

Social Capital in Marine Management Collaborative Networks: Lessons Learned in the Coral Triangle and the Philippines

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**Abstract**

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There has been a recent proliferation of collaborative ecosystem management approaches that create interlinked individuals working together to address socio-ecological problems. In these collaborative networks, through cooperating toward shared goals, participants create and maintain relationships, build trust, and share knowledge – thus generating forms of social capital. Social capital, goodwill fostered among connected individuals, is a crucial component of network success and facilitates collective action and social learning, while also helping members address problems they could not realize on their own. Despite the shift toward larger-scale and more collaborative marine management approaches, thus far there has been limited empirical examination of the importance of social capital in influencing the effectiveness of these efforts. Therefore, in this dissertation I explore the role of social capital and the links between social capital and network effectiveness in three collaborative marine management networks operating at various geographic scales: the Regional Exchange (REX) network of Southeast Asia and Melanesia’s Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security (CTI-CFF)

and the Philippine's Southeast Cebu Coastal Resource Management Council (SCCRMC) and Danajon Double Barrier Reef Management Council (DDBRMC). I explored participant perceptions of their experiences and observed the structure of relationships among network members. I used a mixture of qualitative interviews with participants in each network, social network analysis with members of CTI-CFF and the SCCRMC, and participant observation at network events. I found that in all three networks, new relationships were developed across socio-cultural boundaries among individuals who had not worked together previously, such as individuals in different Coral Triangle countries and from different municipalities active in the SCCRMC and DDBRMC. The networks nurtured the development of local leaders (e.g., national government representatives in the Coral Triangle, Philippine municipal managers), who served as key sources of information and new knowledge and linked network subgroups, thus helping generate social capital. The ability of the networks to achieve their goals, foster social capital, and sustain efforts was strongly influenced by the presence of governance mechanisms to streamline network activities. In the SCCRMC, for instance, strong governance mechanisms provided a platform for coordinating efforts and enabling members to work together efficiently toward goal achievement. Though social capital was created to varying degrees among network members, there was still a need in all three networks for diffusion of the knowledge and social capital gained through the networks to other relevant levels of management, like local communities. The new framework I applied to observe these networks linking key elements of social capital and components of collaborative effectiveness offers a novel analytic approach for examining collaborative network effectiveness and can be applied to other similar networks. My findings offer empirical evidence illustrating how social capital can help networks achieve goals that eventually may result in improved socio-ecological outcomes and are applicable to the

design and implementation of other ecosystem management networks. The CTI-CFF REX network, SCCRMC, and DDBRMC demonstrate some of the tangible benefits of social capital and underscore the value of and need to invest in collaborative ecosystem management networks.

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# 1. Marine resource management networks as environmental institutions fostering social capital

## 1.1 Collaboration and social capital in the Coral Triangle region

The Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security (CTI-CFF) is a regional collaboration among six Southeast Asian and Melanesian countries to better manage the marine resources of the Coral Triangle (CT) region (CTI-CFF, 2009). The CT is one of the most biodiverse marine ecosystems in the world. However, the region exists in a highly degraded state due to a suite of threats, such as overfishing and destructive fishing practices. Given the region's biological interconnectivity and the transboundary and shared nature of its problems (e.g., illegal commercial fishing operations that travel between countries, potential threats to coral reefs and fish stocks from climate change, increasing levels of land-based pollution), the heads of the six CT countries (the CT6) and regional development partners came together in 2007 to design a multilateral approach to address these threats (CTI-CFF, 2009). Though the impetus for CTI-CFF was top-down and from the heads of government and outside partners (Rosen and Olsson, 2012), it represents a geographically "scaled-up" approach to marine management, a common recent trend wherein programs focus on management of entire or larger ecosystems, bridge traditional management boundaries, and offer multi-institutional collaboration opportunities (Adger et al., 2006; Christie et al., 2009; Mills et al., 2010). As a program entailing collaboration across nations and partners that generally did not work together previously, CTI-CFF provides an opportunity for encouraging multi-national cooperation and allowing diverse stakeholders to develop shared ownership of their joint resources and environmental problems (Belaire et al., 2011; Koontz et al., 2004; Schneider et al., 2003).

