies. For this paper we focused on social capital data in relation to participation in decision making related to the fishing sector and protected area related activities, economic issues, and subsidies. We stored survey data in Access (version 2010, Microsoft Office), which an independent team of three assistants reviewed for errors prior to the analysis.

### 4.2.3 Data analysis

We followed a procedure described by Van Der Gaag and Snijders (2005) to construct social capital measures from responses collected using the resource generator method. This method is appropriate and the most economic one for investigation of both instrumental and expressive actions (Van Der Gaag et al. 2008). The analysis is based on item response theory (IRT) non-parametric cumulative scale model termed “Mokken scaling method” (Sijtsma and Molenaar 2002, Sijtsma and Junker 2006). IRT theory is a probabilistic measurement framework used to identify and measure latent traits. Latent
traits are not directly observable (such as intelligence, depression, social capital) and are thus measured using observed responses. Mokken scaling method is appropriate for identifying latent traits from a set of items with dichotomous or ordinal responses (Sijtsma and Junker 2006). We analyzed the data using a Mokken package (Van der Ark 2011) in the R statistical software (version 2.9.2, The R Foundation for Statistical Computing). We were able to generate three different traits of social capital (see results section). After we generated domain-specific social capital measures we assessed their homogeneity and reliability and compared them to the full model (Mokken 1997, Sijtsma and Molenaar 2002). In the second step of the analysis we conducted a series of logistic regressions to simultaneously evaluate the effect of predictor variables separately for each response variable.

Logistic regression is appropriate for response variables that are categorical in nature and that have two distinct outcomes. It relies on the maximum likelihood estimation procedure to assess the effect of log-transforms predictor variables on a categorical dependent variable (Gelman and Hill 2007). The obtained maximum likelihood estimation parameters represent marginal contributions, i.e. how much would the log-odds for the probability of event occurring change if a given predictor variable changed by one unit, or in the case of a categorical predictor to the alternative outcome, and all other predictor variables in the model remained constant. We tested continuous predictor variables for collinearity and for the linearity of the logit, and
categorical predictor variables for incomplete information using contingency tables. We did not identify any limitations with the model variables. We also tested for overdispersion for each of the models and we found none. We examined residual statistics for potential outliers and none were found. We performed quantitative analysis using statistical software JMP (version Pro 11).

4.2.4 Variable description

Variables that we used in our models are shown in tables 13 and 14. The three distinct dimensions of social capital originate from the ‘Resource Generator’ (RG) method (Van Der Gaag and Snijders 2005, Van Der Gaag et al. 2008) that we applied in this study (Table 13). The RG refers to respondent’s access to a concrete list of resources through his/her network, which allows respondent to attain certain goals in life. Given that goal attainment might be population and context specific (i.e. members of different communities, classes, countries have different goals or access them in different ways), great care needs to be placed in determining appropriate goals and in selecting resources needed to achieve them (Lin and Erickson 2008b). We adapted a broad collection of social resources developed by Van Der Gaag and Snijders (2004, 2005) to the small-scale fisheries context in Mexico. In this way we tried to maintain a possibility for cross-cultural comparisons while maintaining the resources list pertinent to the local context. The final list contains key resources that can facilitate individual’s goal of becoming a
successful fisher and entrepreneur, either as an individual or as a member of a fishing cooperative (Table 15). Furthermore, it remains heterogeneous, covering several distinct domains of life: from material and employment oriented to immaterial and household oriented (Van der Gaag and Snijders 2004). For every resource, we recorded the source through which respondent can access it (via acquaintance, friend, or a family member), given that the ease of access to a resource may differ across these sources (Flap 1999).

Table 13: Summary statistics of the continuous variables used in our models.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership skills social capital</td>
<td>325</td>
<td>0</td>
<td>4</td>
<td>2.21</td>
<td>1.22</td>
</tr>
<tr>
<td>Entrepreneurial skills social capital</td>
<td>325</td>
<td>0</td>
<td>6</td>
<td>3.83</td>
<td>1.56</td>
</tr>
<tr>
<td>Personal support social capital</td>
<td>325</td>
<td>0</td>
<td>4</td>
<td>2.90</td>
<td>1.13</td>
</tr>
<tr>
<td>Education</td>
<td>321</td>
<td>0</td>
<td>16</td>
<td>6.64</td>
<td>3.08</td>
</tr>
<tr>
<td>Household Size</td>
<td>325</td>
<td>1</td>
<td>13</td>
<td>4.20</td>
<td>1.91</td>
</tr>
<tr>
<td>Number of income-generating activities</td>
<td>322</td>
<td>1</td>
<td>3</td>
<td>1.32</td>
<td>0.52</td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>325</td>
<td>1</td>
<td>11</td>
<td>4.00</td>
<td>1.81</td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>325</td>
<td>1</td>
<td>5</td>
<td>1.43</td>
<td>0.69</td>
</tr>
<tr>
<td>Years fishing to age ratio</td>
<td>322</td>
<td>0.04</td>
<td>0.91</td>
<td>0.60</td>
<td>0.19</td>
</tr>
</tbody>
</table>

The remaining continuous variables include education (measured in years of schooling), household size, number of income generating activities (including fishing), number of resources fished within a given year, number of different fishing gear types used to catch those resources, and a ratio of years fishing to respondent’s age (ratio closer to 1 indicates a respondent who fished greater proportion of his/her life).
Our nominal explanatory variables include the type of fisher’s principal fishing
gear, ownership of fishing equipment and site (Table 14). Small-scale fishers in this
region tend to fish multiple resources using usually more than one fishing gear (Leslie et
al. In review). However, most tend to have a particular fishing gear they use the most
throughout the year. We used the temporal component as an indicator of the dominant
fishing gear even though this approach may not coincide with the most
economical/profitable fishing gear. Fishers in this region either own fishing equipment
or they borrow/lease it from others. The last variable is a dummy for our research sites.
Table 14: Summary statistics of the nominal variables used in our models.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>% of total</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation in operational situations</td>
<td>Yes</td>
<td>23.38</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>76.62</td>
<td>249</td>
</tr>
<tr>
<td>Participation in collective choice situations</td>
<td>Yes</td>
<td>28.00</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>72.00</td>
<td>234</td>
</tr>
<tr>
<td>Participation in constitutional situations</td>
<td>Yes</td>
<td>12.92</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>87.08</td>
<td>283</td>
</tr>
<tr>
<td>Reception of government subsidy</td>
<td>Yes</td>
<td>77.23</td>
<td>251</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22.77</td>
<td>74</td>
</tr>
<tr>
<td>Weekly income relative to the sample mean</td>
<td>Higher</td>
<td>27.69</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Lower</td>
<td>72.31</td>
<td>235</td>
</tr>
<tr>
<td>Valid fishing permit holder</td>
<td>Yes</td>
<td>63.08</td>
<td>205</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>36.92</td>
<td>120</td>
</tr>
<tr>
<td>Principal fishing gear</td>
<td>Diving</td>
<td>12.92</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Nets</td>
<td>35.69</td>
<td>116</td>
</tr>
<tr>
<td></td>
<td>Hook and line</td>
<td>51.38</td>
<td>167</td>
</tr>
<tr>
<td>Fishing equipment</td>
<td>Owner</td>
<td>74.61</td>
<td>238</td>
</tr>
<tr>
<td></td>
<td>Borrower</td>
<td>25.39</td>
<td>81</td>
</tr>
<tr>
<td>Site</td>
<td>San Felipe</td>
<td>23.38</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>La Paz</td>
<td>17.85</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Loreto</td>
<td>31.08</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>Cabo Pulmo</td>
<td>27.69</td>
<td>90</td>
</tr>
</tbody>
</table>

We coded all response variables as dichotomous (Table 14). Participation in operational arenas refers to instances where a fisher was engaged in surveillance activities and/or in filing a complaint against the alleged offender. Participation in collective-choice arenas refers to fisher’s involvement in one or more consultative and/or decision-making bodies related to fishing or MPA management. Participation in constitutional arenas is related to fisher’s engagement in processes related to the local
MPA creation or its management plan development. Government subsidies that fishers could access come either from the fisheries commission or from protected area commission. We asked each fisher whether or not he received any type of government subsidy over the course of five years. Weekly income relative to the sample mean is a constructed variable which compares each fisher’s income during a good week of fishing to the overall sample mean. Therefore, the income is represented as a dichotomous variable, either higher or lower than the sample mean. All commercial fishing is regulated and one needs to have a fishing permit to legally capture and sell/market seafood products. However, a substantial number of fishers do not have a fishing permit or fishes under a permit in someone else’s name (Leslie et al. In review).

4.3 Results

4.3.1 Social capital as a multidimensional concept

Resources differed considerably in terms of their availability and accessibility to fishers (Table 15). The least available resources included knowing someone who has good contacts with broadcast media and someone who earns more than USD 700 a month. Generally, less available resources were more frequently accessed through weak ties (acquaintances). On the other hand, the most available resources, such as knowing someone who can repair engine/car or someone who can lend money, were usually better accessed through strong ties (such as family or friends).
Table 15: Respondents’ access to particular resources through a specific source.

<table>
<thead>
<tr>
<th>#</th>
<th>Do you know anyone who:</th>
<th>% No</th>
<th>% Yes</th>
<th>If yes, access through Acquaintance</th>
<th>Friend</th>
<th>Family member</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Has good contacts with a newspaper, radio, or TV station</td>
<td>65.23</td>
<td>34.77</td>
<td>54.27</td>
<td>28.67</td>
<td>17.05</td>
</tr>
<tr>
<td>2</td>
<td>Is active in a political party, Knows a lot about</td>
<td>50.40</td>
<td>49.60</td>
<td>57.08</td>
<td>22.28</td>
<td>20.65</td>
</tr>
<tr>
<td>3</td>
<td>governmental regulations, Has knowledge about</td>
<td>50.40</td>
<td>49.60</td>
<td>46.19</td>
<td>25.54</td>
<td>28.27</td>
</tr>
<tr>
<td>4</td>
<td>financial matters,</td>
<td>55.80</td>
<td>44.20</td>
<td>48.78</td>
<td>26.22</td>
<td>25.00</td>
</tr>
<tr>
<td>5</td>
<td>Owns a car, Can speak and write a foreign language, Can work with a personal computer</td>
<td>21.29</td>
<td>78.71</td>
<td>4.45</td>
<td>8.92</td>
<td>86.63</td>
</tr>
<tr>
<td>6</td>
<td>Is active in a political party, Knows a lot about</td>
<td>50.40</td>
<td>49.60</td>
<td>57.08</td>
<td>22.28</td>
<td>20.65</td>
</tr>
<tr>
<td>7</td>
<td>Is active in a political party, Knows a lot about</td>
<td>50.40</td>
<td>49.60</td>
<td>46.19</td>
<td>25.54</td>
<td>28.27</td>
</tr>
<tr>
<td>8</td>
<td>governmental regulations, Has knowledge about</td>
<td>50.40</td>
<td>49.60</td>
<td>46.19</td>
<td>25.54</td>
<td>28.27</td>
</tr>
<tr>
<td>9</td>
<td>financial matters,</td>
<td>55.80</td>
<td>44.20</td>
<td>48.78</td>
<td>26.22</td>
<td>25.00</td>
</tr>
<tr>
<td>10</td>
<td>owns a car</td>
<td>21.29</td>
<td>78.71</td>
<td>4.45</td>
<td>8.92</td>
<td>86.63</td>
</tr>
<tr>
<td>11</td>
<td>Can repair engines or cars</td>
<td>12.67</td>
<td>87.33</td>
<td>31.17</td>
<td>38.58</td>
<td>30.25</td>
</tr>
<tr>
<td>12</td>
<td>Has a university diploma, Earns more than USD 700 per month</td>
<td>24.80</td>
<td>75.20</td>
<td>16.85</td>
<td>18.28</td>
<td>64.87</td>
</tr>
<tr>
<td>13</td>
<td>Can lend you money when you need it</td>
<td>65.20</td>
<td>34.50</td>
<td>41.42</td>
<td>19.51</td>
<td>39.07</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>11.32</td>
<td>88.68</td>
<td>42.86</td>
<td>9.43</td>
<td>47.71</td>
</tr>
</tbody>
</table>

The full set of 14 resource generator items has a considerably lower homogeneity value \((H)\) when compared to domain-specific components of social capital (Table 16).

\( ^{30}\) Approximate conversion for year 2012/2013. In the survey the sum was 10,000 pesos.

\( ^{31}\) This item was a separate question in the survey and was added to the RG list prior to the analysis.
This indicates that social capital in Mexican small-scale fisheries context is better represented as a multidimensional concept than a unidimensional one composed of all resources. We named each of the dimensions based on the nature and function of the resources that were found in them, which showed to be substantively meaningful in content (Table 17). Results of inter-correlations among social capital measures suggest that the components are not highly correlated although each of the components is highly correlated with the total social capital (Table 18).

**Table 16: Scale characteristics of domain-specific social capital measures.**

<table>
<thead>
<tr>
<th>Leadership skills social capital (4 items)</th>
<th>Loewinger's coefficient (H)</th>
<th>Reliability coefficient (ρ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneurial skills social capital (6 items)</td>
<td>0.43</td>
<td>0.69</td>
</tr>
<tr>
<td>Personal support social capital (4 items)</td>
<td>0.57</td>
<td>0.73</td>
</tr>
<tr>
<td>Total social capital (all 14 items)</td>
<td>0.32</td>
<td>0.81</td>
</tr>
</tbody>
</table>

**Table 17: Domain-specific social capital measures and their components. Number refers to a particular resource from Table 15.**

<table>
<thead>
<tr>
<th>Leadership skills social capital</th>
<th>Entrepreneurial skills social capital</th>
<th>Personal support social capital</th>
</tr>
</thead>
<tbody>
<tr>
<td># Resource</td>
<td># Resource</td>
<td># Resource</td>
</tr>
<tr>
<td>1 Knows media</td>
<td>4 Knows finances</td>
<td>5 Owns a car</td>
</tr>
<tr>
<td>2 Is politically active</td>
<td>6 Knows foreign language</td>
<td>8 Can give advice-work</td>
</tr>
<tr>
<td>3 Knows regulations</td>
<td>7 Knows computer</td>
<td>9 Can give advice-family</td>
</tr>
<tr>
<td>14 Can lend money</td>
<td>10 Knows subsidies</td>
<td>11 Can repair engine</td>
</tr>
<tr>
<td></td>
<td>12 University graduate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13 Earns a lot</td>
<td></td>
</tr>
</tbody>
</table>
Table 18: Correlations among social capital measures. All p<0.001.

<table>
<thead>
<tr>
<th></th>
<th>Leadership skills social capital</th>
<th>Entrepreneurial skills social capital</th>
<th>Personal support social capital</th>
<th>Total social capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership skills social capital</td>
<td>1.0000</td>
<td>0.5040</td>
<td>0.3005</td>
<td>0.7748</td>
</tr>
<tr>
<td>Entrepreneurial skills social capital</td>
<td>1.0000</td>
<td>0.3476</td>
<td>0.6731</td>
<td>0.8478</td>
</tr>
<tr>
<td>Personal support social capital</td>
<td></td>
<td>1.0000</td>
<td></td>
<td>0.6731</td>
</tr>
<tr>
<td>Total social capital</td>
<td></td>
<td></td>
<td></td>
<td>1.0000</td>
</tr>
</tbody>
</table>

4.3.2 Relationship among social capital domains and participation in multi-level governance arenas

Results of the logistic regression suggest that leadership skills social capital is significantly related, either alone or in an interaction with other two social capital domains, to all three levels of governance investigated in this study (Tables 19, 20, 21). In operational arena, the increase in one unit of leadership skills or personal support social capitals while holding all the other variables constant is associated with 1.5 times greater likelihood of an individual fisher’s participation in monitoring activities and/or in filing a complaint (Table 19). No interactions among social capital domains were significant in this model. In collective-choice arena, the increase in one unit of leadership skills social capital while holding all the other variables constant is associated with 1.39 times greater likelihood of an individual fisher’s participation in consultative and/or decision-making bodies related to fisheries (Table 20). Interaction between leadership skills and
entrepreneurial skills social capitals was also associated with a greater likelihood of an individual fisher’s participation in consultative and/or decision-making bodies (Table 20). The overall model that analyzed the relationship between fisher’s participation in constitutional arena and individual social capital domains was not significant (p=0.14) (Table 21). Once interactions among the social capital domains were included, the model appeared significant (p=0.0048) (Table 21). Interaction between leadership skills and entrepreneurial skills social capitals were associated with a greater likelihood of an individual fisher’s participation in the most recent management process related to the local MPA, holding all other variables constant (Table 21). On the other hand, interaction between leadership skills and personal support social capital was associated with a lower likelihood of an individual fisher’s participation in the most recent management process related to the local MPA, holding all other variables constant (Table 21).
Table 19: Probability of fishers' participation in operational arena (i.e. monitoring and surveillance activities and/or filing a complaint): coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership skills social capital</td>
<td>0.43*** (0.15)</td>
<td>0.41*** (0.15)</td>
</tr>
<tr>
<td>Entrepreneurial skills social capital</td>
<td>-0.03 (0.12)</td>
<td>-0.04 (0.12)</td>
</tr>
<tr>
<td>Personal support social capital</td>
<td>0.43*** (0.15)</td>
<td>0.43*** (0.16)</td>
</tr>
<tr>
<td>Leadership skills SC*Entrepreneurial skills SC</td>
<td></td>
<td>-0.06 (0.10)</td>
</tr>
<tr>
<td>Leadership skills SC*Personal support SC</td>
<td>0.19 (0.15)</td>
<td>0.01 (0.11)</td>
</tr>
<tr>
<td>Entrepreneurial skills SC*Personal support SC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CONTROLS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years fishing to age ratio</td>
<td>1.53 (1.00)</td>
<td>1.41 (1.01)</td>
</tr>
<tr>
<td>Education</td>
<td>-0.03 (0.06)</td>
<td>-0.02 (0.06)</td>
</tr>
<tr>
<td>Household Size</td>
<td>0.07 (0.08)</td>
<td>0.07 (0.08)</td>
</tr>
<tr>
<td>Number of income-generating activities</td>
<td>0.00 (0.28)</td>
<td>-0.05 (0.29)</td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>0.01 (0.10)</td>
<td>0.00 (0.10)</td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>-0.04 (0.26)</td>
<td>-0.06 (0.26)</td>
</tr>
<tr>
<td>Principal fishing gear [Diving]</td>
<td>-0.11 (0.43)</td>
<td>-0.21 (0.44)</td>
</tr>
<tr>
<td>Principal fishing gear [Nets]</td>
<td>-0.70* (0.40)</td>
<td>-0.64 (0.40)</td>
</tr>
<tr>
<td>Principal fishing gear [Hook and line]</td>
<td>0.81*** (0.30)</td>
<td>0.85*** (0.30)</td>
</tr>
<tr>
<td>Fishing equipment [Owner]</td>
<td>0.30 (0.19)</td>
<td>0.33* (0.19)</td>
</tr>
<tr>
<td>Site [La Paz]</td>
<td>-0.12 (0.37)</td>
<td>-0.11 (0.37)</td>
</tr>
<tr>
<td>Site [Loreto]</td>
<td>-0.27 (0.28)</td>
<td>-0.28 (0.28)</td>
</tr>
<tr>
<td>Site [Cabo Pulmo]</td>
<td>-0.50 (0.33)</td>
<td>-0.48 (0.33)</td>
</tr>
<tr>
<td>Site [San Felipe]</td>
<td>0.89* (0.45)</td>
<td>0.87* (0.46)</td>
</tr>
<tr>
<td>Constant</td>
<td>-4.74*** (1.21)</td>
<td>-4.56*** (1.22)</td>
</tr>
</tbody>
</table>