The CTI-CFF can be thought of as an environmental institution: agreed upon sets of practices that dictate and constrain behaviors (e.g., Keohane et al., 1993; Koremenos et al., 2001; Underdal, 2002). Environmental institutions are components within the larger landscape of environmental governance, which also includes other processes (e.g., negotiation, decision-making) and structures (e.g., laws, regulations) that shape actions (Lebel et al., 2006). Unlike some institutions, CTI-CFF does not employ formal sanctions or penalties for non-compliant members. However, in 2009 participants created a Regional Plan of Action (RPOA) that outlines a set of conservation and management goals for the region and the member countries, such as establishment of a regional system of marine protected areas (MPAs) and implementing regional and local climate change adaptation plans. Additionally, the CT6 each created National Plans of Action (NPOAs) detailing specific actions they will take and programs they will implement to achieve the RPOA's goals. A final step in the formalization of the CTI-CFF was the ratification of a Regional Secretariat in November 2014, which will lead and coordinate the continuation of CTI-CFF activities (CTI-CFF, 2014)

Environmental institutions function as interlinked networks of actors (e.g., member nations, organizations, individuals) collaborating to implement institutions' recommendations (Miles, 2006), and thus can be referred to as "collaborative networks." Collaborative networks allow actors to address problems they could not realize on their own (Bryson et al., 2006; Ostrom, 1990; Thomson and Perry, 2006). By cooperating toward shared goals, participants create and maintain relationships, build trust, and share information – thus creating and sustaining forms of social capital (Feiock, 2008). Social capital – goodwill generated among connected actors – is a resource produced through exchanges occurring among network actors (e.g., Adler and Kwon, 2002; Burt, 1997; Woolcock and Narayan, 2000). In collaborative

networks, social capital can be used facilitate collective action among members and help achieve ecosystem management goals (Coleman, 1988). Since its establishment, the CTI-CFF has coordinated a broad range of regional activities that offer opportunities for interactions and collaboration among participants, thus creating venues for building social capital. For instance, yearly high-level Senior Officials Meetings where government officials from the CT6 agree upon policy actions and recommendations provide opportunities for developing social capital among CT6 decision-makers. Additionally, frequent topical regional exchanges (REXs) have brought together managers and practitioners from across the region, as well as foreign technical experts, to share knowledge on topics such as designing a regional MPA system (White et al., 2014). The meetings have provided potential opportunities for individuals from across the CT6 to maintain relationships, build trust, and share lessons learned, thus creating chances to generate regional social capital.

## **1.2 Marine management programs in the Coral Triangle**

In essence, the CTI-CFF is a large-scale institution that serves as an umbrella over existing marine management institutions at the national and subnational levels. Though the impetus for CTI-CFF was top-down, its programs incorporate a range of innovative marine management approaches and tools, from community-based and co-management approaches to ecosystem-based management to MPA networks. For instance, project sites where communities are working on local climate change adaptation plans incorporate elements of community-based management (CBM), which can engender increased engagement and empowerment of coastal resource users to manage their resources in a sustainable manner and capitalize on local ecological knowledge (e.g., Christie, 2002; Courtney et al., 2002; Pollnac et al., 2001). CBM reflects the theory that community members should be beneficiaries of and active participants in resource management (Pomeroy and Carlos, 1997). Although CTI-CFF project sites emphasize

community involvement, because the impetus for CTI-CFF and activities operating under it was not bottom-up, the project sites are not true CBM efforts. Instead, they more closely resemble co-management arrangements, where local communities and governments share the responsibility for management activities (Berkes, 2009; Christie and White, 2007). For CTI-CFF, nongovernment actors are also crucial players in these efforts and have coordinated many of the community-based activities.

One of the main goals of CTI-CFF is to institute an ecosystem approach to fisheries management (EAFM) throughout the region (Pomeroy et al., 2015). EAFM originates from the United Nations Food and Agricultural Organization (FAO) term “ecosystem approach to fisheries,” a framework that emphasizes planning, developing, and managing fisheries in a manner that adequately addresses societal needs without jeopardizing marine ecosystems (FAO, 2003). EAF and EAFM are types of ecosystem-based management (EBM), a framework that emphasizes the need to manage entire ecosystems through actions such as ecosystem-level planning, cross-jurisdictional management, and co-management (e.g., Aswani et al., 2007; Christie et al., 2007; Lester et al., 2010; Tallis et al., 2010). Other recurring themes in EBM include: the importance of science-based management; a focus on dynamic interactions between ecosystem components (including humans); an attempt to balance societal needs and ecological functions; participatory management processes; and institutional harmonization of management frameworks (e.g., Christie et al., 2007; Hilborn et al., 2005; Mace, 2004; Pikitch et al., 2004).

Reflecting the trend exemplified by EBM to consider large ecosystem areas, in recent years there has been a shift from single MPAs that involve only one community or area to MPA networks. MPA networks endeavor to address the pervasive problem of MPAs that are too small or poorly designed to attain their goals (Agardy et al., 2011) and constitute groups of spatially-

linked MPAs that attempt to achieve ecological, social, and economic benefits that could not be realized through individual MPAs (WCPA/IUCN, 2007). Networks serve important ecological functions by creating interconnected areas with linked habitat to support fish and invertebrate populations and protect a larger portion of the ecosystem than an individual MPA (TNC, 2008). While the ecological benefits of MPA networks are important, their ultimate success and ability to yield improved environmental outcomes is highly dependent upon their human dimensions and the linked social and ecological nature of these systems (Pollnac et al., 2010). MPA networks foster new relationships among individuals, communities, and organizations involved in MPA management (Christie et al., 2009; Green et al., 2011; Lowry et al., 2009). These relationships may help MPA networks overcome some of the collective action problems commonly associated with no-take reserves, such as free riders from neighboring areas (Jones, 2006).

The various management efforts encompassed within CTI-CFF represent different types of environmental institutions connecting national and local government agency representatives, nongovernmental organization (NGO) staff, and resource users. Regardless of the specific approaches taken, marine management activities in the CT require collaboration among individuals toward specific goals, like the establishment of new MPAs or implementation of a local climate change adaptation plan. For the CTI-CFF, as well as many marine management programs in other countries, stakeholder collaboration underscores all management activities and is a crucial preliminary step in helping these programs achieve ecological goals like decreased illegal fishing or improved coral reef condition. My dissertation focused on the collaborative network aspects of the CTI-CFF and other institutions in the region because of the importance of collaboration to all management activities.

### **1.3 National and subnational networks in a CTI-CFF member country**

For each of the CT6, an NPOA outlines how they will work to achieve CTI-CFF goals and targets, and the implementation of the NPOA is spearheaded by a National Coordinating Committee (NCC). In the Philippines (one of the CT6), for instance, the Department of Environment and Natural Resources and the Bureau of Fisheries and Agricultural Resources jointly chair the NCC. The Philippine NCC also includes members from other relevant agencies, such as the League of Municipalities and the Department of Foreign Affairs, as well as NGO representatives. At the community level in the Philippines, CTI-CFF efforts have included projects activities such as the development of community-level MPAs and fisheries management plans in project sites across the Philippines. Similar site-level activities occur in targeted areas throughout the CT6.

In the Philippines, in addition to activities related directly to the CTI-CFF, there are numerous subnational initiatives fostering collaboration and the development of smaller-scale collaborative networks. The Philippines has an extensive infrastructure for marine and coastal management and is considered by some to be one of the leaders in community-based coastal management for the last three decades (Christie and White, 1997; White et al., 2006). The Local Government Code of 1991 and the Fisheries Code of 1998 provide a framework for devolved governance that grants autonomy to municipal governments to manage their coastal resources (White et al., 2006). Under this decentralized structure, municipalities can enact management actions like the development of coastal management plans, the designation of small-scale MPAs, and enforcement against intrusion of illegal fishers. Municipalities are part of provinces, who oversee the actions of municipalities (e.g., through review of municipal legislation) and have the ability to link programs and activities of different municipalities within a province. Local communities within municipalities, known as *barangays*, are also strongly involved in coastal

resource management and are often responsible for MPA management and local enforcement. However, as in other regions, the Philippines has recently experienced a push to implement more regional approaches that encourage collaboration among municipalities and allow for management at the ecosystem level. This has resulted in a number of collaborative initiatives throughout the country that link municipalities in a region to achieve more ecosystem-based approaches (e.g., Armada et al., 2009; Christie et al., 2009; Eisma-Osorio et al., 2009; Horigue et al., 2012). As stated earlier, though not all of these initiatives are officially part of CTI-CFF, by encouraging coordinated approaches to MPAs, fisheries management, and other marine resource management objectives, many of these smaller-scale collaborative networks contribute to the goals of CTI-CFF.