- Model $\chi^2$                                                        | 40.77              | 42.85              |
- DF                                                                    | 15                 | 18                 |
- p-value                                                               | 0.0003             | 0.0008             |
- Pseudo $R^2$                                                          | 0.12               | 0.13               |
- N                                                                    | 313                | 313                |
Table 20: Probability of fishers’ participation in collective choice arena (i.e. engagement with consultative and/or decision-making bodies related to fisheries): coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Collective-choice level</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td></td>
<td>Model 2</td>
</tr>
<tr>
<td>Leadership skills social capital</td>
<td>0.33** (0.14)</td>
<td>0.28* (0.15)</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial skills social capital</td>
<td>-0.06 (0.11)</td>
<td>-0.03 (0.12)</td>
<td></td>
</tr>
<tr>
<td>Personal support social capital</td>
<td>-0.01 (0.14)</td>
<td>-0.03 (0.14)</td>
<td></td>
</tr>
<tr>
<td>Leadership skills SC*Entrepreneurial skills SC</td>
<td></td>
<td>0.25*** (0.09)</td>
<td></td>
</tr>
<tr>
<td>Leadership skills SC*Personal support SC</td>
<td></td>
<td>-0.12 (0.14)</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial skills SC*Personal support SC</td>
<td></td>
<td>-0.09 (0.09)</td>
<td></td>
</tr>
<tr>
<td><strong>CONTROLS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years fishing to age ratio</td>
<td>-0.86 (0.85)</td>
<td>-0.75 (0.87)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.02 (0.05)</td>
<td>0.02 (0.05)</td>
<td></td>
</tr>
<tr>
<td>Household Size</td>
<td>-0.02 (0.08)</td>
<td>-0.02 (0.08)</td>
<td></td>
</tr>
<tr>
<td>Number of income-generating activities</td>
<td>-0.38 (0.28)</td>
<td>-0.24 (0.29)</td>
<td></td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>0.07 (0.09)</td>
<td>0.07 (0.09)</td>
<td></td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>0.42* (0.22)</td>
<td>0.51** (0.24)</td>
<td></td>
</tr>
<tr>
<td>Principal fishing gear [Diving]</td>
<td>-0.29 (0.35)</td>
<td>-0.24 (0.36)</td>
<td></td>
</tr>
<tr>
<td>Principal fishing gear [Nets]</td>
<td>-0.05 (0.30)</td>
<td>-0.13 (0.31)</td>
<td></td>
</tr>
<tr>
<td>Principal fishing gear [Hook and line]</td>
<td>0.35 (0.25)</td>
<td>0.36 (0.25)</td>
<td></td>
</tr>
<tr>
<td>Fishing equipment [Owner]</td>
<td>0.56*** (0.20)</td>
<td>0.55*** (0.20)</td>
<td></td>
</tr>
<tr>
<td>Site [La Paz]</td>
<td>0.85*** (0.31)</td>
<td>0.87*** (0.32)</td>
<td></td>
</tr>
<tr>
<td>Site [Loreto]</td>
<td>0.08 (0.25)</td>
<td>0.01 (0.25)</td>
<td></td>
</tr>
<tr>
<td>Site [Cabo Pulmo]</td>
<td>-0.73** (0.32)</td>
<td>-0.79* (0.33)</td>
<td></td>
</tr>
<tr>
<td>Site [San Felipe]</td>
<td>-0.19 (0.36)</td>
<td>-0.08 (0.37)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-1.88* (1.02)</td>
<td>-2.35** (1.05)</td>
<td></td>
</tr>
</tbody>
</table>

| Model χ²                                                                 | 46.94 |                  | 54.89 |                  |
| DF                                                                      | 15    |                  | 18    |                  |
| p-value                                                                 | <0.0001 |                  | <0.0001 |                  |
| Pseudo R²                                                               | 0.13  |                  | 0.15  |                  |
| N                                                                       | 313   |                  | 313   |                  |
Table 21: Probability of fishers' participation in constitutional arena (i.e. participation in the most recent management process related to the local MPA): coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Constitutional level</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
<td></td>
</tr>
<tr>
<td>Leadership skills social capital</td>
<td>-0.14 (0.18)</td>
<td>-0.34 (0.22)</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial skills social capital</td>
<td>0.15 (0.15)</td>
<td>0.34** (0.18)</td>
<td></td>
</tr>
<tr>
<td>Personal support social capital</td>
<td>-0.14 (0.17)</td>
<td>-0.22 (0.17)</td>
<td></td>
</tr>
<tr>
<td>Leadership skills SC*Entrepreneurial skills SC</td>
<td></td>
<td>0.37*** (0.12)</td>
<td></td>
</tr>
<tr>
<td>Leadership skills SC*Personal support SC</td>
<td></td>
<td>-0.48*** (0.20)</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial skills SC*Personal support SC</td>
<td></td>
<td>-0.16 (0.12)</td>
<td></td>
</tr>
<tr>
<td><strong>CONTROLS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years fishing to age ratio</td>
<td>-0.16 (1.03)</td>
<td>0.28 (1.06)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-0.13** (0.06)</td>
<td>-0.14** (0.07)</td>
<td></td>
</tr>
<tr>
<td>Household Size</td>
<td>0.09 (0.10)</td>
<td>0.09 (0.10)</td>
<td></td>
</tr>
<tr>
<td>Number of income-generating activities</td>
<td>-0.09 (0.37)</td>
<td>0.06 (0.39)</td>
<td></td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>0.02 (0.13)</td>
<td>0.05 (0.13)</td>
<td></td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>-0.28 (0.35)</td>
<td>-0.28 (0.36)</td>
<td></td>
</tr>
<tr>
<td>Principal fishing gear [Diving]</td>
<td>0.86** (0.42)</td>
<td>1.27*** (0.46)</td>
<td></td>
</tr>
<tr>
<td>Principal fishing gear [Nets]</td>
<td>-0.65 (0.44)</td>
<td>-0.91** (0.47)</td>
<td></td>
</tr>
<tr>
<td>Principal fishing gear [Hook and line]</td>
<td>-0.21 (0.32)</td>
<td>-0.36 (0.34)</td>
<td></td>
</tr>
<tr>
<td>Fishing equipment [Owner]</td>
<td>0.04 (0.23)</td>
<td>-0.05 (0.24)</td>
<td></td>
</tr>
<tr>
<td>Site [La Paz]</td>
<td>0.12 (0.40)</td>
<td>0.17 (0.42)</td>
<td></td>
</tr>
<tr>
<td>Site [Loreto]</td>
<td>0.13 (0.34)</td>
<td>0.04 (0.36)</td>
<td></td>
</tr>
<tr>
<td>Site [Cabo Pulmo]</td>
<td>-0.77* (0.43)</td>
<td>-0.89* (0.45)</td>
<td></td>
</tr>
<tr>
<td>Site [San Felipe]</td>
<td>0.52 (0.51)</td>
<td>0.68 (0.55)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.63 (1.31)</td>
<td>-1.31 (1.39)</td>
<td></td>
</tr>
<tr>
<td><strong>Model χ²</strong></td>
<td>20.98</td>
<td>37.26</td>
<td></td>
</tr>
<tr>
<td>DF</td>
<td>15</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>0.14</td>
<td>0.0048</td>
<td></td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.09</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>313</td>
<td>313</td>
<td></td>
</tr>
</tbody>
</table>
4.3.3 Relationship among social capital domains and fishers’ goal attainment performance measures

Results of the logistic regression suggest that entrepreneurial skills social capital is significantly related, either alone or in an interaction with other two social capital domains, to all three performance indicators of goal attainment (Tables 22, 23, 24). The odds of fisher’s reception of government subsidy increase 1.3 times with every unit of increase in entrepreneurial skills social capital while holding all the other variables constant (Table 22). In addition, the interaction between entrepreneurial skills and personal support social capitals was also associated with a greater likelihood of fisher’s reception of government subsidy (Table 22). The interaction between entrepreneurial skills and leadership skills social capitals was further associated with a greater likelihood of fisher’s having a higher weekly income than the sample mean, albeit at the 0.10 level (Table 23). Finally, the odds of a fisher holding a valid fishing permit increase 1.33 times with every unit of increase in entrepreneurial skills social capital while holding all the other variables constant (Table 24).
Table 22: Probability of receiving government subsidy: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Subsidy Model 1</th>
<th>Subsidy Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership skills social capital</td>
<td>-0.18 (0.15)</td>
<td>-0.17 (0.15)</td>
</tr>
<tr>
<td>Entrepreneurial skills social capital</td>
<td>0.26** (0.12)</td>
<td>0.25** (0.12)</td>
</tr>
<tr>
<td>Personal support social capital</td>
<td>0.12 (0.14)</td>
<td>0.20 (0.14)</td>
</tr>
<tr>
<td>Leadership skills SC*Entrepreneurial skills SC</td>
<td></td>
<td>-0.02 (0.09)</td>
</tr>
<tr>
<td>Leadership skills SC*Personal support SC</td>
<td></td>
<td>-0.03 (0.14)</td>
</tr>
<tr>
<td>Entrepreneurial skills SC*Personal support SC</td>
<td></td>
<td>0.22** (0.10)</td>
</tr>
</tbody>
</table>

**CONTROLS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Subsidy Model 1</th>
<th>Subsidy Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years fishing to age ratio</td>
<td>0.06 (0.90)</td>
<td>-0.04 (0.90)</td>
</tr>
<tr>
<td>Education</td>
<td>0.00 (0.05)</td>
<td>-0.01 (0.06)</td>
</tr>
<tr>
<td>Household Size</td>
<td>0.07 (0.08)</td>
<td>0.09 (0.08)</td>
</tr>
<tr>
<td>Number of income-generating activities</td>
<td>-0.02 (0.30)</td>
<td>-0.04 (0.31)</td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>0.24** (0.11)</td>
<td>0.22** (0.11)</td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>-0.22 (0.27)</td>
<td>-0.18 (0.28)</td>
</tr>
<tr>
<td>Principal fishing gear [Diving]</td>
<td>0.60 (0.42)</td>
<td>0.49 (0.43)</td>
</tr>
<tr>
<td>Principal fishing gear [Nets]</td>
<td>-0.38 (0.35)</td>
<td>-0.32 (0.36)</td>
</tr>
<tr>
<td>Principal fishing gear [Hook and line]</td>
<td>-0.21 (0.29)</td>
<td>-0.16 (0.29)</td>
</tr>
<tr>
<td>Fishing equipment [Owner]</td>
<td>0.56*** (0.17)</td>
<td>0.61*** (0.17)</td>
</tr>
<tr>
<td>Site [La Paz]</td>
<td>0.04 (0.36)</td>
<td>0.04 (0.37)</td>
</tr>
<tr>
<td>Site [Loreto]</td>
<td>-0.39 (0.28)</td>
<td>-0.36 (0.29)</td>
</tr>
<tr>
<td>Site [Cabo Pulmo]</td>
<td>0.33 (0.32)</td>
<td>0.39 (0.32)</td>
</tr>
<tr>
<td>Site [San Felipe]</td>
<td>0.03 (0.40)</td>
<td>-0.07 (0.42)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.55 (1.08)</td>
<td>-0.80 (1.14)</td>
</tr>
</tbody>
</table>

Model $\chi^2$ | 32.54 | 38.99 |
DF | 15 | 18 |
p-value | 0.0054 | 0.0029 |
Pseudo R$^2$ | 0.10 | 0.12 |
N | 313 | 313 |
Table 23: Probability of having a higher earnings than the sample mean: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Earnings Model 1</th>
<th>Earnings Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership skills social capital</td>
<td>-0.04 (0.14)</td>
<td>-0.09 (0.15)</td>
</tr>
<tr>
<td>Entrepreneurial skills social capital</td>
<td>-0.01 (0.12)</td>
<td>0.06 (0.13)</td>
</tr>
<tr>
<td>Personal support social capital</td>
<td>0.16 (0.15)</td>
<td>0.14 (0.15)</td>
</tr>
<tr>
<td>Leadership skills SC*Entrepreneurial skills SC</td>
<td>0.17* (0.09)</td>
<td></td>
</tr>
<tr>
<td>Leadership skills SC*Personal support SC</td>
<td>-0.03 (0.15)</td>
<td>-0.11 (0.11)</td>
</tr>
<tr>
<td>Entrepreneurial skills SC*Personal support SC</td>
<td>-0.01 (0.15)</td>
<td>-0.11 (0.11)</td>
</tr>
</tbody>
</table>

**CONTROLS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years fishing to age ratio</td>
<td>-0.11 (0.93)</td>
<td>0.12 (0.94)</td>
</tr>
<tr>
<td>Education</td>
<td>0.03 (0.05)</td>
<td>0.04 (0.05)</td>
</tr>
<tr>
<td>Household Size</td>
<td>0.05 (0.08)</td>
<td>0.04 (0.08)</td>
</tr>
<tr>
<td>Number of income-generating activities</td>
<td>-0.10 (0.29)</td>
<td>0.00 (0.30)</td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>0.00 (0.11)</td>
<td>0.00 (0.11)</td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>0.15 (0.28)</td>
<td>0.21 (0.28)</td>
</tr>
<tr>
<td>Principal fishing gear [Diving]</td>
<td>-0.18 (0.52)</td>
<td>-0.13 (0.53)</td>
</tr>
<tr>
<td>Principal fishing gear [Nets]</td>
<td>-0.12 (0.42)</td>
<td>-0.17 (0.43)</td>
</tr>
<tr>
<td>Principal fishing gear [Hook and line]</td>
<td>0.30 (0.34)</td>
<td>0.30 (0.34)</td>
</tr>
<tr>
<td>Fishing equipment [Owner]</td>
<td>-0.08 (0.18)</td>
<td>-0.09 (0.18)</td>
</tr>
<tr>
<td>Site [La Paz]</td>
<td>-1.34*** (0.47)</td>
<td>-1.35*** (0.47)</td>
</tr>
<tr>
<td>Site [Loreto]</td>
<td>-0.76** (0.32)</td>
<td>-0.83*** (0.33)</td>
</tr>
<tr>
<td>Site [Cabo Pulmo]</td>
<td>0.13 (0.34)</td>
<td>0.09 (0.34)</td>
</tr>
<tr>
<td>Site [San Felipe]</td>
<td>1.97*** (0.45)</td>
<td>2.08*** (0.45)</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.07* (1.10)</td>
<td>-2.57** (1.15)</td>
</tr>
</tbody>
</table>

Model \( \chi^2 \) 71.97 75.96

DF 15 18

p-value <0.0001 <0.0001

Pseudo R\(^2\) 0.19 0.20

N 313 313

148
Table 24: Probability of a fisher holding a valid fishing permit: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fishing permit</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
<td></td>
</tr>
<tr>
<td>Leadership skills social capital</td>
<td>0.03 (0.14)</td>
<td>0.02 (0.14)</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial skills social capital</td>
<td>0.29*** (0.11)</td>
<td>0.31*** (0.12)</td>
<td></td>
</tr>
<tr>
<td>Personal support social capital</td>
<td>0.04 (0.13)</td>
<td>0.07 (0.13)</td>
<td></td>
</tr>
<tr>
<td>Leadership skills SC*Entrepreneurial skills SC</td>
<td>0.11 (0.09)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leadership skills SC*Personal support SC</td>
<td>-0.02 (0.13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial skills SC*Personal support SC</td>
<td>0.15 (0.09)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CONTROLS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years fishing to age ratio</td>
<td>1.74** (0.83)</td>
<td>1.73** (0.84)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.03 (0.05)</td>
<td>0.03 (0.05)</td>
<td></td>
</tr>
<tr>
<td>Household Size</td>
<td>0.10 (0.08)</td>
<td>0.11 (0.08)</td>
<td></td>
</tr>
<tr>
<td>Number of income-generating activities</td>
<td>-0.71*** (0.27)</td>
<td>-0.71*** (0.28)</td>
<td></td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>0.22** (0.10)</td>
<td>0.21** (0.10)</td>
<td></td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>0.11 (0.26)</td>
<td>0.18 (0.27)</td>
<td></td>
</tr>
<tr>
<td>Principal fishing gear [Diving]</td>
<td>0.58 (0.37)</td>
<td>0.54 (0.39)</td>
<td></td>
</tr>
<tr>
<td>Principal fishing gear [Nets]</td>
<td>-0.43 (0.33)</td>
<td>-0.41 (0.34)</td>
<td></td>
</tr>
<tr>
<td>Principal fishing gear [Hook and line]</td>
<td>-0.15 (0.27)</td>
<td>-0.13 (0.27)</td>
<td></td>
</tr>
<tr>
<td>Fishing equipment [Owner]</td>
<td>0.87*** (0.17)</td>
<td>0.93*** (0.17)</td>
<td></td>
</tr>
<tr>
<td>Site [La Paz]</td>
<td>-0.07 (0.33)</td>
<td>-0.05 (0.33)</td>
<td></td>
</tr>
<tr>
<td>Site [Loreto]</td>
<td>0.00 (0.27)</td>
<td>-0.02 (0.28)</td>
<td></td>
</tr>
<tr>
<td>Site [Cabo Pulmo]</td>
<td>0.48 (0.30)</td>
<td>0.54* (0.31)</td>
<td></td>
</tr>
<tr>
<td>Site [San Felipe]</td>
<td>-0.42 (0.38)</td>
<td>-0.47 (0.39)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-2.61*** (1.03)</td>
<td>-3.11*** (1.08)</td>
<td></td>
</tr>
<tr>
<td>Model $\chi^2$</td>
<td>78.04</td>
<td>84.12</td>
<td></td>
</tr>
<tr>
<td>DF</td>
<td>15</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>Pseudo R$^2$</td>
<td>0.19</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>313</td>
<td>313</td>
<td></td>
</tr>
</tbody>
</table>
4.3.4 Other variables

The following are variables from our models that were significant in both iterations (with and without interaction terms) of the same model, except for the results from participation in the constitutional arena (baseline model, without interactions, was not significant).

4.3.4.1 Demographics

Greater experience in fishing (years fishing to age ratio) was significant and positively associated with the increased likelihood of a fisher holding a valid fishing permit (Table 24). Odds of fisher’s participation in constitutional arenas increased 1.15 times with each unit of decrease in education (Table 21). Fishers with a higher number of income-generating activities were less likely to have a valid fishing permit when compared to those that had less income-generating activities (Table 24).

4.3.4.2 Structure of fishing activities

Fishers that use hook and line were more than five times more likely to participate in operational arena when compared to fishers who use nets as a principal fishing gear (Table 19). Fishers that are divers were on average 7 times more likely to participate in constitutional arena when compared to those that use hook and line or nets (Table 21). Fishers that catch greater number of resources were more likely to receive government subsidies (Table 22) and were more likely to have a valid fishing permit.
permit (Table 24). Fishers that owned their fishing equipment were at least three times more likely to participate in collective-choice arena (Table 20) and to receive government subsidies when compared to non-owners (Table 22). Furthermore, owners were approximately 6 times more likely to hold a valid fishing permit than non-owners (Table 24).

4.3.4.3 Sites

Fishers from La Paz were more likely to participate in collective-choice arena when compared to fishers from Cabo Pulmo and Loreto (Table 20). Fishers from San Felipe had much greater probability of having higher weekly income than the sample mean when compared to fishers from other three sites (Table 23). For example, in a baseline model, fishers from San Felipe had 7.28 times greater likelihood of having a higher weekly income than the sample mean than fishers form Cabo Pulmo, 18.30 times greater than fishers from Loreto, and 30.69 times greater than fishers from La Paz.

4.4 Discussion

Our findings suggest that participation in multi-level governance and indicators of a successful fisher are associated with different dimensions of social capital. These dimensions may interact in a complementary or in an antagonistic fashion depending on a particular participatory arena. From this perspective social capital, at least within the small-scale fisheries context and perhaps even more broadly, should be treated as a
multidimensional concept that can be used to both facilitate and impede certain outcomes. Furthermore, some of the variables specific to the fisheries context, such as fishing gear types or ownership of fishing equipment, were also related to fishers’ participation in multi-level governance arenas suggesting the importance of local conditions. Lastly, we also noted difference across our study sites in some of the outcomes, indicating the relevance of site-specific processes that operate within this social-ecological system.

The three distinct dimensions of social capital that we identified by using the resource generator methodology, entrepreneurship skills, leadership skills, and personal support social capitals, represent a mixture of resources, which based on their function can be divided into instrumental and expressive actions (Lin et al. 2001). For example, most of components of entrepreneurial skills and leadership skills social capital, such as knowing somebody who knows how to obtain governmental subsidies or is active politically, are instrumental in nature, meaning that they are better suitable for searching and obtaining new assets. On the other hand, components of personal support social capital have a combination of expressive and instrumental actions (i.e. instrumental: knowing an individual who owns a car or can repair an engine; expressive: knowing someone who can give advice about work-related and family-related issues). Expressive actions refer to those resources that are mostly used for preserving already existing assets. Maintaining a personal dimension diverse might be beneficial to an individual.
given that it can provide him/her with varied material and immaterial resources necessary for overcoming multiple challenges in daily lives of a small-scale fisher in this region of Mexico (Robles-Zava 2014, Sievanen 2014).

Furthermore, strength of the tie through which a particular resource was accessed (acquaintance, friend, or a family member) also differed across the three domains (Table 15). Leadership skills social capital was more readily accessible through weak ties while personal support social capital through strong ties. This distinction is closely related to the resources’ function and is supported by previous research (Lin 2001, Van Der Gaag and Snijders 2005). Instrumental actions, such as resources that can help obtain government subsidies, are accessed more often through weak ties, indicating the importance of more socially distant connections. Expressive actions, in turn, are more embedded/prominent in strong ties. These findings suggest the importance of both weak and strong ties to specific goal attainments of small-scale fishers.

Distinction between the role of leadership skills and entrepreneurial skills social capitals on measured set of outcomes was also evident in our study. Leadership skills social capital was more prominent in multi-level participation arenas, while entrepreneurial skills social capital was more closely associated with fishers’ goal attainment activities. Given the lack of causal inference, we hypothesize that in the Mexican small-scale fisheries context fishers’ participation in multi-level governance arenas depends more on the relationships of power. Even though established and
encouraged by the law, civic participation in administrative decision-making arenas is considerably low in Mexico (Klesner 2007, Nenadovic forthcoming) and seems to be driven by distinguished members of the community such as cooperative leaders (A. H. Weaver, personal communication). The role of leadership in fisheries management has been recognized in recent studies as an important component of successful fisheries (Bodin and Crona 2008, Gutiérrez et al. 2011). Although we treat potential for leadership as an endogenous component of social capital, we recognize that this concept has a much broader connotation and that it can be operationalized in various ways depending on the theoretical framework and contextual factors. Fishers’ success in goal attainment, on the other hand, is more dependent on their ability not only to catch fish but also to market such products and to maintain a viable enterprise by securing fishing permits and having functional fishing equipment (Cinti et al. 2010a, Basurto et al. 2013).

The aforementioned findings speak strongly to the multidimensionality of social capital where its dimensions can act either independently or synergistically/complementally. For example, leadership skills and personal support social capitals are independently and positively associated with fisher’s participation in operational arenas (Table 19) while leadership skills and entrepreneurial skills social capital effect on fisher’s participation in constitutional arena is complemental in nature (Table 21). This characteristic of social capital was already observed in other studies related to natural resource management (Sekhar 2007, Ohno et al. 2010). We recognize
that multidimensionality of a concept can create theoretical and measurement problems and challenges (Lin 2001, Woolcock 2010), although in this case social capital’s different dimensions are the outcome of the analysis and are not its preconceived constructions. For example, majority of the studies in natural resource management treat social capital as separate entities, such as relationships of trust, trustworthiness, or institutions (Ostrom and Ahn 2003, Sekhar 2007, Ohno et al. 2010). We find that our approach to measuring social capital in the context of Mexican small-scale fishers provides at the same time greater theoretical flexibility and measurement rigidity. This is because particular domains that emerge from the analysis may differ from place to place based on the cultural, political, social contexts although they are measured using a common methodology.

In addition, social capital as a multidimensional concept has another property where its dimensions can produce antagonistic or negative effects. For example, the cumulative effect of leadership skills and personal support social capitals on fisher’s participation in constitutional arena is negative (Table 10). Ohno and colleagues (2010), while measuring social capital using a different methodology, found that some of its components negatively affect people’s participation in government led activities. Normatively speaking, components of social capital, apart from stimulating resource conservation or equality, can also be used to promote resource overuse or to restrict individual freedoms (Berkes 1987, Portes and Sensenbrenner 1993, Baland and Platteau
1996). Although of great practical importance, particular mechanisms that drive such negative effects of social capital are not fully understood in natural resource management and should be further explored.

Besides social capital, we also found relationship among other explanatory variables and the measured outcomes that are worth explaining in more detail. For example, greater engagement of hook and line fishers in operational arenas (Table 19) is concurrent with our observations from this region. This group views themselves as traditional and conservation minded given that they relate the use of nets on rocky reefs as predatory and destructive (Nenadovic, personal observation). With such strong differentiation, this group might be more willing to participate in monitoring and surveillance activities. In terms of income diversification, those who hold a valid fishing permit are less likely to engage in income generating activities outside of fisheries (Table 24), despite active promotion of such practices by government agencies (Nenadovic forthcoming). Interestingly, less educated and less represented (i.e. divers) were more likely to participate in constitutional arena. This finding suggests that such arenas are either more amenable to underprivileged groups or that there is a great effort by organizations who arrange such participatory processes to encourage participation of diverse actors.

We have also noted some differences among our sites. For example, fishers from San Felipe reported much higher income from fishing most likely due to a combination
of high catch volume (e.g. bigeye croaker) and high retail value of particular species (e.g. blue and brown shrimps) (CONAPESCA 2012). Illegal fishing activities targeting totoaba, an endangered and endemic croacker species, may have also contributed to such disparity, given that its swimming bladder was highly prized on the black market (Galván 2013). However, we are unsure if fishers from this site were reporting income generated through such activities. In terms of participation, fishers from La Paz were more likely to participate in collective-choice arena than fishers from other sites, except for San Felipe (Table 20). This is not surprising given that La Paz is a capital of the state of Baja California Sur and as such is a political and administrative center, which provides ample opportunities for participation within this arena. Similarly, Brzezinski et al. (2010) found that proximity of participatory venues were correlated to participants place of residence in the New England fishery council meetings.

Overall, the research from the natural resource management field has shown that social capital is significantly related to participation and resource use/conservation as separate outcomes (Sekhar 2007, Ohno et al. 2010, Marín et al. 2012). However, no studies that we could find investigate the effects of social capital on those outcomes jointly. Given the growing emphasis on a need to develop and create effective multi-level governance regimes (Armitage et al. 2007, Brondizio et al. 2009), and given the proposition that the level of participation of individual actors is conditional on benefits they may receive from such activities (Marshall 2008), there is a need to understand how
those relate and interact. Multi-level governance regimes, such as co-management, rely on active participation among actors in terms of the exchange of knowledge and information and of the testing and revision of institutional arrangements (Armitage et al. 2007). Findings from our study suggest that leadership skills social capital relates to participation across multiple governance levels, although it is not an indicator of a successful fishing venture as defined in our study. In that regard entrepreneurial skills social capital was more closely associated with fishers’ goal attainment outcomes. We conclude that social capital should be treated as a multidimensional concept where each of its components relates to a specific outcome. Therefore, in the context of small-scale fisheries, identifying and fostering different dimensions of social capital is necessary for securing successful participatory and venture outcomes.
5. Effects of fishers participation and government subsidies on adaptive capacity of small-scale fishers from Baja California Sur (BCS), Mexico

5.1 Introduction

A rising number of anthropogenic drivers of change has begun to challenge and undermine many of the existing governance arrangements that structure and organize use of renewable resources such as fisheries (Dietz et al. 2003). Those drivers such as climate change (Allison et al. 2009), resource overexploitation (Jackson et al. 2001), regulatory constraints (Mascia and Claus 2009), market globalization (Perry et al. 2011) in direct or indirect ways, acting either individually or synergistically, have a tendency to reduce catches and therefore negatively affect livelihoods of the people who depend on them. This trend is particularly relevant for the small-scale fisheries (SSF) sector given that it employs more than 90% of world’s fishers (Berkes et al. 2001), contributes at least 50% of the total catch (FAO 2010), and provides a social safety net to a large number of its participants (Allison and Ellis 2001, Béné et al. 2007a). Since the majority of SSF tends to be marginalized, illiterate, and impoverished (Berkes et al. 2001, Béné 2003), it is difficult for them to adapt to or to recover from both short- and long-term changes (Béné et al. 2007c). Therefore, there is a need to better understand institutional arrangements that can increase adaptive capacity of SSF to the changing conditions of their social-ecological system.
In this study we are trying to understand the effects of fishers’ participation in fisheries related governance activities and the government subsidies on the adaptive capacity of the small-scale fisheries sector. To our knowledge, this is the first study examining the effects of fishers’ participation and subsidy programs on small-scale fisheries in Mexico using a before-and-after study design to look at the levels of participation and the performance of the program as a tool to facilitate adaptive capacity of small-scale fisheries. We analyze changes in the small-scale fishing fleet from La Paz, Baja California Sur, Mexico, over a course of 6 year period as a case-study. In the remaining of the introduction section we define the main terms and provide a theoretical background for our study. In the following section, we describe a multi-method approach that we used to collect data. Then, we present the main results of the study and finish with discussing their relevance in the context of small-scale fisheries in Mexico and beyond.

5.1.1 Definitions

Resource users in our study are small-scale fishers who harvest one or more marine natural resources to secure a living either through commercialization or through direct consumption. Resource users are a subgroup of actors, which also include managers, government officials, non-governmental organizations’ employees, tourism operators, academics, and other interested parties (Evans et al. 2014). Actors in general
and resource users in particular have an opportunity to engage in various participation
fora related to governance regarding the use of local resources.

There is no single definition of participation, given that it can take various forms
depending on normative and legal constraints (McCay and Jentoft 1996, Michener 1998).
In our study, we focused on two aspects of fishers’ participation: one is in formal and
informal decision-making bodies as well as consultative groups that are related to
fisheries governance and management. The other is in resource monitoring and
surveillance activities. Both of these aspects are associated with improved governance of
renewable resources (Chhatre and Agrawal 2008, Dalton et al. 2012). However, their role
in strengthening adaptive capacity of small-scale fishers is not well understood.

Adaptive capacity can be defined as resource users’ ability to adequately adjust
their behavior and actions in order to deal with external drivers of stress and change
(Adger 2003). In our study we measure adaptive capacity in terms of users’ income
diversification and their ability to engage in developing value added services. Income
diversification is a strategy that reduces the risk of financial collapse by distributing it
across more than one income stream (Allison and Ellis 2001). Developing value added
services refers to resource users’ ability to earn extra profit by increasing the product
value through different processing mechanisms (e.g. deboning, cooking, canning)
(Sehgal and Sehgal 2002, Mahon et al. 2007). Both of these strategies are in our case
fostered by various government programs (i.e. subsidies).
Subsidy is defined as a direct or indirect form of payment, economic concession or privilege which is granted by a government to private firms, individuals, households or other governmental entities with a goal of fostering a particular public objective (FAO 2014). In our case we are focusing on government subsidies available to the small-scale fisheries sector such as modernization of the fleet and related infrastructure (excluding fuel subsidies), provision of alternative production opportunities and a reliable income stream (more details on the specific subsidies programs follow later in this section).

5.1.2 Civic participation as a method that fosters adaptive capacity of resource users

The concept of civic participation in general and among resource users in particular has been considered a cornerstone of natural resource management (Wells and Brandon 1993, Michener 1998). However, implementation and application of this concept in natural resource conservation are far from reaching their full potential and are often undermined by differing world-views, knowledge systems, and/or power relations among the actors (Campbell and Vainio-Mattila 2003).

Some authors suggest that participation is often used as a pretext by centralized government entities to further their own goal and agenda masked as a democratic process (Cooke and Kothari 2001, Berkes 2007). On the other hand, weak government organizations can be similarly captured by private interests through the decentralized process that only benefits particular groups or individuals (Singleton 2000). In any of
these two cases, poor and marginalized actors are disadvantaged either way, considering that barriers to participation can be set high either through financial limitations (e.g. traveling to meetings) or through deliberate exclusion from participatory processes by more powerful actors (Agrawal and Gupta 2005). It is, therefore, important to consider shortcomings of the participatory approach, especially in the context of strengthening resource users’ adaptive capacity.

Research in the field of environmental governance and adaptive capacity points out that meaningful and effective participation of actors in governance processes leads to the enhancement of their capacity to adapt (Armitage and Plummer 2010, Fabricius and Cundill 2010, Kalikoski and Allison 2010). In addition, active participation of actors may lead to the development of adaptive capacities that are appropriate for the local context (Smit and Wandel 2006). In general, participation of local actors in marine governance initiatives has been associated with improved community cooperation and enhanced compliance with rules (Pollnac et al. 2001, Dalton et al. 2012). Furthermore, studies have found that local participation also promotes sustainable resource use and conservation practices (and vice-versa) (Cudney-Bueno and Basurto 2009, Guidetti and Claudet 2010), outcomes that may improve and strengthen adaptive capacity of individuals or community as a whole to external drivers of change. However, the outcomes of participatory processes do not only depend on the mere involvement of local actors but also on the nature and quality of their engagement with the process.
(Menzel et al. 2013). As Robinson and Berkes (2011) point out, deliberative participation that spans across multiple institutional levels is necessary to stimulate and ensure the attainment of adaptive capacity. At the local level the potential for adaptive capacity may be impacted by a multitude of factors, such as entrepreneurial ability, access to financial and information resources, power relationships, and social capital among others (Wisner et al. 2004, Pelling and High 2005, Few et al. 2007, Keskitalo et al. 2011). At the individual level, as Adger et al. (2004) suggest, those actors who actively participate in resource management processes are generally more capable of adapting to changing conditions of their social-ecological systems. We postulate that fishers’ participation in processes related to governance and management of marine resources fosters their adaptive capacity through facilitating their access to government subsidies.