Two examples of scaled-up collaborations in the Philippines that help the country address CTI-CFF goals are the Southeast Cebu Coastal Resource Management Council (SCCRMC) and the Danajon Double Barrier Reef Management Council (DDBRMC). The SCCRMC is a coordinated effort among municipalities in Southeast Cebu that emerged from collaboration in the early 2000's under a United States Agency for International Development (USAID) project (pers. comment, 2-10-12). Coastal Conservation and Education Foundation (CCEF), a domestic NGO, expanded upon these efforts and helped catalyze and formalize the SCCRMC (Eisma-Osorio et al., 2009). The SCCRMC currently includes seven municipalities working to jointly manage their marine resources through tools such as a network of MPAs, aligned fisheries ordinances, and joint patrolling. The DDBRMC has a broader geographic scope and involves more political units than the SCCRMC: it entails nineteen municipalities across four provinces (Leyte, Southern Leyte, Cebu, and Bohol). The DDBRMC was initiated in 2010 through the efforts CCEF's Danajon Bank Project. This project built off of previous efforts, such as the

Fisheries Improved for Sustainable Harvest Project (Armada et al., 2009), another USAID-sponsored effort in Danajon Bank to promote collaboration among the municipalities, provinces, and administrative regions active in the area. The DDBRMC encourages municipalities and provinces to collaborate to implement activities such as a harmonized coastal management plans and shared fisheries enforcement strategies (CCEF, 2013).

Both the SCCRMC and the DDBRMC are environmental institutions with distinct rules and governance processes. Each network has a Memorandum of Agreement (MOA) signed by all participating municipalities and provinces. The SCCRMC hosts monthly meetings where members discuss updates on management issues. Each municipality contributes 40,000 pesos (~\$900 USD) to support the activities of the SCCRMC, and they elect presiding officers every three years. The SCCRMC also has a management committee composed of municipal coastal managers; the management committee conducts the majority of the SCCRMC coordinating tasks. The monthly meetings provide opportunities for ongoing on interactions between SCCRMC participants, allowing them to develop friendships, increase trust, and share information and knowledge.

Although participating municipalities signed the DDBRMC MOA and elected officers in 2012, during its tenure the DDBRMC met much less frequently than the SCCRMC, and all activities were coordinated by CCEF. Since the termination of CCEF's project funding in 2013 the DDBRMC has been inactive. However, other projects in the areas, such as the Ecosystems Improved for Sustainable Fisheries Project (ECOFISH), also funded by USAID, have been active in the Danajon Bank region in the intervening years and are currently attempting to resurrect the DDBRMC (pers. comment from ECOFISH staff, 10-2014). Thus, the DDBRMC provides a contrast to the SCCRMC, which was able to sustain its efforts and continue operations

even after termination of donor support and funding. I compared these two contrasting efforts to observe whether and how differences in social capital informed the operation and effectiveness of these networks.

#### **1.4 The role of social capital in collaborative networks**

Social capital is both a potential outcome of member interactions in a network and a resource that helps collaborative networks like the CTI-CFF, SCCRMC, and DDBRMC function effectively toward achieving ecosystem management goals. Social capital supports network function by facilitating collective action among actors and strengthening their capacity to work together (Adler and Kwon, 2002; Burt, 1997; Coleman, 1988; Woolcock and Narayan, 2000). In the context of collaborative network effectiveness, three attributes of social capital are particularly useful to examine: relationships, trust, and information and knowledge exchange. These elements create a feedback loop where one (e.g., trust) influences the other (e.g., information exchange) and vice versa. For instance, trust – which can be conceptualized as faith in the goodwill of others and a belief that they will follow through on commitments (Adler, 2001; Ballet et al., 2007; Ring and Van de Ven, 1994) – has the ability to create cohesion within a group, and groups that have more trust may be able to achieve their goals more efficiently and effectively (Coleman, 1988; Ostrom, 1990). The relationships and trust built within a network create potential pathways facilitating information flow (Adler and Kwon, 2002; Lowry et al., 2009). Because social capital in a collaborative network fosters exchange of information and ideas, collaborative networks often function as learning networks. A learning network is a group of individuals with common concerns who work together to build capacity and engage in social learning, a process of developing collective knowledge and shared values (Creech and Willard, 2001; Keen et al., 2005; Heinz Center, 2004). Social learning in theory facilitates environmental program sustainability by fostering collective action; encouraging reflection and adaptation; and

spurring changes in understanding and behavior that transcend participants and are diffused to wider communities (Keen et al., 2005; Muro and Jeffrey, 2008; Berkes, 2009; Reed et al., 2010).

Although social capital helps collaborative networks work toward fulfilling their goals, there are also many other factors that influence network effectiveness. In particular, a number of researchers of collaborative and institutional effectiveness (e.g., Bryson et al. 2006; Huxham and Vangen, 2005; Keohane et al. 1993; Provan et al., 2008) have highlighted key design and implementation elements that are instrumental to collaborative network function. The first of these is for members to establish clear goals – i.e., agree on the problems to be solved, actions to take, and outcomes to achieve (Huxham and Vangen, 2005; Keohane et al., 1993). After participants establish goals, they should consider designing a governance structure to promote effective network operations, help align member and network policies, and control the flow of information in the network (Bryson et al., 2006; Goldsmith and Eggers, 2004; Provan et al., 2008; Thomson and Perry, 2006). Networks should also consider working to build trust among participants. Trust, which is also a key element of social capital, helps groups accomplish their goals by creating member cohesion and encouraging compliance with rules and norms (Ostrom, 1998; Ring and Van de Ven, 1994; Thomson and Perry, 2006). Trust among members can be promoted through transparency and accountability mechanisms, which ensure member actions align with collaborative goals (Chayes and Chayes, 1993) and increase member compliance (Keohane et al., 1993; Ostrom, 1990). Networks must also demonstrate both internal and external legitimacy. Internal legitimacy, or how members perceive the network, has the ability to help the network avoid member conflict and furthers trust among members (Provan and Kenis, 2007), whereas external legitimacy promotes outside support (e.g., fiscal support, technical expertise) that helps support network activities (Bryson et al., 2006; Provan and Kenis, 2007).

Finally, it is important for networks to build capacity to implement and allocate resources toward agreed upon actions among members and constituents (Keohane et al., 1993; Underdal, 2002). Actions taken by member institutions with their constituents (e.g., provincial or municipal governments in the Philippines) are key to achieving network success (Hanf and Underdal, 1990).

Social capital has the ability to influence each component of network effectiveness. For instance, the relationships formed and trust built among network participants help achieve collective action (Adler and Kwon, 2002; Coleman, 1988), thus facilitating participant agreement on network goals. Through sharing information about their activities, members promote transparency, increase trust, and demonstrate accountability to their peers by showing that they are following through on commitments (Huxham and Vangen, 2005; Thomson and Perry, 2006). Strong bonding relationships and trust among members foster shared norms and vision for the network (Burt, 2005; Coleman, 1988; Lauber et al., 2008), thus supporting internal legitimacy. Conversely, bridging social capital from those within the network to organizations outside of the network can provide pathways for information transfer with external actors (Burt, 1997; Granovetter, 1973) and offer opportunities to build external legitimacy. Social capital also facilitates knowledge exchange and learning among network members (Adler and Kwon, 2002; Lowry et al., 2009); therefore, the information sharing that occurs in the network increases member capacity and ability to implement network activities (NRC, 2008).