**5.1.3 Government subsidies as a basis for improving adaptive capacity**

Literature on fisheries policy and economics is replete with the negative impacts of subsidies on the performance and viability of the fisheries sector as well as on the sustainability of fish stocks throughout the world (Cox and Schmidt 2002, Grynberg 2003, Stokke and Coffey 2006, Sumaila et al. 2008, Willman et al. 2009, Sumaila et al. 2010). Majority of subsidies are given to industrial fisheries sector in developed countries mostly to cover fuel costs or increase overcapacity by furnishing the sector with modern boats and equipment (Sumaila et al. 2008, Willman et al. 2009). On the
other hand, small-scale fisheries sector receives little government financing. For example, some rough estimates suggest that small-scale fisher receives almost 200 times less fuels subsidies a year when compared to the average industrial fisher (Jacquet and Pauly 2008). According to Mondaca-Schachermayer et al (2011), the main focus of the subsidies in SSF sector is to alleviate poverty and to improve both social and ecological sustainability of the fishery either through specific programs (e.g. sustainable livelihoods) or through general funding schemes (e.g. credits and loans).

One aspect of improving social and ecological sustainability is through building adaptive capacity. Some fishery subsidy programs are specifically designed to strengthen adaptive capacity of the actors in both developed and developing countries (Markus 2010, Robles-Zavala 2014). For example, in 2006 the European Union appropriated approximately USD 5.5 billion fund to govern the implementation of the Common Fisheries Policy under which one of the main components is a Sustainable development of fisheries areas (Markus 2010). Under this component, the first two out of four strategies include (I) enhancing value added services into the fisheries production chain and (II) providing economic alternatives to the fishing communities (The Council of the European Union 2006, art.43). Similarly, development programs for SSF created by the Mexican government have sought to strengthen livelihoods of coastal communities and to conserve ecosystems by fostering sustainable resource use (Robles-Zavala 2014).
From both theoretical and empirical perspective, for such programs to be effective they need to be developed with active and meaningful input from the actors who will use them (Larsen and Gunnarsson-Östling 2009). We postulate that fishers’ participation in various fora is of interest to them as long as they can reap benefits from the participation itself (Marshall 2008).

5.1.4 Civic participation and government subsidies in the Mexican context

Right to participate in the governance processes, either through voting or through engagement in the creation and elaboration of development programs (e.g., subsidies), has been granted to every Mexican by their constitution (Mexican Constitution art. 26, § A; art. 35, § I). However, quality of participatory activities and the outcome of such processes have been historically stymied by the federal government whose representatives were able to manipulate and alter political processes and policy discourses to keep themselves in power (Cook et al. 1994, Weyland 2004). Even though the democratization of the Mexican political process over the last two decades has brought significant changes to the role of civic engagement in governance processes, there is indication that levels of civic participation are considerably lower when compared to more mature democracies (Klesner 2007). However, this is not to say that civic engagement in participatory processes is irrelevant in Mexico. Cleary (2007) points out that quality of municipal government in Mexico depends on the levels of public
engagement in nonelectoral forms of participation, such as partaking in the demonstration or signing a protest letter. This finding suggests that even regimes in countries with nacent democracies may be responsive to organized public demands.

The main approach in which government subsidies in Mexico are designed is through the plan for national development, which is enacted every six years with the change of federal government. To determine its content, broad participation of different social sectors is sought with the goal of incorporating demands and aspirations of the civic society into the resulting development programs (Mexican Constitution art. 26, § A). Once finalized and approved by the legislature development programs are implemented by federal agencies. In terms of fisheries in general, and small-scale fisheries in particular, two federal agencies have a mandate to regulate fisheries or the extraction of marine organisms for commercial purposes on which we will focus in this study.

The Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) through one of its commissions, National Commission of Aquaculture and Fishing (CONAPESCA), is in charge of regulating and managing fisheries while the Secretariat of Environment and Natural Resources (SEMARNAT) is in charge of regulating and managing species listed under special protection (Diario Oficial 2010), some of which can be exploited commercially. Furthermore, a decentralized body of SEMARNAT, the National Commission of Natural Protected Areas (CONANP), directly
affects fishing through the creation of marine protected areas even though it does not regulate fishing activities per se. Its mission is protection, restoration, and conservation of ecosystems and natural resources and promotion of their use and sustainable development. As such it plays a major role in providing alternative economic opportunities to fishers.

Our study coincides with a single development strategy, issued by the government of Felipe Calderón for a period 2007-2012. The motivation for this development strategy resulted from the finding that national fisheries were overexploited and the main goal was to maintain capture throughout this period at 1.4 million metric tons without further deteriorating their condition (Diario Oficial 2008a). This general development strategy is further refined through sectorial development programs implemented by individual federal secretariats. In order to promote the development of the fisheries sector and especially SSF sector, both SEMARNAT’s and SAGARPA’s in their respective sectorial strategic development programs emphasized the need for promoting economic diversification, building value added services into the production chain, and furthering access to competitive inputs of production through government programs and subsidies (Diario Oficial 2008a, e). In addition, both programs indicated the need to foster civic participation in decision-making processes in an effort to achieve sustainable development by effectively managing human use of natural resources and conserving ecosystems and habitats.
There were five government action plans funded by CONAPESCA and two funded by CONANP during our study period for the state of Baja California Sur (BCS) (Note: CONAPESCA had in total 5 different action plans but given that their names changed from one year to the next we decided to merge them together). From now on we refer to CONAPESCA subsidies as fisheries and to CONANP’s as conservation subsidies, given the respective commissions’ primary focus. Three of the five CONAPESCA action plans concentrated on providing subsidies for strategic investments in equipment and infrastructure (e.g. building processing plants, ice factories, rearing facilities) in order to carry out sector’s primary production activities and to increase sector’s production value. The other two action plans focused on improving fishers’ efficiency by modernizing small-scale fisheries (i.e. subsidies for new engines, boats, fishing gear, and navigation and communication equipment). CONANP’s action plans that were available to La Paz small-scale fishers during this time either focused on providing alternative production opportunities (PROCODES) or on ensuring reliable income stream in the times of hardship (PET). While the former allowed fishers to diversify income portfolio, the latter one served as a safety net to prevent them from descending deeper into poverty during times of year when income from fishing was low.
5.1.5 Small-scale fisheries of the Baja California Sur and the anthropogenic drivers

The SSF sector in BCS has been historically significant as both a subsistence activity and a commercial endeavor for a large number of people (León-Portilla 1995). Almost 99% of the registered fishing belong to the SSFs sector (Ortiz et al. 2006). Performance of the sector is affected most strongly by prominent forms of external drivers such as climate change, resource overexploitation, regulatory constraints, and global markets.

The small-scale fishing fleet consists of 2,758 pangas, 6-8 meter fiberglass boats with outboard motors (CONAPESCA 2010, unpublished data). The revenue generated by the BSC SSF fleet in 2005 was the highest in the nation - 23.5% of the total fisheries revenue in Mexico (Diario Oficial 2008a). Every fisher needs to have a fishing permit in order to legally catch and market the product. Fishers within this sector operate in three ways: as members of fishing cooperatives; as individual permit holders (permisionarios); and as independent fishers (pescadores libres). Independent fishers either fish without a permit or under a permit of individual permit holders (or cooperative).

Recent studies have shown that climate change and specifically El Niño Southern Oscillation (ENSO) events negatively affect multiple commercial fisheries on both the Pacific and Gulf of California coasts of BCS, although with varying temporal lags and intensities, which are mediated by the target species’ life histories and the biophysical
Resource overexploitation is evident for many commercial species which decreased considerably in abundance over the last 50 years (Sala et al. 2004, Saenz-Arroyo et al. 2005). Currently, no new permits are being issued for almost any of the fish species, arthropods, and many mollusks (Diario Oficial 2012a). Lack of new permits coupled with the increasing trend of conservation initiatives which result in the creation of marine protected areas and fisheries refuges put limits to the new entrants (at least legal) into the local fisheries and shrunk fishing grounds for the existing fishers (Cudney-Bueno et al. 2009, Diario Oficial 2012d). Lastly, studies investigating market dynamics of BCS fisheries suggest that integration of local fisheries into regional and global markets affects fishers’ incentives and impacts the structure of local fishing institutions (Basurto et al. 2013, Reddy et al. 2013).

5.1.6 Research questions

We are interested in investigating the relationship of public participation (i.e. fishers) to adaptive capacity vis-à-vis government subsidies. Research questions guiding this study are:

1. Does fishers’ participation in processes related to governance and management of marine resources brings them direct economic benefits?
a. Is there a relationship between fishers’ participation and their receiving government subsidies?

2. Does fishers’ participation in processes related to governance and management of marine resources fosters their adaptive capacity?
   a. Is there a relationship between fishers’ participation and their employment diversification (over two time periods)?
   b. Is there a relationship between fishers’ participation and their increase in monthly income (over two time periods)?

3. Do government subsidies targeting small-scale fisheries sector affect fishers’ adaptive capacity?
   a. Is there a relationship between government subsidies and fishers’ employment diversification (over two time periods)?
   b. Is there a relationship government subsidies and fishers’ increase in monthly income (over two time periods)?

5.2 Methods

5.2.1 Study site

The city of La Paz, with a population of 215,178 (2010 census data), is the economic and administrative center of BCS. Its SSF sector, even though small (less than 0.05% of the city’s population), is an important component of local tradition and history (Anaya Reyna et al. 2005a, Leslie et al. Forthcoming). Major fishing areas for SSFs from
this area are the nearby islands of Espiritu Santo, Cerralvo, San Jose, and the La Paz Bay (Figure 13). Fishers catch approximately 80 species of fish and invertebrates in this region (Díaz-Uribe et al. 2007), mostly using nets and hook and line, although other forms of fishing, such as hookah diving and seining are also practiced (Arreguín-Sánchez et al. 2004).

Figure 13: Location of the Espiritu Santo National Park in relation to La Paz.

Waters surrounding the Espiritu Santo Island have been protected as a National Park since 2007 (DOF 2007a) while the terrestrial portion has been protected since 1978.
Most of the area is open to fishing except for the three no-fishing zones that cover slightly more than 1% of the total area of the Park. The island is located approximately 20 kilometers north of the city of La Paz, Baja California Sur, Mexico. This region is an important fishing ground to a number of fishers from this area (Anaya Reyna et al. 2005a). The relevance of this protected area to our study is that it provides opportunity to its users to apply for and access various government programs and subsidies through the CONANP that otherwise would not be available to them.

5.2.2 Data Collection

We collected data using structured survey, interviews, and participant observation. The large-n survey allowed us to discover patterns in the data. The interviews and participant observation permitted the generation of explanatory hypotheses about the patterns observed in the data. A mixed methods approach permits researchers to produce more robust findings by allowing better understanding of research problems that would not be possible if either approach were used alone (Creswell and Clark 2007). We conducted two surveys, one in 2006 prior to the establishment of the Espiritu Santo National Park, and one 5 years after the implementation. The first author conducted interviews with key informants in 2012 and all the authors engaged in participant observation during the last five years.
5.2.2.1 Surveys

We conducted 80 surveys during a four-month period (September-December) in 2006 and 73 surveys during a 3-month period (July-September) in 2012 with fishers who use the Espiritu Santo National Park as a fishing ground. In both instances we trained local enumerators who were familiar with small-scale fisheries within BCS. One of the enumerators in 2012 was an active fisher and he played an important role as a contact person with the local fishing community. Given that the official lists of registered fishers are incomplete and do not take into account a large number of independent fishers who work for individual permit holders or without a permit, having members on our team with knowledge of local fishers’ residences was especially valuable. Similarly essential was collaboration with the local non-governmental institution Niparajá (to whom the last two authors are affiliated), given their involvement with fishers using Espiritu Santo since 2004. Given that we could not proceed with a random sampling, we decided to identify and survey all the active users in 2006 and all the active and inactive users of the Espiritu Santo marine region in 2012. This approach allowed us to take into account those fishers that left the fishery since the creation of the marine park. In 2006, we identified approximately 130 fishers and surveyed 62% of them (n=80). In 2012, we identified 161 fishers and surveyed 45% of them (n=73). The remaining 55% either did not want to participate in the survey (n=38) or were difficult to locate (n=50). We surveyed fifteen fishers in 2012 that were also surveyed in 2006. Those individuals were
dropped from the 2006 dataset and kept in 2012 dataset since the latter one had less cases overall. In this way we maintained independent observations between the two years. Once we removed cases with missing values, the total sample size was 136 (64 from 2006 and 70 from 2012).

Prior to initiating the survey, we conducted a focus group with 5 local fishers to fine-tune the survey instrument and identify questions that were unclear or inapplicable to the local context. We further pretested the survey instrument with 12 fishers to additionally improve questions or clarify any misinterpretations. Themes covered in the survey included: (1) basic demographic information; (2) general information about fishing history and fishing activities; (3) seasonal fishing patterns; (4) perceived threats to fisheries; (5) knowledge of existing governance structures related to fishing activities; (6) fishers organizational strategies; (7) perceptions and use of the MPA; (8) participation in decision making related to the fishing sector and protected area related activities; (9) social capital; (10) economic issues; and (11) information about subsidies. For this paper we focused on basic demographic information, general information about fishing history and fishing activities, participation in decision making related to the fishing sector and protected area related activities, economic issues, and subsidies. We stored data from the 2007 survey in Excel (version 2003, Microsoft Office) and from the 2012 survey in Access (version 2010, Microsoft Office). An independent team of three assistants was in charge of reviewing the information in the database and correcting any potential errors after the
enumerators finished inputting the survey results. Prior to the analysis, we transferred responses to the questions relevant to this analysis from both databases into a single Excel spreadsheet.

5.2.2.2 Interviews

The first author conducted 20 in-depth interviews with fishers; government officials from a number of federal institutions that regulate fishing activities or manage protected areas (i.e. CONAPESCA, INAPESCA, CONANP, and PROFEPA); NGO staff that was active in the creation and implementation of the local MPA; and other key informants that were knowledgeable about present and historic fishing practices, and the origins of the local MPA. The interviews were semi-structured, allowing the interviewer to collect information on the main issues but also to explore other relevant fishing and conservation aspects that were raised during the interview (Johnson and Weller 2002). All interviews were recorded but two. Interviews followed appropriate informant consent protocols (Duke University IRB #B0259). We transcribed all the interviews prior to the analysis.

5.2.2.3 Participant observation

During the two time periods when we conducted surveys (2006 and 2012), each of the authors participated to some degree in fishing activities and assisted some of the discussions that fishing sector had about the creation and management of the MPA. We
cumulatively generated at least 10,000 hours of active engagement in such activities.
This experience allowed us to gain in-depth knowledge about the local fishing community, to understand contextual information, and to establish a rapport with the fishers (Bernard 2011).

5.2.3 Variable description

5.2.3.1 Response variables

All the response variables were binary coded. We obtained information on government subsidies by asking each fisher to list whether or not he received any type of government subsidy over the course of five years. We subsequently divided them into fishery (administered by CONAPESCA) and conservation (administered by CONANP) subsidies. We gathered information on income sources by asking each fisher to list all income-generating activities he was engaged in. Lastly, we collected information on weekly incomes during a good week of fishing. We defined income level as a weekly income relative to the sample mean.

5.2.3.2 Explanatory variables

We assessed fishers’ participation in two types of engagements. The first type is participation in consultative and/or decision-making bodies. This form of participation is classified by fishers’ engagement in various councils and committees that deal with fisheries issues. These bodies either propose the creation of new rules or suggest the
modification of existing ones. The second type is participation in monitoring activities and/or in filing a complaint. Engagement in monitoring activities is a voluntary activity that is available to all fishers through various paths. Every fisher could also submit a complaint if witnessing a potential illegal activity either in writing or by calling the appropriate authority. The responses for these two components were merged into a single variable.

In addition to these variables, we controlled for year of the survey, and a number of variables related to fishing practices. Years fishing to age ratio is a proxy for respondents’ experience as a fisher. Type of fisher was divided into independent and organized (i.e. member of a cooperative) fisher. Number of resources fished and number of fishing gear types used indicate respondents’ potential for diversification within a fishery.

5.2.4 Data Analysis

5.2.4.1 Surveys

We conducted a logistic regression analysis to simultaneously assess the effect of predictor variables separately for each response variable. The general form of the logistic regression is appropriate for response variables that are categorical in nature and that have two distinct outcomes. Such outcomes are assessed using Binomial distribution, which is a discrete probability distribution of the number of times that a particular event occurs in a sequence of independent observations (Menard 2002). Logistic regression
log-transforms predictor variables and uses the maximum likelihood estimation to assess their effect on a categorical dependent variable (Gelman and Hill 2007). The obtained maximum likelihood estimation parameters represent marginal contributions, i.e. how much would the log-odds for the probability of event occurring change if a given predictor variable changed by one unit, or in the case of a categorical predictor to the alternative outcome, and all other predictor variables in the model remained constant. These parameter estimates may be multiplied by their antilog to obtain the odds ratio.

We tested continuous predictor variables for collinearity and for the linearity of the logit, and categorical predictor variables for incomplete information using contingency tables. We did not identify any limitations with the model variables. We also tested for overdispersion for each of the models and we found none. We examined residual statistics for potential outliers; one outlier was identified that we removed after further investigation. We performed a specification test using a LINKTEST (Vittinghoff et al. 2012) and confirmed that all of our models were adequate. Quantitative analysis was performed using a statistical package JMP (version Pro 11).