Despite the importance of social capital to collaborative network function there is limited understanding of how social capital informs the functioning of marine management networks. Previous research on the CTI-CFF, the SCCRMC, and the DDBRMC has not focused on participant-level interactions and role of social capital within these networks. Scholars studying

the CTI-CFF have detailed the conditions leading to CTI-CFF's formation (Rosen and Olsson, 2013); its institutional structure and the ability of this structure to fulfill CTI-CFF's goals (Fidelman and Ekstrom, 2012; Fidelman et al., 2012; Foale et al., 2013; Mills et al., 2010); and initial management outcomes of the CTI-CFF, such as the regional system of MPAs and fisheries management policies (Pomeroy et al., 2015; White et al., 2014). For the SCCRMC and the DDBRMC, previous research has examined community level perceptions of management interventions like MPAs and MPA networks (Christie et al., 2009; Pietri et al., 2009; Segi, 2013) or the governance context of these initiatives (Armada et al., 2009; Eisma-Osorio et al., 2009; CCEF, 2013). Thus, examining the role of social capital in these collaborative networks is crucial to understanding their progress, designing strategies to strengthen and sustain them, and providing recommendations and lessons-learned for similar collaborative ecosystem management networks in other areas. My research expands on previous efforts by quantifying participant interactions in these collaborative networks, illustrating whether participant interactions generate social capital, and assessing the degree to which social capital can subsequently be applied toward achievement of network goals. I offer a new analytical approach for examining the effectiveness of collaborative networks by drawing from theory on social capital, collaborative network effectiveness, and environmental institutions. Through mixing quantitative methods of evaluating social capital with in-depth qualitative assessments of participant perceptions, I provide empirical evidence regarding the role of social capital in collaborative networks that elucidates the progress of the networks as well as the barriers and challenges they faced. The findings and recommendations from my research can be applied to the design and implementation of other collaborative networks.

## 1.5 Research objectives and questions

I examined the role of social capital in the CTI-CFF, the SCCRMC, and the DDBRMC. The overarching objectives for my dissertation were to: 1) explore the role of social capital in marine management collaborative networks operating at multiple geographic scales; 2) compare multiple collaborative networks and understand how three attributes of social capital – relationships, trust, and information and knowledge exchange – influence networks' effectiveness and ability to create increased capacity for management; and 3) contribute to the theoretical understanding of collaborative network function in the context of marine management and provide recommendations and lessons-learned to collaborative ecosystem management networks.

Specifically, I examined the following research themes and questions in relation to my three studies of collaborative networks:

1. **The Coral Triangle Initiative and regional exchanges: Strengthening capacity through a regional learning network:** What are the major characteristics of the REX information exchange network (e.g., emergent leaders, network groups)? For the REX network and conservation learning networks in general, what network characteristics promote sharing lessons among divergent network groups (e.g., sharing knowledge among different Coral Triangle countries, a key objective of the REXs)? What actions can be taken to strengthen conservation learning networks by improving their ability to increase capacity and promoting network sustainability?
2. **The role of social capital in collaborative marine management networks: A Philippine case study:** To what extent is there evidence of social capital development (as evaluated through indicators of interactions, innovation exchange, and trustworthy

information) among SCCRMC members? In the SCCRMC, has social capital transcended and bridged traditional management groupings (i.e., municipalities)? How can the lessons learned by examining social capital in the SCCRMC be applied to strengthen the design and implementation of other collaborative networks?

- 3. Comparing the role of social capital in two subnational marine management networks in the Central Visayas Region, Philippines:** What are the nature of the differences between a sustainable and a nascent collaborative network in regards to elements of social capital, such as relationships, trust, and information and knowledge exchange? In the DDBRMC and SCCRMC, how does social capital influence their ability to meet key components of collaborative effectiveness? How can the lessons-learned from the SCCRMC be applied to strengthen and sustain the DDBRMC and other similar networks?

## **1.6 Summary of Methods**

I used a triangulated methods approach (e.g., Jick, 1979), combining key informant interviews, social network analysis, and participant observation to observe and quantify the three collaborative networks I studied. Survey instruments and interview guides were approved by the University of Washington Human Subjects Division. I used social network analysis (Borgatti et al., 2009; Wasserman and Faust, 1994) to quantify and describe the structure of relationships, trust, and information exchange within the CTI-CFF and the SCCRMC (Appendix A and B). Qualitative, semi-structured interviews (e.g., Patton, 2001; Weiss, 1994), which were conducted for all three networks, complement the social network data by offering in-depth narrative accounts of participants (Appendix C). Through participant observation at network meetings, I was able to see the networks in action and observe the dynamics of participant interactions.