5.2.4.2 Interviews

We coded the interviews using the qualitative data analysis software NVivo (version Mac, QSR International). Major themes explored in this paper relate to
respondents’ answers to the following questions: (1) Who actively participated or is actively participating in making the rules governing Espiritu Santo National Park? (2) Is local community involved in any aspect of administration and management of the Espiritu Santo National Park? (3) Which are the main problems that are encountered in the Espiritu Santo National Park? (4) Are there specific assistance programs associated with the Espiritu Santo National Park? (5) What is your opinion of them and how do they impact local communities? (6) Is there a way to improve subsidies related to Espiritu Santo National Park or their distribution within the community? (7) What have been the social impacts of management in Espiritu Santo National Park? (8) Who makes the greatest contributions to or sacrifices for the Espiritu Santo National Park? (9) Who benefits most from the Espiritu Santo National Park? (10) Do you think MPAs can serve the dual purpose: protecting biodiversity AND enhancing fisheries?

5.3 Results

5.3.1 Survey analysis

Tables 25 and 26 show the summary statistics of all the variables we used in our model. Slightly more than 41% of fishers received fisheries subsidy and 28% received a conservation subsidy (Table 25). Majority of the fishers indicated fishing as their only source of employment (Table 25). The number of cooperative members and independent fishers is almost equal in our sample (Table 25). In terms of participation, approximately
one fourth of the fishers actively participated (Table 25). Fishers reported to use two types of fishing gear to harvest almost six species on average (Table 26).

**Table 25: Summary statistics of the nominal variables used in our model.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiving fisheries subsidy</td>
<td>Yes</td>
<td>41.04 (N=55)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>58.96 (N=79)</td>
</tr>
<tr>
<td>Receiving conservation subsidy</td>
<td>Yes</td>
<td>28.57 (N=38)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>71.43 (N=95)</td>
</tr>
<tr>
<td>Fishing as the only employment</td>
<td>Yes</td>
<td>75.40 (N=95)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>24.60 (N=31)</td>
</tr>
<tr>
<td>Monthly income from fishing relative to the mean</td>
<td>Higher</td>
<td>33.33 (N=41)</td>
</tr>
<tr>
<td></td>
<td>Lower</td>
<td>66.67 (N=82)</td>
</tr>
<tr>
<td>Year</td>
<td>2006</td>
<td>47.76 (N=64)</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>52.24 (N=70)</td>
</tr>
<tr>
<td>Type of fisher</td>
<td>Cooperative member</td>
<td>51.88 (N=69)</td>
</tr>
<tr>
<td></td>
<td>Independent fisher</td>
<td>48.12 (N=64)</td>
</tr>
<tr>
<td>Participation in consultative and/or decision-making bodies</td>
<td>Yes</td>
<td>27.07 (N=36)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>72.93 (N=97)</td>
</tr>
<tr>
<td>Participation in monitoring activities and/or in filing a complaint</td>
<td>Yes</td>
<td>20.00 (N=26)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>80.00 (N=104)</td>
</tr>
</tbody>
</table>

**Table 26: Summary statistics of the continuous variables used in our model.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years fishing to age ratio</td>
<td>125</td>
<td>0.04</td>
<td>0.92</td>
<td>0.64</td>
<td>0.21</td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>133</td>
<td>1</td>
<td>12</td>
<td>5.90</td>
<td>2.70</td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>133</td>
<td>1</td>
<td>5</td>
<td>1.90</td>
<td>0.70</td>
</tr>
</tbody>
</table>
Fishers were 3.5 times more likely to receive fisheries subsidy and 10 times more likely to receive conservation subsidy in 2012 than in 2006 (Table 27). Furthermore, fishers that are members of cooperatives were 5.5 times more likely to receive fisheries subsidy and 4.5 times more likely to receive a conservation subsidy. The odds of receiving subsidies (both fisheries and conservation) are 3.5 times higher for a fisher that participated in at least one consultative and/or decision making body. In addition, the odds of receiving a conservation subsidy increase slightly more than 3 times for a fisher that participated in monitoring activities or has filed a complaint. Furthermore, the odds of receiving this same subsidy increase 1.3 times for each additional resource caught but decrease slightly more than 2 times with usage of every additional fishing gear type. Overall, these two models explained 29% and 35% of variance in relation to the receiving fisheries and conservation subsidies respectively.
Table 27 Probability (a) of the receiving fisheries subsidy and (b) of conservation subsidy: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Subsidy-fisheries</th>
<th>Subsidy-conservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation in consultative and/or decision-making bodies [yes]</td>
<td>0.63** (0.27)</td>
<td>-0.09 (0.15)</td>
</tr>
<tr>
<td>Participation in monitoring activities and/or in filing a complaint [yes]</td>
<td>-0.04 (0.29)</td>
<td>0.06 (0.13)</td>
</tr>
</tbody>
</table>

**CONTROLS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Subsidy-fisheries</th>
<th>Subsidy-conservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year [2006]</td>
<td>-0.62** (0.26)</td>
<td>0.12 (0.94)</td>
</tr>
<tr>
<td>Years fishing to age ratio</td>
<td>1.57 (1.23)</td>
<td>0.04 (0.05)</td>
</tr>
<tr>
<td>Type of fisher [cooperative member]</td>
<td>0.85*** (0.24)</td>
<td>0.04 (0.08)</td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>-0.16 (0.11)</td>
<td>0.00 (0.30)</td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>0.27 (0.35)</td>
<td>0.00 (0.11)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.87 (0.96)</td>
<td>-2.57** (1.15)</td>
</tr>
</tbody>
</table>

Model $\chi^2$ | 48.14 | 53.01 |
DF | 7 | 7 |
p-value | <0.0001 | <0.0001 |
Pseudo $R^2$ | 0.29 | 0.35 |
N | 121 | 120 |

Results from the two models of the logistic regression related to the income diversification are shown in table 28. The addition of the two types of subsidies as independent variables in the second model did not affect the outcome when compared to the first model. In both models the odds of fishing being the only income source increase 1.4 times for each additional resource caught. In addition, the odds of fishing being the only income source are almost 4 times (model 1) and 5 times (model 2) higher for those that do not participate in monitoring activities and/or in filing a complaint. No
other variables were significant. Overall, the first model explained 16% and the second 18% of variance in relation to the fishing being the only income source.

**Table 28:** Probability of fishing being the only employment for two different models: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fishing as the only income source</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
<td></td>
</tr>
<tr>
<td>Participation in consultative and/or decision-making bodies [yes]</td>
<td>0.19 (0.33)</td>
<td>-0.06 (0.36)</td>
<td></td>
</tr>
<tr>
<td>Participation in monitoring activities and/or in filing a complaint [yes]</td>
<td>-0.67** (0.29)</td>
<td>-0.80*** (0.31)</td>
<td></td>
</tr>
<tr>
<td>Receiving fisheries subsidy [yes]</td>
<td>0.36 (0.33)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiving conservation subsidy [yes]</td>
<td>0.61 (0.37)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CONTROLS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year [2006]</td>
<td>0.25 (0.29)</td>
<td>0.51 (0.33)</td>
<td></td>
</tr>
<tr>
<td>Years fishing to age ratio</td>
<td>0.88 (1.27)</td>
<td>0.61 (1.30)</td>
<td></td>
</tr>
<tr>
<td>Type of fisher [cooperative member]</td>
<td>0.44* (0.26)</td>
<td>0.23 (0.29)</td>
<td></td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>0.36*** (0.12)</td>
<td>0.38*** (0.12)</td>
<td></td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>0.11 (0.35)</td>
<td>0.20 (0.36)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.47*** (0.99)</td>
<td>2.78*** (1.04)</td>
<td></td>
</tr>
<tr>
<td>Model $\chi^2$, DF, p</td>
<td>18.98</td>
<td>22.44</td>
<td></td>
</tr>
<tr>
<td>DF</td>
<td>7</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>0.008</td>
<td>0.008</td>
<td></td>
</tr>
<tr>
<td>Pseudo R$^2$</td>
<td>0.16</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>114</td>
<td>118</td>
<td></td>
</tr>
</tbody>
</table>

Results from the two models of the logistic regression related to the increase in monthly income from fishing are shown in table 29. As in the previous analysis related to the income diversification, the addition of the two types of subsidies as independent variables to the second model did not substantially affect the outcome when compared
to the first model. In both models the odds of having a higher than the mean monthly income are 19 times (model 1) and 33 times (model 2) higher for the year 2012 than for 2006. In addition, the odds of having a higher than the mean monthly income increases 1.4 times with each additional resource caught. No other variables in either of the two models were significant. Overall, the first model explained 48% and the second 50% of variance in relation to the increase in monthly income from fishing.

Table 29: Probability of having a monthly income higher than the mean income for the entire dataset for two different models: coefficients and standard errors (in parenthesis). Significance: *p-value ≤ 0.10, **p-value ≤ 0.05, ***p-value ≤ 0.01.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Earnings from fishing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
</tr>
<tr>
<td>Participation in consultative and/or decision-making bodies [yes]</td>
<td>-0.10 (0.35)</td>
</tr>
<tr>
<td>Participation in monitoring activities and/or in filing a complaint [yes]</td>
<td>-0.50 (0.36)</td>
</tr>
<tr>
<td>Receiving fisheries subsidy [yes]</td>
<td>-0.60 (0.41)</td>
</tr>
<tr>
<td>Receiving conservation subsidy [yes]</td>
<td>-0.10 (0.39)</td>
</tr>
<tr>
<td><strong>CONTROLS</strong></td>
<td></td>
</tr>
<tr>
<td>Year [2006]</td>
<td>-2.62*** (0.53)</td>
</tr>
<tr>
<td>Years fishing to age ratio</td>
<td>-0.84 (1.45)</td>
</tr>
<tr>
<td>Type of fisher [cooperative member]</td>
<td>0.05 (0.32)</td>
</tr>
<tr>
<td>Number of resources fished</td>
<td>0.31** (0.15)</td>
</tr>
<tr>
<td>Number of fishing gear types used</td>
<td>0.69 (0.48)</td>
</tr>
<tr>
<td>Constant</td>
<td>-3.73*** (1.48)</td>
</tr>
</tbody>
</table>

Model $\chi^2$, DF, p | 70.15 | 71.45 |
DF | 7 | 9 |
p-value | <0.001 | <0.001 |
Pseudo R$^2$ | 0.48 | 0.50 |
N | 106 | 105 |
Some 33% (N=23) of fishers from our sample received both fisheries and conservation subsidies (Table 30). Only one of them received both types of subsidies in 2006. In regards to income diversification, there were 19 fishers who had at least one more income in addition to fishing in both 2006 and 2012 (Table 31). The reasons that the fishers reported for having alternative incomes were largely to secure earnings during the times of the year when fishing was bad. Six of the 19 fishers left the fishery since our initial survey in 2006. They all left because they found a better employment opportunity. Furthermore, 10 out of the 19 fishers had at least part of their income derived from conservation subsidies or from CONANP directly. Some of them are park rangers (n=2), some are part- or full-time ecotourism guides (n=2), and some are certified biological monitoring divers, which are occasionally employed by CONANP or by local NGOs (n=4).

Table 30: Cross-tabulation of the fisheries and conservation subsidies (N=133).

<table>
<thead>
<tr>
<th>Receiving fisheries subsidy</th>
<th>Receiving conservation subsidy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 31: Reasons for having alternative jobs to fishing.

| Year | | | | | |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|      | Yes | Yes | No | No | Yes | Yes | No | No | N | N | N | N |
|      | 2006 | 2012 | | | | | | | | | | | |
| Alternative income to fishing | 19 | 2006 | Yes | 31.15 | 31 | 68.85 | 42 | 19 | 27.14 | 72 | 72.86 |

Reason for having alternative income for those that responded Yes

| Access to social security/healthcare | 1 | 2 | 5.26 | 10.53 |
| Secure earnings | 11 | 12 | 57.90 | 63.16 |
| Higher earnings | 7 | 5 | 36.84 | 26.31 |

Official data on fisheries and conservation subsidies programs indicate that fishers from La Paz received a total of USD 627,000, during the 2007-2012 period (Tables 32a, 33a). In terms of fisheries subsidies, fishers in La Paz received little bit less than half a million USD in strategic investments funding during the 2007-2012 period (Table 32a), which is less than 10% of the entire amount disbursed in the state during this time period (data not shown). There were 43 such projects, which benefited some 200 people (Table 32b,c). None of the fishers we surveyed received funding for strategic investment. All of the subsidies that fishers reported in our survey belonged to the improvement of SSF efficiency (boats, motors, fishing gear, and navigation and communication equipment). Unfortunately, the exact impact of this subsidy program on the fishers in La Paz is not known (Table 32). At the state level, the improvement of SSF efficiency program had the highest number of financed projects as well as the greatest number of beneficiaries (data not shown).
Table 32: Impact of fisheries subsidies distributed during 2008-2012 period in terms of (A) funding, (B) number of financed projects, (C) number of beneficiaries. Amounts in (A) are adjusted for inflation and reported in 2012 USD.

<table>
<thead>
<tr>
<th>(A) 2012 USD</th>
<th>YEAR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRAM</td>
<td>2007</td>
<td>2008</td>
</tr>
<tr>
<td>Strategic investments in equipment and infrastructure</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Improvement of SSF efficiency(^{32})</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(B) # of financed projects</th>
<th>YEAR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRAM</td>
<td>2007</td>
<td>2008</td>
</tr>
<tr>
<td>Strategic investments in equipment and infrastructure</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Improvement of SSF efficiency(^{31})</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(C) # of beneficiaries</th>
<th>YEAR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRAM</td>
<td>2007</td>
<td>2008</td>
</tr>
<tr>
<td>Strategic investments in equipment and infrastructure</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Improvement of SSF efficiency(^{31})</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

\(^{32}\) Breakdown by city was not available (NA). The total amount given over this time period for the state of BCS is USD 5,710,000; financed projects 1,691; beneficiaries 8,890.

\(^{31}\) Some beneficiaries received support more than once.
Official data on conservation subsidies indicate that the total amount of support for the La Paz fishing community during the same time period was USD 177,375 (Table 33a). Some 40% of these funds went into a program that focused on developing alternative production opportunities. Three projects were funded from which 50 people benefited (Table 33b,c). Program that focused on maintaining income in the time of need benefited less than 280 people, given that some of the individuals received it more than once over this time period.
Table 33: Impact of conservation subsidies distributed during 2007-2012 period in terms of (A) funding, (B) number of financed projects, (C) number of beneficiaries. Amounts in (A) are adjusted for inflation and reported in 2012 USD.

<table>
<thead>
<tr>
<th>(A)</th>
<th>2012 USD</th>
<th>YEAR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRAM</td>
<td>2007</td>
<td>2008</td>
<td>2009</td>
</tr>
<tr>
<td>Developing alternative production opportunities</td>
<td>--</td>
<td>--</td>
<td>39,219</td>
</tr>
<tr>
<td>Ensuring reliable income stream</td>
<td>7,516</td>
<td>27,869</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>7,516</td>
<td>27,869</td>
<td>39,219</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(B)</th>
<th># of financed projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR</td>
<td>2007</td>
</tr>
<tr>
<td>PROGRAM</td>
<td>2007</td>
</tr>
<tr>
<td>Developing alternative production opportunities</td>
<td>--</td>
</tr>
<tr>
<td>Ensuring reliable income stream</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(C)</th>
<th># of beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR</td>
<td>2007</td>
</tr>
<tr>
<td>PROGRAM</td>
<td>2007</td>
</tr>
<tr>
<td>Developing alternative production opportunities</td>
<td>--</td>
</tr>
<tr>
<td>Ensuring reliable income stream</td>
<td>60</td>
</tr>
<tr>
<td>TOTAL</td>
<td>60</td>
</tr>
</tbody>
</table>

34 Some programs were not available each year; marked as (--).
35 Data for projects only.
36 Both fishers and their spouses were eligible
37 Some beneficiaries received support more than once.
5.3.2 Interviews analysis

Qualitative content analysis of informal interviews shows that interviewees identified lack of civic participation in governance processes and a lack of government support in fostering participation in such processes as the principal limitations, not only to the development of successful and effective governance institutions, but also to the formation of engaged and proactive citizenry. One key informant from the government sector articulated the above findings the following way:

You have a country that isn’t usually accustomed to participate and get involved in social processes, because the participation hasn’t been around for more than 15 or 20 years... That combination of [people] not being accustomed to participate and the government being required to have spaces [for participation] leads to a situation where those processes are not being utilized and potentiated. [For participation to truly work] you need to be educated to participate, accustomed to participate, and to know how to participate. (G27)

Another informant who has been directly involved in the PNES creation process indicated that fishers had a passive attitude toward their decision-making role and were not comfortable in engaging in dialog with the government (N03). The root of civic subordination stems from historic paternalistic tendencies of the Mexican state that is still present in many spheres of the society, including fisheries management. One government official involved with subsidies programs pointed out:

[Community members] come and say: “Listen, I heard that you give out subsidies here. If you have a project, or an idea for a park, I would be
interested to apply. Tell me what is needed so that I know what to ask for.” (G17)

Within this social context, some of the government officials saw subsidies as an approach to strengthen civic participation:

[Subsidies] are an incentive to foment fishers’ participation, because they [fishers] know that if they do they have a possibility for getting help in the upcoming years. (G09)

However, creating positive expectations and building motivation proved to be difficult, due to historic tendencies and inexperience on the side of managers. In the words of one of the former government officials:

We spent three years on subsidies for projects that didn’t endure. Now I can clearly see that they were not created from fishers’ necessity. [We created] those projects which were accepted [by the fishers] but there was no true commitment to keep them running. I think we were naïve. I think that three years of investment didn’t create any experience or interest, and I don’t think they generated money. And on the contrary, I think that maybe we lost, not only the money, but the opportunity to really plan or strengthen productive activities. I can’t prove it but for me it was a very bitter experience… and I am under the impression that this is still happening in many places. (G26)

In terms of fishers’ lack of participation in monitoring activities, one of the cooperative presidents pointed out that such activities should be exclusively carried out by the government entities due to a fear of braking social cohesion:

[Monitoring] is not our responsibility because we don’t want to have enemies at sea. At the sea we want to be a family. Even though they are not like me [respecting rules], I am with them because they are my friends and also because fishery is their main source of income. They have to do what they need to do. (F07)
However, while some of the fishers maintained this view, others were willing to engage in monitoring activities as long as they can get paid. Two out of three interviewed small-scale fisheries sector leaders emphasized that fishers tend to participate in activities from which they know will benefit economically. Participation in some of the monitoring activities, although paid, was not considered as an adequate income for some of the fishers. One of the fishery leaders explained:

We have people in the cooperative who work for FONMAR. FONMAR helps federal government in monitoring activities. Those folks [who work for them] are fishers… However, they don’t remain in this job for a long time because the earnings in fishing are greater than in monitoring. (F09)

All the informants (n=20) indicated that government subsidies are beneficial to the small-scale fisheries sector either by fostering income diversification or by improving fishers’ efficiency and generating added value to fisheries. However, they also pointed out that current system could be improved. One government official indicated that the great effort is being placed in supporting the investment in infrastructure that will help generate added value to Mexican fisheries and in that way make them more competitive in the international market, which benefits both the nation and the fisher. However, such opportunities had not been readily available to SSF in La Paz as one of the local fisheries leaders pointed out:

What is necessary is to look for a way… to generate a viable income. In other words, look for a good marketing approach; look for a process [that
can increase] the added value of the product. In that way with the little product they harvest they can earn more. (F09)

The focus of conservation subsidies, on the other hand, was mostly to ensure reliable income stream in the times of hardship (program known as PET). However, inadequate financing was indicated as a problem for such programs. As one of the local cooperative leaders pointed out:

If you take those 70,000 pesos and divide it among all the people in three months each one gets maybe about 3,000 or 4,000 pesos during those months of work. Right now given the state of the things and the rising costs [of living] that is not enough (F08)

According to one of the government officials knowledgeable about various subsidies programs low budgets for conservation programs are a common challenge for their effective implementation:

The resource assigned to the temporary employment is, for example, 1 million pesos. I have to distribute that million among 20 communities. So then, you get 50,000 pesos for each of the communities. Those 50,000 pesos are not enough because they don’t allow us to do some of the activities satisfactorily. There are just too many people. (G09)

Another government official stated:

[PET] is just a relief, a palliative measure that does not solve the problem. We are fighting poverty, though it is true that PET is a good help... But the amount [of money] that is given out is small and is not enough for everyone. (G10)

Our findings from the survey indicate that most of the fishers received subsidies in this form. This would suggest that an opportunity to engage in developing stable
income alternatives might be limited even though one of the government employees pointed out that the creation of such alternatives was in fact one of the main goals of the conservation initiatives, such as protected areas:

I think that many times you can stimulate alternatives [through subsidies] by substituting or diversifying fishers’ income generating activities. For example, when the fishery is low they can do tourism, ecotourism, or completely switch from being fishers to being tourism service providers. (G13)

However, the informants emphasized that the development of new income generating activities has been limited by a number of factors. Firstly, low levels of education of the fishers’ sector were considered by many as a challenge not only to participation but also to effective entrepreneurship. One of the local small-scale fisheries leaders pointed out:

We are not educated enough, we barely speak Spanish and we don’t have much interaction with tourism… We do not have proper qualifications and it is very difficult for us to be well prepared given that we cannot speak the [foreign] language [and run a business]. (F08)

Lack of education was also a barrier for many fishers to navigate complex bureaucratic system to fulfill the application requirements for subsidies:

If you have a fishery sector where most of the actors are illiterate, that is an obstacle. Not to mention poverty and marginalization that characterize this group. This situation doesn’t allow them to take charge and use these opportunities [access to government subsidies and programs]. (G27)

This void is mostly filled by NGOs, which serve as a mediator between government and the fishers:
Some people like us [members of a particular fisheries cooperative – name omitted] were beneficiaries of the federal government programs with the help of a local NGO [name omitted]. They wrote the application for us and helped us get the funding we asked for... [Their assistance was instrumental] because we simply don't know how to request those subsidies. (F08)

On the other hand, receiving a subsidy does not guarantee that the proposed business model will be viable given that building a well functioning enterprise appears to be a costly endeavor. Our informants indicated that this requires great effort, time, and dedication from all parties involved. One of the former government officials pointed out:

A local NGO [name omitted] was involved with a local fishing cooperative in a tourism project. [At the end it was] probably the most expensive tourism project of all times. (G26)

Secondly, lack of motivation, which seemed to be shaped at least in part by a strong sense of identity, was identified as another barrier to success:

There are many fishers that cannot be changed; you can't take away that lifestyle from them... They are fishers and you can't convert them into anything else. They will die as fishers. Even if they want to change it is still hard... We had a desire at first [to develop alternative incomes such as tourism] but [some of us] quickly became discouraged because we did not find it interesting. (F08)

Thirdly, strong emphasis on only one model of alternative income strategy (i.e. ecotourism), at least within the protected areas, has been of limited success. As one of the former government employees indicated, focusing mostly on a single model is of
limited benefits to fishers who seek to diversify or have more secure income-generating activities:

The country is full of cottages financed by PROCODES [a particular subsidy program]. [Every time we decide] to diversify economic activities in the Upper Gulf we say: Oh, let’s build cottages! As if building a cottage will attract tourists… The [number of cottages] does not influence the influx of tourists; like in the US movies – build a stadium and people will come. (G26)

This situation, according to some of the informants, is due to a lack of strategic vision and a lack of indicators that measure effectiveness of such programs:

It is very complicated to finance income-generating activities and to follow up with them properly… I have seen some projects in the protected areas, not in the Espiritu Santo per se, but in general where you give money, money, and money for projects that never really get sustainable over time, neither economically nor environmentally, and I think that needs a review. (G26)

Furthermore:

When I arrived to the area I realized that there were many users who had been receiving PROCODES [a particular subsidy program] for five years and hadn’t had any results… And those same ones still get the money. (N03)

Lastly, subsidies can be a target of elite capture. One of the government employees stated:

You have to be very careful so that they [subsidies] get used in the spirit they were created in. Otherwise, you start having clientelism. There are people who know the way around and [how to get the subsidies]. (G13)

Another former government employee noted:
In reality, representatives of the fisheries sector are not its true representatives. Those are individuals who got organized to obtain government support and subsidies [for themselves]. There is no true representation [of the fisheries sector]. (G27)

5.4 Discussion

Our findings suggest that fisher’s participation in processes related to governance and management of marine resources has a limited effect on building their adaptive capacity to external drivers of change. On the one hand, participation in consultative and/or decision-making bodies is positively related to the receiving government subsidies but it does not play a role in increasing fisher’s adaptive capacity. On the other hand, while fishers’ participation in monitoring activities is unrelated to the receiving government subsidies, it is positively associated with income diversification. Government subsidies, overall, were not related to fisher’s adaptive capacity, measured as employment diversification and as increase in income.

5.4.1 Civic participation as a driver for obtaining government subsidies

Fishers’ participation in processes related to governance and management of marine resources is positively related to their reception of government subsidies (Table 3). While this at face value is an encouraging news, given that subsidies are seen by the government as one approach to inporve civic participation in administrative matters, it
obscures some of the potential problems in relation to distribution of subsidies and their impact on the local communities.

One challenge is what one of our informants labeled as lack of true representation among the fisheries sector. There is some indication that fishers organize fishing cooperatives exclusively to access government programs and subsidies (Sievanen 2014, Nenadovic pers. observation). This can lead to a sector that lack cohesion and is preoccupied with personal gains instead of collective benefit, which has been reported to be the case in some other areas of Baja California Sur (Robles-Zavala 2014). Second challenge that this situation may create is the rise of corruption and clientelism, which are widespread within the Mexican society (Morris and Klesner 2010). For those that learned how to participate and have found their way through the bureaucratic process, the benefits obtained through government programs and subsidies may be substantial. Robles-Zavala (2014) observed in his study of SSF in Magdalena Bay, BCS, the prevalence of corruption in the allocation of fishing permits and subsidies to those that have strong ties to the authorities and are already economically wealthy.

In general, fishers that belong to cooperatives are much more likely to receive subsidies than those that are not. Given the absence of individual permit owners in our sample, this finding is not surprising since only those that have a valid fishing permit can access government subsidies (there are some exceptions for conservation subsidies). The surprising part is that a number of the independent fishers in our sample reported
receiving fisheries subsidies (i.e. outboard motors, fishing gear) over the period of 6 years despite existence of a regulatory pathway to do so. One plausible explanation could be that those fishers accessed such subsidies by working for permit holder or cooperative members who received them in the first place. In that way, independent fishers were indirect recipients of government subsidies.

Overall, while there is a positive relationship between participation and government subsidies in our study, levels of fishers’ participation are relatively low despite government efforts to bolster civic participation in administrative matters as one of the main strategic goals. However, low participation within the small-scale fisheries sector is not exclusive to Mexico, as it has been reported elsewhere (Satia et al. 2004). Given this general tendency there is a question whether or not civic participation, as one of the primary tenants of democratic societies, can affect adaptive capacity of their beneficiaries by improving their lives across various domains, such as income, health, education, and more.

5.4.2 Civic participation as a precursor for building adaptive capacity

Civic participation in public administration is generally low in Mexico even though government has developed many fora for such initiatives over the last 20 years. As some of our informants pointed out such fora are generally underutilized due to a number of social (e.g. lack of education) and institutional (government not promoting
participation) factors. This is in line with an observation by Eakin et al. (2011) who point out that despite institutional reforms focused on improving participation and transparency, government administrative operations had not changed in practice. More problematic for the ongoing maturation of civic participation processes in public administration could be both historical and present distrust in authorities (Morris and Klesner 2010, Eakin et al. 2011). For instance, Morris and Klesner (2010) found that distrust in political institutions impedes civic engagement and promotes corruption.

Lack of fishers’ engagement in monitoring activities and in reporting a complaint were generally low which is consistent with current trends in Mexico. The National Institute of Statistics and Geography recently reported that at the national level more than 92% of offenses go unreported (INEGI 2013). Even though low, our findings suggest that this type of participation is related to higher income diversification of its participants. The fact that full-time fishers are less likely to participate in monitoring activities or report illicit activities is corroborated by one of our informants who indicated that full-time fishers were less likely to betray their colleagues due to the social pressure. On the other hand, those that fish part-time are less likely to be members of the group and thus not required to share those same norms. While we could not establish causality, the relationship between participation in monitoring activities and income diversification suggests potentially interested dynamics that should be further explored. One reason for having part-time fishers more engaged in monitoring would be because
it was a paid activity. In our sample we had one fisher who reported monitoring as one of the income generating activities. Second reason could be that monitoring is a consequence of diversified income portfolio: part-time fishers are not considered being members of the same group as full-time fishers and therefore more likely to engage in monitoring activities (less incentive to invest in fishery). Given that successful resource monitoring by users is a second-order collective action dilemma, the current situation of La Paz small-scale fisheries suggests that this sector lacks potential necessary to overcome such challenges.

Overall, it is difficult to conclude that civic participation can be a viable driver for building adaptive capacity within the existing social and political environment of our study area. Eeakin et al. (2011) point out that government reforms in Mexico did not improve adaptive capacity related to water and flood risk management in at least one of its states. In terms of small-sale fisheries sector, its ability to meaningfully engage in activities to develop and request government funds is further decreased by its high level of marginalization, impoverishment, and lack of education.

5.4.3 Subsidies as a vehicle for building adaptive capacity

Government subsidies aimed at the small-scale fisheries were designed to improve fisher’s livelihoods in an environment where fisheries yields have been stagnant due to a number of drivers of change and are unlikely to change in the future.
(Diario Oficial 2008a, 2012a). In the case of the small-scale fishers in La Paz subsidies do not seem to be functioning as intended since they neither lead to income diversification nor to the development of value-added services (Tables 28 and 29). This does not seem to be an isolated case since research from other primary activities in Mexico indicates that government programs aimed at increasing adaptive capacity of farmers to natural disasters were difficult to access (Saldaña-Zorrilla 2008). However, not all of the subsidies are created equal.

Majority of the subsidies received by the small-scale fisheries sector in La Paz did not necessarily lead to increased adaptive capacity, even though they were deemed beneficial. Investment in new engines, boasts and fishing gear could lead to higher income, by improving fishers’ efficiency, but do little to strengthen this sector’s role and capacity in the face of present and future drivers of change, such as resource overexploitation, climate change, and market globalization. In addition, the increase of fleet capacity through its modernization might have negative impacts on both the ecosystem and on socio-economic fabric of small-scale fishery communities (Pauly et al. 2002, Pauly 2006). Similarly, financial support during the times of need does not allow fishers to diversify their income in a longer term.

Income diversification, even though not enhanced by the subsidies based on our quantitative analysis (Table 28), seems to be partially facilitated by them (Table 31). Half of the fishers who had additional income to fishing in 2012 gained it through the
assistance of government conservation programs. One of the challenges in taking advantage of such programs seems to be fishers’ lack of education. This prevents them from accessing the subsidies and from building and running a viable enterprise, such as a tourism business. Based on our 2012 dataset, the average education of a fisher from La Paz is 5.7 years. A study of small-scale estuarine fishery in Benin found that low levels of education contribute to low levels of income diversification (Stoop et al. 2013). Based on our interviews, non-governmental organizations seem to be an important actor by providing expertise and knowledge to fishers in establishing alternative livelihood opportunities. This role of NGOs in providing capacity building and supportive services to local communities, including poor and marginalized segments of the population, has been reported in various parts of the world, although some of these outcomes have been of limited impact (Bebbington 2005, Biekart 2008). Part of the challenge can be that building a capacity to run a successful commercial enterprise is time and resource consuming. Estimates based on one of such attempts from the region points out that establishing a viable cooperative that specializes in live aquarium fish trade and building the necessary infrastructure to support such operations took one local NGO more than six years and at least USD 200,000 to achieve it (Fernández-Rivera Melo et al. 2013).

While fishers from La Paz do not seem to have diversified incomes, they do seem to diversify portfolio of resources they depend on. Not only are those individuals that
catch greater number of species more likely to be full-time fishers (Table 28), they are also more likely to have higher income (Table 29). This result suggests that being a generalist, instead of specializing in a particular resource, is a better strategy within the given context. Coulthard (2008) explains that overspecialization in a prawn fishery in India reduces fishers’ adaptive capacity to environmental changes. Similarly in the terrestrial environments, Saldaña-Zorrilla (2008) asserts that crop diversification is one of the mechanisms that some of the farmers from Chiapas, Mexico employ to shield themselves from the negative impacts of natural disasters. Current regulatory framework of Mexican fisheries fosters such diversification strategy given that most abundant fishing permit in the state, for bony fish, encompasses 271 species distributed across 61 families (Diario Oficial 2012a). Therefore, it seems that being a generalist pays better under such conditions - having less diversified income portfolio fosters opportunism (in fishing).

Building of value-added services as a strategy for adaptive capacity did not occur within the study’s timeframe in La Paz, unlike in other regions in the state. For example, small-scale fisheries in the northwestern side of the state (generally known as the Pacifico Norte region) that mostly target high-end products such as abalone and lobsters, received considerable government support over the years (CONAPESCA 2015). Some of the cooperatives from this region joined forces and are harvesting, processing and marketing their products, and are referred to as a prime example of sustainable co-
managed fisheries (Cunningham 2013, FEDECOOP 2015). Unequal distribution of subsidies within a particular region has been observed in other Latin American countries (Mondaca-Schachermayer et al. 2011). Furthermore, the same study reports that government subsidies targeting Chilean small-scale fisheries did not affect fishers’ income over a 12-year period (Mondaca-Schachermayer et al. 2011). Even though findings from our study support this conclusion, they also point out that there were significantly more fishers with an income higher than the average in 2012 than in 2006. This pattern might be driven by relative increases in prices of harvested species, increase in the abundance of harvested species, or by some form of a systemic error present in our 2012 sample. Even though some of our results were based on partial official datasets, they suggest a limited effect of subsidies and participation on building small-scale fishers’ adaptive capacity to external drivers of change.
6. Conclusion

6.1 Review of research questions

The role of multi-level governance arrangements has been recognized as an important component of effective natural resource management through which information, knowledge, and data can be exchanged, debated, and shared across diverse users and entities. In this study I argued that participatory processes, which form the basis of successful collective action outcomes, depend on the amount of social capital among actors within a specific governance system. Multi-level governance is operationalized by using a microinstitutional analysis that links decision-making arenas across three distinct levels: operational, collective-choice, and constitutional. Multi-level governance, participation, and social capital were constrained in this study within the common-pool resource context related to the small-scale fisheries sector from the Gulf of California region in Mexico. The relationships among these different concepts formed a basis for the research questions that guided this study (see figure 1 for a schematic representation):

6. What is the role of two different conceptualizations of social capital (A and B) in fisheries multi-level governance?

7. What is the link between the two conceptualizations of social capital (A and B) and individual outcomes particular to small-scale fisheries?
8. Does fishers’ participation in processes related to governance and management of marine resources relates to the generation of specific outcomes necessary for achieving sustainable livelihoods?

6.2 Review of findings

Overall, my results suggest that both social capital models reveal multidimensional nature of social capital where none of its individual types form a consistent and statistically significant relationship with the six outcomes that I measured. However, these types are related in different ways to fishers engagement in participatory processes across the three levels of governance. Low levels of fishers’ engagement in participatory processes across different governance levels were evident in this study. Qualitative analysis revealed that participatory processes related to fisheries conservation and management although existent, are not fully potentialized and are stymied by a historical context and a lack of general participatory culture.

Specifically, in chapter 3, I addressed the first question with a combined structural-cultural approach that incorporated various aspects of group membership with relations of trust, rules, and norms. I found that none of the individual types of social capital form a consistent and statistically significant relationship with three participatory engagement processes across the three levels. Structural bonding and bridging components are positively related to participation in operational and collective-
choice level arenas, while cognitive linking is associated with participation in constitutional level arena. In chapter 4, I addressed the same question by applying a structural approach focused on resources embedded within each fisher’s network using a position generator methodology. My results indicated that social capital is a multidimensional concept, where each dimension consists of resources that are similar to each other in their nature and function. Dimensions that emerged from the data analysis were: leadership skills, entrepreneurial skills, and personal support social capitals. These dimensions may interact in a complementary or in an antagonistic fashion depending on a specific outcome. For example, the interaction between leadership skills and personal support social capitals decreased, while between leadership skills and entrepreneurial skills social capitals increased the likelihood of individual fisher’s participation in the constitutional arena. In terms of multi-level governance arrangements, I found that leadership skills social capital was closely related to participatory engagements of fishers across the three levels.

I also addressed question two using these two approaches to measuring social capital separately. The outcomes that I looked at focus on fishers’ characteristics of being a successful fisher and entrepreneur, either as an individual or as a member of a fishing cooperative. In the Mexican context, these included greater earnings, greater access to government subsidies, and ownership of a fishing permit.
Using a combined structural-cultural approach (chapter 3) I found that reception of subsidies, increase in earnings, and owning a fishing permit were exclusively associated with structural bonding, bridging, and institutional components of social capital. In chapter 4, I found that the structural approach to measuring social capital revealed that those fishers that have high levels of entrepreneurial skills social capital were more likely to attain specific goals.

Lastly, I addressed question three in chapter 5. My results suggested that fishers' participation in collective-choice and constitutional level arenas is positively related to the reception of government subsidies, while their participation in operational level arenas is positively associated with income diversification.

In this study I tested a novel theoretical model (Figure 1) within a specific social-ecological context in a response to a major policy issue. The results of my research have both theoretical and practical relevance that are described in the following two sections.

6.3 Theoretical relevance

This study further contributed to CPR literature in two major ways. First, by expanding our understanding of the role of different conceptualizations of social capital in multi-level fisheries governance arrangements; and second by applying and operationalizing the three distinct governance levels within the SSF context.
Firstly, the theoretical distinction between structural and combined structural-cultural conceptualizations of social capital across various foci, as described in chapter 1 (table 2), provides a strong basis for assessing and comparing their respective relationships with multi-level governance arrangements. Given that structural social capital focuses on an individual, it evaluates individual’s access to particular resources through his/her network. Unequal access to the resources and thus the varying level of social capital among the individuals suggest the presence of structural holes within a group. On the other hand, a combined structural-cultural social capital focuses on a collective. In this case, network closure (i.e. lack of structural holes) indicates high level of social capital within the group. Burt (2001) points out that while the mechanisms of the two approaches are different, both indicate the relevance of social capital as a general performance indicator. At the individual level, the structural holes argument emphasizes the opportunities individuals gain through brokerage across the holes. At the collective level, the closure argument underlines benefits the group obtains through lower transaction costs and increased trust. While this debate is vivacious within the social networks literature, it is seldom considered within the CPR scholarly work.

My research contributes to this debate by extending it to the realm of CPR literature suggesting that both conceptualizations of social capital have something to offer. Fishers’ participation across different governance levels is related to the characteristics of both individual and a collective. The structural approach demonstrates
that fishers’ participation in various governance arenas is associated with having access to people who are influential. The combined structural-cultural approach indicates that participatory activities are related to the presence of trust and civic engagements among the community members. What is uniform across the two conceptualizations of social capital is its multidimensional manifestation in relation to resource governance, which is consistent with findings from some of the previous studies (Ohno et al. 2010). From this perspective, social capital is a force that operates at both the individual and the collective levels.

Secondly, the differentiation of the three governance levels within the CPR literature, although under-utilized by commons scholars (Clement and Amezaga 2013), has high practical relevance and should be further explored. Ostrom and colleagues (Kiser and Ostrom 2000, Ostrom 2005) propose that the three governance levels are nested within each other based on the level of rulemaking authority vested within a particular entity. Entity with such powers can have formal (such as a council or a legislative body) or informal (such as a group of fishers working within a particular area) structure, depending on the underlying or contextual conditions (Ostrom et al. 1994, Poteete et al. 2010). The exact organization of these governance levels may take diverse arrangements. As Cash et al. (2006) point out multi-level governance can be analyzed and studied from a variety of vantage points. For example, multi-level feature can be assessed across spatial (patch, landscape, region), temporal (daily, seasonal,
annual), jurisdictional (local, provincial, national), institutional (operational, collective-choice, constitutional), or knowledge (contextual, universal) scales (Cash et al. 2006). Clement and Amezaga (2013), for example, provide an example of how institutional scale can be linked to jurisdictional one, by assigning a particular governance level to a decision-making administrative body at the village, provincial or the national level. While this approach streamlines the analysis it disguises some of the complexities associated with the nature of the rule-making process within each of the administrative levels.

As the Mexican fisheries case shows, fisheries decisions can be made by the fisheries entities or by conservation entities at the national, regional or even local level. Given that such diverse entities have different rule-making authorities, the multi-level nature of governance arrangements is present at every jurisdictional level. In this study I show that the three governance levels as defined by Kiser and Ostrom (2000) can be assessed solely on the nature of the rulemaking process, thus permitting researcher to account for a diverse array of institutional arrangements regardless of the jurisdictional boundaries.

6.4 Practical relevance

Since failure of marine natural resource and conservation management strategies has been a common occurrence throughout the world (e.g. Mora et al. 2009, Hargreaves-
Allen et al. 2011), there is a need to better integrate scientific theories with policy practice. For example, the major obstacles to effective governance of marine resources include ambiguous goals and objectives, inadequate monitoring and enforcement, and a lack of community involvement (Mora et al. 2003, Beddington et al. 2007, Byers and Noonburg 2007, Ban et al. 2011). I argued that establishing effective linkages across multi-level governance regimes that will allow for the exchange of information and knowledge is necessary for overcoming these obstacles. In this inquiry both strong institutions and social capital are necessary ingredients since they operate jointly to produce effective participatory processes.

Developing and creating effective participatory fora across multiple governance levels is a complex undertaking that depends on a number of contextual factors as well as on the structure of the governance regime in place. Relationships among the government officials and resource users, connections among community members, officials’ experience with participatory processes, and community’s capacity to take active role in such processes are some of the factors that showed to be impacting participation in this study. As Menzel et al. (2013) suggest improving the quality of participation instead of degree of participation is more important for obtaining positive planning outcomes. Lack of effective fishers’ involvement in governance processes within the Gulf of California region has been suggested to result in an organized system.
of rule breaking in an effort to deal with the newly implemented regulatory conditions (Vásquez León 1994, Young 2001).

In regards to social capital, my findings indicate that it is related to participation at both the individual and the collective level, although slightly different depending on the exact nature of the participatory process. The multidimensional nature of social capital suggests policymakers should be cautious when measuring and identifying social capital in relation to expected outcomes, since a failure to adequately assess it might lead to implementing unrealistic policy objectives (Ohno et al. 2010). This is especially salient due to the “routinization” of social capital in the policy sphere through the push by national and international donor organizations and foundations (Woolcock 2010). In the Mexican small-scale fishery context, given that fishers’ participation in governance related processes is relatively sparse, the bigger practical issue remains of how to foster necessary ingredients that might lead to greater social capital formation within this sector. While social capital can be built, this process requires time, knowledge of local conditions, and support from external institutions and agencies (Uphoff and Wijayaratna 2000), which in many policy settings constitute as limiting factors. These challenges, although substantial, should provide even greater impetus for collaborative work across diverse agencies and institutions in partnership with local communities to finding appropriate solutions to environmental problems within natural resource governance.
Appendix A: Study information handouts distributed at study sites

Investigando cambios en las pesquerías ribereñas en el Golfo de California, México

Leila Sievanen y Mateo Nenadovic, de las universidades de Brown y Duke en los Estados Unidos, están realizando un estudio para entender los posibles cambios en las pesquerías ribereñas del Golfo de California y cómo las diferentes personas relacionadas con la pesca explican dichos cambios.

Los pescadores tienen amplio conocimiento sobre estos temas y queremos aprender de su conocimiento. Su participación es importante para el éxito de este estudio. El cuestionario dura aproximadamente una hora. La información proporcionada es confidencial y utilizada con fines académicos y de investigación científica. Su participación es voluntaria. Puede terminar su participación en cualquier momento, o omitir preguntas que no quiera responder. Si usted tiene preguntas sobre este estudio o tiene alguna duda sobre el cuestionario puede contactarnos en cualquier momento.

¡Muchas gracias!

Preguntas principales del nuestro estudio:

- ¿Cómo han cambiado las pesquerías en el Golfo de California?
- ¿Cómo responden los pescadores y otros participantes a estos cambios?
- ¿Cómo explican los pescadores y otros participantes estos cambios?
- ¿Cuáles son impactos sociales de las áreas marinas protegidas?
- ¿Qué perciben los pescadores sobre el funcionamiento de estas áreas?


Duke University  Brown
# Appendix B: List of formal interviews

<table>
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<tr>
<th>#</th>
<th>Code</th>
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<th>Group</th>
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<td>Cabo Pulmo</td>
<td>Fisher</td>
<td>Commercial</td>
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<tr>
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¹ Not transcribed and coded. Interview was of general character not pertinent to a specific site.
Appendix C: Interview instrument

Thank you for your willingness to participate in this study. In this discussion, I would like to learn about the use of marine resources in the local area, the rules that govern use of marine resource, how decisions are made about these marine resources, and how these rules are enforced\(^{38}\).

Section 1. Background

1. Can you please tell me about the history of [name of MPA] and your involvement with it? How did you first get involved? What was management of marine resources like in [name of MPA] when you first got involved and how changed over time? Why has it changed?

Section 2. Congruence of rules with local conditions

I would like to know more about the rules governing use of marine resources in [name of MPA], particularly how the [name of MPA] is “zoned.”

(For the purposes of this study, a management “zone” is a specific place or geographic area with a specific set of rules. This may include both formal and informal zones, whose boundaries are written or unwritten. Examples of zones include: legally-designated no-fishing areas, village marine tenure areas, tourism zones, etc.)

2. What types of formal and informal management zones exist within the [name of MPA]?

3. Are the boundaries of these management zones related to ecological differences from place to place within [name of MPA]?

4. Are the boundaries of these management zones related to social differences from place to place within [name of MPA]?

I would now like to ask you about the rules governing use of important species and habitats in the [name of MPA]. I am interested in formal and informal rules that both restrict use and those which provide permission for use.

\(^{38}\) The interview was semi-structured where I asked questions depending on the conversation flow.
5. In particular, are there special rules governing the behavior of specific user groups inside the [name of MPA]? For example, are there rules that apply to these groups and nobody else? Probe for hookah divers, handliners, longliners, trappers, netters.

6. Do the rules use of governing marine resources in [name of MPA] change based on changes in ecological conditions in and around [name of MPA] over time?

7. Do the rules governing marine resources use in [name of MPA] change based on changes in social conditions in and around [name of MPA] over time?

Section 3. Boundaries

8. How are the rules and boundaries of [name of MPA] made clear to individuals who use marine resources within [name of MPA]?

_________________________________________________________________________________________________

_________________________________________________________________________________________________

Section 4. Resource use rights

9. To what extent do the rules governing [name of MPA] differ in practice from the way that they are written on paper?

_________________________________________________________________________________________________

_________________________________________________________________________________________________

10. Are there any unwritten or informal rules that govern the use of marine resources in [name of MPA]?

_________________________________________________________________________________________________

_________________________________________________________________________________________________

Section 5. Decision-making arrangements

11. Who actively participated in or is actively participating in making the rules governing [name of MPA]?

_________________________________________________________________________________________________

_________________________________________________________________________________________________
Section 6. Rights to self-organize

12. To what extent does the national government oppose or support the rights of users to develop their own rules governing resources within [name of MPA]? 

Section 7. Monitoring and Enforcement

13. How are the rules governing [name of MPA] monitored and enforced? Who is responsible for that?

_________________________________________________________________________________________________

14. What incentives are provided to encourage compliance with the rules governing marine resource use?

Section 8. Conflict Resolution

15. How are conflicts about marine resources in [name of MPA] resolved among users, and between users and government officials?

_________________________________________________________________________________________________

Section 9. Impacts

Lastly, I would like to ask you about the ecological and social impacts of management in [name of MPA].

16. What have been the ecological impacts of management in [name of MPA]?

_________________________________________________________________________________________________

17. What have been the social impacts of management in [name of MPA]?

_________________________________________________________________________________________________

18. Who makes the greatest contributions to or sacrifices for the [name of MPA]?
Which groups of users and communities?

_________________________________________________________________________________________________
19. Who benefits most from the [name of MPA]? Which groups of users and communities?
________________________________________________________
________________________________________________________

That is very interesting. That is all the questions that I have. Thank you very much for your time. Before I go:

20. Is there anything else I should know about [name of MPA]?
________________________________________________________
________________________________________________________

21. Is there anyone else I should talk with about [name of MPA]?
________________________________________________________
________________________________________________________

22. Are there any documents or sources of information that I should read about [name of MPA]?
________________________________________________________
________________________________________________________

Thank you again for your time. I greatly appreciate the opportunity to learn from you.
Appendix D: Survey instrument

Date: ______________________________

Location: ___________________________

Start Time: __________________________

End Time: ____________________________

Section 1: Demographic Information

We would like to start this interview by asking you some of the basic demographic questions such as your age, birthplace, and education level.

1.1. How old are you?
   ____________________________ (Years)

1.2. Where were you born?
   ____________________________________________

1.3. How many years have you lived in {LOCALITY NAME}?
   ____________________________ (Years)

1.4. Why did you choose to move to {LOCALITY NAME}?
   [1]...Family reasons
   [2]...Friends
   [3]...Access to fishing
   [4]...Health reasons
   [995]...Other, Specify: ____________________________

1.5. What is your level of education?
   [1]...Primary incomplete
   [2]...Primary complete
   [3]...Secondary incomplete
   [4]...Secondary complete
   [5]...High school incomplete
   [6]...High school complete
   [7]...University incomplete
   [8]...University complete
1.6. What is your marital status?
   [1]...Married
   [2]...Single
   [3]...Free Union
   [4]...Divorced
   [5]...Widowed

Section 2: General Information about Fishing Activity

Thank you. Now I would like to ask you about your fishing experience and fishing practices.

2.1. Are you currently engaged in fishing?
   [1]...Yes
   [2]...No → go to 2.5

2.1.1. How often do you fish?
   [1]...Every week
   [2]...A few times a month
   [3]...A few times a year
   [4]...Only once a year
   [995]...Other, Specify: ________________________________

2.2. How old were you when you first started fishing?
   ____________ (Years)

2.2.1. Why did you decide to start fishing?
   __________________________________________________________

2.3. Are you currently working with a fishing permit?
   [1]...Yes
   [2]...No

2.3.1. Who owns the fishing permit?
   [1]...Myself
   [2]...Fishing cooperative
   [3]...Permit holder
   [995]...Other, Specify: ____________________________________
2.3.2. For what species is the permit?

[1]...Fish
[2]...Shark
[3]...Clams
[4]...Squid
[5]...Cucumber
[995]...Other, Specify: __________________________________________

2.4. With the respect to the fishing equipment that you are using, who owns the:

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<td>[4]...Cooperative</td>
<td>[4]...Cooperative</td>
<td>[4]...Cooperative</td>
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2.5. When was the last time you fished commercially?

_______________ (Year)

2.6. What was the reason you decided to stop fishing?

[1]...Competition with other fishermen
[2]...Revenues leaving fisheries are low
[3]...No continuity of work
[4]...I found a better opportunity
[995]...Other, Specify: __________________________________________

2.7. What is your current occupation?

________________________________________________________________

**After this question, go to Section 7: Perception and use of MPA**
Section 3: Information about Fishing Practices and Resource Use

Thank you for all this detailed information. Now I would like to ask you some information about the resource use.

3.1. First, could you tell me:
- Which marine resources have you fished during the last year? Write down all the resources that he/she mentions.
- Could you tell me during which months are you caching {NAME OF RESOURCE}?
- What type of gear are you using to catch {NAME OF RESOURCE}?
- Lastly, when you fish for {NAME OF RESOURCE}, is it {READ OPTIONS in the {MPA NAME}?
Section 4: Threats to Fisheries

Thank you. Now, I would like to ask you a few questions about your opinion of threats to fisheries.

4.1. In your opinion, what are the two biggest threats to fisheries in the area?

1. ______________________________________________________________
2. ______________________________________________________________

4.2. I will read you a list of issues that may or may not affect fisheries in the area. For each, could you tell me if it is a problem, and if it is, how important is it?

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<tr>
<td>Little solidarity among fishermen to define and respect rules</td>
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<tr>
<td>Bad prices of fish</td>
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<td>Lack of economic alternatives</td>
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<tr>
<td>Lack of technical support</td>
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<tr>
<td>Climate change</td>
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</tbody>
</table>
Section 5: Fisheries Governance Issues

Thank you. In this section I will ask you about some of the rules/regulations that pertain to local fisheries.

5.1. I will read you a list of topics about the rules/regulations that exist in the area. Can you tell me if you have heard about any of these, what they are about, and how you learned about them?

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</thead>
<tbody>
<tr>
<td>Areas where fishing is prohibited</td>
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<td></td>
<td></td>
<td>[1]…Radio</td>
</tr>
<tr>
<td>Prohibited fishing gear</td>
<td></td>
<td></td>
<td></td>
<td>[2]…Television</td>
</tr>
<tr>
<td>Trawlers limitations</td>
<td></td>
<td></td>
<td></td>
<td>[3]…Newspaper</td>
</tr>
<tr>
<td>Areas where you can use only a particular type of fishing gear</td>
<td></td>
<td></td>
<td></td>
<td>[4]…Cooperative</td>
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<td></td>
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<td></td>
<td></td>
<td>[5]…Co-workers</td>
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<td></td>
<td>[6]…Government</td>
</tr>
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<td></td>
<td>[7]…NGOs</td>
</tr>
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<td></td>
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<td>[995]…Other</td>
</tr>
</tbody>
</table>

5.2. Are no-take zones clearly defined in the {MPA NAME}?
   [1]…Yes, they are
   [2]…More or less
   [3]…No

5.3. If you have any doubts about what you can and cannot do in the {MPA NAME}, whom do you contact?
Section 6: Organization

Thank you for all this detailed information. Now, I would like to ask you some questions about how fishers’ organize themselves in {LOCALITY NAME}.

6.1. To better understand how the fishers are organized:
   - Could you tell me the names of fishing groups that currently exist in {LOCALITY NAME}?
   - Do you have a familial relationship with {GROUP NAME}?
   - Did you work for {GROUP NAME} in the past?
   - Are you currently working for {GROUP NAME}?

<table>
<thead>
<tr>
<th>Name of the group:</th>
<th>Familial relationship</th>
<th>Did you work with them?</th>
<th>Are you currently working with them?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1]...Yes</td>
<td>[1]...Yes</td>
<td>[1]...Yes</td>
<td>[1]...Yes</td>
</tr>
<tr>
<td>[2]...No</td>
<td>[2]...No</td>
<td>[2]...No</td>
<td>[2]...No</td>
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</tbody>
</table>

6.2. Do you feel represented by any of the current representatives of the fishing sector?
   [1]...Yes
   [2]...No → go to 6.4

   6.2.1. Could tell me who this person is?

   6.2.2. Is there somebody that you feel would better represent the fishers?

6.3. Are you a member of a cooperative?
   [1]...Yes
   [2]...No → go to 6.10

   6.3.1. What is the name of your cooperative?
6.3.2. How long have you been a member?
______________ (Years)

6.3.3. Do you hold an administrative position within the cooperative?
[1]...Yes
[2]...No → go to 6.5

6.3.4. Which one?

6.4. How would you describe the functioning of your cooperative?
[1]...Very good
[2]...Good
[3]...Bad
[4]...Very bad
[5]...Neither good nor bad

6.5. What is the main benefit of being a member of a cooperative?
[1]...Access to permits
[2]...Access to subsidies
[3]...Getting best prices for the products
[4]...None
[995]...Other, specify: __________________________

**Only if the answer in 6.3 was [No]**

6.6. Have you ever been a member of a cooperative?
[1]...Yes
[2]...No → go to 7.1

6.6.1. Why did you leave the cooperative?

_______________________________________________________________________________________
Section 7: Perception and Use of {MPA NAME}

Thank you very much for the very helpful information about how fishers organize to work in {LOCALITY NAME}. Now, I would like to ask you some questions about your views of the {MPA NAME} and your involvement in its creation process.

7.1. Which of the following statements would best describe your use of the {MPA NAME}:
   [1]...Always: work there year-round
   [2]...Frequently: {MPA NAME} is my main place to work, although I could be spending 1 or 2 months at other sites
   [3]...Seasonally: I spend part of the year working at {MPA NAME}
   [4]...From time to time: I sometimes work in {MPA NAME}
   [5]...Historically: I used to work in {MPA NAME} in the past but not anymore
   [6]...Never
   [995]...Other, Specify: ____________________________________________________________

7.2. For how many years have you been fishing in the {MPA NAME}?
   _____________________________________ (years)

7.3. Did your fishing practices change since the creation of the {MPA NAME}?
   [1]...My fishing practices did not change
   [2]...My fishing practices changed very little
   [3]...My fishing practices changed moderately
   [4]...My fishing practices changed a lot

   7.3.1. Can you tell me why?
   __________________________________________________________________________
   __________________________________________________________________________

7.4. Which of the following statements describes the best your involvement in the creation process of {MPA NAME}:
   [1]...I was never invited to attend the creation meeting(s)
   [2]...I was in a position to attend the creation meeting(s)
   [3]...I attended at least one creation meeting
   [4]...I contributed my knowledge of and/or views about the {MPA NAME}

7.5. Which of the following statements describes the best the local community involvement in the creation process of {MPA NAME}:
   [1]...Local community members did not contribute to the creation of the {MPA NAME}
   [2]...Local community members attended the creation meetings
[3]...Local community members influenced final decision about the size and location of the [MPA NAME]
[4]...Local community members decided on their own the size and location of the [MPA NAME]

7.6. How much do you agree with the following statements:

<table>
<thead>
<tr>
<th>Situation</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>[MPA NAME] helps increase fish yields</td>
<td></td>
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<tr>
<td>[MPA NAME] protects marine species</td>
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<tr>
<td>[MPA NAME] provides alternative sources of income</td>
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<tr>
<td>Enforcement in the [MPA NAME] works well</td>
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<tr>
<td>No-take zones in the [MPA NAME] should be opened for fishing</td>
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</tbody>
</table>

7.7. Could you tell me which of the following statements describes the best your position at the time that [MPA NAME] was created? You:
[1]...Completely agreed with the creation of the [MPA NAME]
[2]...Agreed with the creation of the [MPA NAME]
[3]...Disagreed with the creation of the [MPA NAME]
[4]...Strongly disagreed with the creation of the [MPA NAME]
[5]...I had a neutral position

7.8. Could you tell me which of the following statements describes the best your position about the [MPA NAME] today? You:
[1]...Completely agree
[2]...Agree
[3]...Disagree
[4]...Completely disagree
[5]...I have a neutral position

7.9. Let us suppose that the [MPA NAME] was never created. What do you think the status of the marine resources would have been in that case when compared to the present situation?
[1]...Much better
[2]...Slightly better
[3]...The same
[4]...Worse
[5]...Much worse
**Section 8: Participation**

Thank you very much for your responses. The next round of questions inquires about your participation in various activities related to fisheries and fishing sector.

8.1. There are several committees and councils that discuss issues and propose recommendations related to fisheries and marine protected areas. Have you ever participated in any of the following ones:

- [1] Municipal Fisheries and Aquaculture Subcommittee
- [2] State Board of Fisheries and Aquaculture
- [4] PETs Social Committee
- [5] PROCODES Committee
- [995] Other

8.2. How many times have you participated in some type of inspection and enforcement activities over the past year in the [MPA NAME]?

- [1] 1 time
- [2] 2-5 times
- [3] 6-10 times
- [5] Never → go to 8.4
- [6] I was never invited to participate → go to 8.4

8.2.1. With whom did you conduct such activities?

- [1] Field ranger / CONANP
- [2] PROFEPA
- [3] CONAPESCA
- [4] Navy
- [5] Citizens watch group
- [6] FONMAR
- [7] Community watch program / CONANP
- [8] Municipality
- [995] Other

specify:

8.3. Have you seen other fishermen participating in inspection and enforcement activities during the last year in the [MPA NAME]?

- [1] All the time
- [2] Often
[3]…Sometimes
[4]…Once or twice
[5]…Never

8.4. Have you ever made a complaint?
[1]…Yes
[2]…No → go to 8.5

8.4.1. What was the reason? How did you make a complaint? What was the result?

<table>
<thead>
<tr>
<th>What was the reason?</th>
<th>How did you make a complaint?</th>
<th>What was the result?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[1]…In writing to CONAPESCA</td>
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<td></td>
<td>[2]…In writing to PROFEPA</td>
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<td></td>
<td>[3]…Verbally to authorities</td>
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<td>[4]…Verbally at the fisheries meetings</td>
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<td>[5]…Verbally to fisheries representatives</td>
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<td></td>
<td>[6]…Verbally to the media</td>
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<td></td>
<td>[995]…Other</td>
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</tbody>
</table>

8.5. Have you participated in any courses over the past year?
[1]…Yes
[2]…No

8.6. Have you participated in a research project over the past year?
[1]…Yes
[2]…No

8.7. How much do you agree with the following statements:

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</thead>
<tbody>
<tr>
<td>Most fishers follow the rules of the [MPA NAME]</td>
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<tr>
<td>Most fishers are proud of the [MPA NAME]</td>
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<tr>
<td>Fishers can work together to solve a problem related to fishing</td>
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<tr>
<td>Government is the only entity who can solve a problem related to fishing</td>
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Section 9: Social Capital

Thank you very much for all the information you provided us with in this section. Now, I would like to move to a different subject and ask you about the level of social capital that exists in this community. Social capital includes the amount of trust among the people in your community and in the various government agencies, level of community organization, and the nature of your interaction with different groups of people in your community.

9.1. Generally speaking, could you say that you can trust the government to do what is right for the people?
   [1]...Always
   [2]...Almost always
   [3]...Sometimes
   [4]...Seldom
   [5]...Never

9.2. Generally speaking, could you say that fishermen in your community trust one another in matters of lending and borrowing?
   [1]...Always
   [2]...Almost always
   [3]...Sometimes
   [4]...Seldom
   [5]...Never

9.3. In the recent years, has the level of trust between fishers in your community improved, worsened, or stayed the same?
   [1]...Improved
   [2]...Worsened
   [3]...Stayed the same

9.4. Compared with other fishing communities, how much do people in this community trust each other in matters of lending and borrowing?
   [1]...More trust than in other fishing communities
   [2]...Same as in other fishing communities
   [3]...Less trust than in other fishing communities

9.5. There are many different organizations involved in fisheries and fisheries management, ranging from the federal government to your neighboring cooperatives and NGOs. In general, when thinking about each organization below, would you say you completely trust them, completely distrust them, or are you somewhere in between?
### Organization:

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<tbody>
<tr>
<td>CONAPESCA / SAGARAPA</td>
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<tr>
<td>SEPESCA</td>
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<tr>
<td>CRIP</td>
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<td>CONANP</td>
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<tr>
<td>PROFEPA</td>
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<tr>
<td>FONMAR</td>
<td></td>
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<tr>
<td>Mayor’s Office</td>
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<td>Harbor Master’s Office</td>
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<td>NGOs</td>
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<td>Universities</td>
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<td>Tourism agencies</td>
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<td>Banks</td>
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<td>Fishing cooperatives</td>
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<td>Cooperative federations</td>
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<td>Independent fishers</td>
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<td>Fish buyers</td>
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<tr>
<td>Restaurants</td>
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<tr>
<td>Local fish markets</td>
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<tr>
<td>Supermarkets</td>
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</tbody>
</table>

9.6. For each of the following statements, please indicate if you know such a person and how well you know him/her (including yourself).

<table>
<thead>
<tr>
<th>Do you know anyone who:</th>
<th>Yes</th>
<th>No</th>
<th>Acquaintance</th>
<th>Friend</th>
<th>Family member</th>
<th>Yourself</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has contacts with media</td>
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<tr>
<td>Is politically active</td>
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<tr>
<td>Knows a lot about government regulations</td>
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<tr>
<td>Knows a lot about financial matters</td>
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<tr>
<td>Owns a car</td>
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<tr>
<td>Can speak and write a foreign language</td>
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<tr>
<td>Can work with a personal computer</td>
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<tr>
<td>Can give advice about work-related problems</td>
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<tr>
<td>Can give advice about conflicts with family member</td>
<td></td>
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</tr>
<tr>
<td>Knows how to obtain government subsidies</td>
<td></td>
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<tr>
<td>Can repair a car/boat</td>
<td></td>
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<tr>
<td>Has graduated from college</td>
<td></td>
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<tr>
<td>Earns more than $10,000 monthly</td>
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</tbody>
</table>
9.7. If there was a water supply problem in your community, how likely is that people will cooperate to try to solve this problem?

[1]...Very likely
[2]...Likely
[3]...Unlikely
[4]...Very unlikely

9.8. In the past year, how often have people in your community gotten together to jointly petition government officials for something benefiting the community?

[1]...Many times
[2]...A few times
[3]...Once
[4]...Never → go to 9.10

9.8.1. Were some of these petitions successful?

[1]...All were successful
[2]...Some were and some were not
[3]...None were successful

9.9. In the past year, have you worked with others in your community to do something for the benefit of the community?

[1]...Many times
[2]...A few times
[3]...Once
[4]...Never

9.10. Could you tell me if you voted in the last election?

[1]...Yes
[2]...No

9.11. When you need money, whom do you ask for a loan?

[1]...Family member
[2]...Cooperative
[3]...Co-worker
[4]...Fish buyer
[5]...Friend
[6]...Loan shark
[7]...Boss
[995]...Other, Specify: _________________________________
9.12. Are you a member of any group that is not related to fisheries? This group may have a formal or informal organizational structure.

[1]...Yes
[2]...No → go to 9.8

9.12.1. In that case, can you tell me:

<table>
<thead>
<tr>
<th>What is the name of the group?</th>
<th>Do you hold a position within the group?</th>
<th>Have you received any payments from that group in the last year?</th>
<th>Have you participated in any of the group’s meetings in the last year?</th>
<th>Approximately, how many days per year do you spend on activities associated with the group?</th>
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Section 10: Economic Aspects

In this penultimate section, I would like to ask you about certain economic aspects related to fishing and to your household.

10.1. During the last year, how much did you earn on an average good week?

$______________

10.2. During the last year, how much did you earn on an average bad week?

$______________

10.3. What are the three species that give you the highest earnings (in the order of importance)?

1._____________________________________________
2._____________________________________________
3._____________________________________________

10.4. In which way did the {MPA NAME} affect your earnings?

[1]...In a positive way
[2]...In a negative way
[3]...It did not impact my earnings - neutral
[4]...I did not fish in that year
10.5. In the last year, what percentage of your income came from fishing?
   [1]...100%  go to 10.7
   [2]...less than 100%

10.5.1. How much does the fishing contribute to your earnings?
   [1]...More than half
   [2]...Less than half
   [3]...Same as other income

10.5.2. Apart from fishing, what other economic activities are you engaged in?
   How much does each of them contribute to your total income?

<table>
<thead>
<tr>
<th>Economic activity:</th>
<th>% contribution to total income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10.5.3. What is the main reason for having alternative economic activities besides fishing?
   [1]...Access to social security
   [2]...Secure income
   [3]...Higher income
   [995]...Other, Specify: _______________________________________________________

10.6. Would you like to work in something else besides fishing?
   [1]...Yes
   [2]...No → go to 10.8

10.6.1. What other job would you like to do?
   ____________________________________________________________

10.7. How many people live in your household including yourself?
   ______________________ (Number of people)

   **If the number is 1 → go to 11.1**
10.7.1. Who else, besides you, has a job?
For each person that is mentioned ask:
• Where do they work?
• Do they contribute financially to the household?
• How much (in %)?

<table>
<thead>
<tr>
<th>Household member</th>
<th>Employment</th>
<th>Contribute to household?</th>
<th>% of the total household income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>[1]...Yes [2]...No</td>
<td></td>
</tr>
</tbody>
</table>

Section 11: Subsidies

Lastly, I would like to ask you a few questions about subsidies available to the fisheries sector.

11.1. Have you or your cooperative received subsidies from the government in the last 5 years?

[1]...Yes
[2]...No → go to 11.2

11.1.1. In that case, can you tell me:
• What type of subsidies did you receive?
• Who gave you the subsidies?
• How did you learn about the subsidies?

<table>
<thead>
<tr>
<th>Subsidies received</th>
<th>Provider</th>
<th>Source of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1]...Motors</td>
<td>[1]...SEPESCA</td>
<td>[1]...Radio</td>
</tr>
<tr>
<td>[2]...Boats</td>
<td>[2]...CONANP</td>
<td>[2]...Television</td>
</tr>
<tr>
<td>[3]...Gas</td>
<td>[3]...SAGARPA</td>
<td>[3]...Newspaper</td>
</tr>
<tr>
<td>[4]...Money to repair gear</td>
<td>[4]...NGO</td>
<td>[4]...Cooperative</td>
</tr>
<tr>
<td>[5]...Fishing gear</td>
<td>[995]...Other</td>
<td>[5]...Co-workers</td>
</tr>
<tr>
<td>[995]...Other</td>
<td>[995]...Other</td>
<td>[6]...Government</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[7]...NGOs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[995]...Other</td>
</tr>
</tbody>
</table>

242
11.2. In general, what is your opinion about subsidies?

11.3. Talking about different government subsidies:
- Have you heard of:
- Have you requested any of these over the past 5 years? If yes, how many times have you requested [NAME] over the past 5 years?
- Have you received any of these over the past 5 years? If yes, how many times have you received [NAME] over the past 5 years?

<table>
<thead>
<tr>
<th>Subsidies</th>
<th>Requested</th>
<th>Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1]...PROCODES</td>
<td>[1]...PROCODES</td>
<td>[1]...PROCODES</td>
</tr>
<tr>
<td>[2]...PETs</td>
<td>[2]...PETs</td>
<td>[2]...PETs</td>
</tr>
<tr>
<td>[3]...PROVICOM</td>
<td>[3]...PROVICOM</td>
<td>[3]...PROVICOM</td>
</tr>
<tr>
<td>[4]...Haven’t heard</td>
<td>[4]...Haven’t heard</td>
<td>[4]...Haven’t heard</td>
</tr>
<tr>
<td>[995]...Other</td>
<td>[995]...Other</td>
<td>[995]...Other</td>
</tr>
</tbody>
</table>

END: Closing Statement

Thank you very much for your time and for deciding to participate in this survey. If you have any questions please feel free to contact Mateja Nenadovic (give card containing all the contact information)
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256


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Biography

Mateja was born in Beograd, Serbia in 1977, where he lived through some turbulent times until he and his family made it possible for him to leave the country and start college education abroad. In 2000 he got enrolled at the Suffolk University from which he received a B.Sc. in Biology and Marine Sciences in 2005. His undergraduate journey started at Madrid, Spain, and ended in Boston, Massachusetts. Mateja received a dual M.S. degree in Marine Biology and Marine Policy from the University of Maine in 2009. While at the University of Maine, he co-taught summer classes in Marine Biology and Ecology and worked as a Research Associate at the Suffolk’s University Friedman Field Station in Maine. In 2009 Mateja got enrolled at the Marine Science and Conservation program at Duke University. He received research support from the World Wildlife Fund Fuller Fellowship and from the Walton Family Foundation.