Using a complementary multi-methods approach helps validate and interpret research results (e.g., Jick, 1979; Patton, 2001). For instance, though social network analysis shows patterns of interactions among network members, by probing participant perceptions of their experiences, qualitative interviews can further explain these patterns and offer insights as to why they occurred.

#### 1.6.1 Semi-structured qualitative interviews

To examine participant perceptions of their experiences in the three collaborative networks I studied, I conducted semi-structured, qualitative interviews (Appendix C) with: 26 CTI-CFF participants (14 who work in the Philippines, and 12 who work in a regional coordinating capacity); 26 DDBRMC participants (including respondents in 12 out of 19 municipalities in the collaboration, as well as assisting NGOs); and 15 SCCRMC participants (including respondents in 6 out of the 7 municipalities active in the SCCRMC, as well as assisting NGOs). Some of the interviewees from assisting NGOs had participated in both the DDBRMC and the SCCRMC; thus the total number of informants was 61. Interviews were recorded with consent from participants; all recordings were transcribed; and transcripts were analyzed using the qualitative data analysis software Atlas.ti (Scientific Software Development, 2012). Nine of the CTI-CFF interviews were conducted as part of the US Coral Triangle Initiative (USCTI) Learning Project (LP) in October and November 2013 (P.I.s: Patrick Christie and Richard Pollnac). Additional interviews (N = 110) were conducted by other LP team members with managers and practitioners in the other CT6 countries, as well as regional practitioners. I analyzed the portions of these additional interviews that were relevant to my research questions for CTI-CFF (e.g., social learning, capacity building, social capital).

I used a mixture of inductive (e.g., Corbin and Strauss, 1990; Glasser and Strauss, 1967) and deductive (e.g., Miles and Huberman, 1994; Saldaña, 2010) coding methods to analyze all qualitative interview data. Deductive coding helps test existing assumptions about qualitative data through the application of *a priori* codes to the data, while inductive coding allows for common themes to emerge through the participants' narratives. For the CTI-CFF interviews, the research team first used provisional coding and hypothesis coding techniques (Miles and Huberman, 1994; Saldaña, 2010), where a set of 32 pre-existing codes were applied to the data based on expected themes. I then conducted furthering coding on a subset of code categories related to learning networks and capacity development. I applied inductive coding methods on these passages to explore themes that emerged in participants' narratives (e.g., Corbin and Strauss, 1990; Glasser and Strauss, 1967). For the SCCRMC and DDBRMC interviews, I first used provisional and hypothesis coding techniques that allow for pre-existing codes based on expected themes to be applied to the data (Miles and Huberman, 1994; Saldaña, 2010). I deductively created a set of codes that reflected expressions of key aspects of research themes (e.g., relationships, trust, learning networks, improved capacity). I then used inductive coding (e.g., Corbin and Strauss, 1990; Glasser and Strauss, 1969) to explore and identify common themes that emerged through participants' accounts of their experiences that were not obvious from pre-existing key aspects of social capital. Throughout the coding processes, I developed analytic memos to highlight overarching emergent themes and notable trends in the data.

#### 1.6.2 Social network surveys

A research assistant and I distributed social network surveys to 38 SCCRMC members. Respondents were selected by soliciting advice from key members of the SCCRMC management committee to see who else in their municipality was active in the SCCRMC and using past meeting minutes to identify individuals who had been active in the SCCRMC the previous year.

The initial round of respondents was asked to identify other individuals in their municipality who were also active in the SCCRMC; these individuals were then surveyed as well. At least four individuals from each of the seven municipalities were surveyed. Prior to distribution, the survey was tested through cognitive interviews (Beatty and Willis, 2007; Willis, 1999) with marine management professionals to ensure clarity of survey wording and optimal participant comprehension of the survey's objective and questions. Though many respondents spoke English, surveys were translated from English to Cebuano, the most common language in the Central Visayas region of the Philippines, with the help of a research assistant to aid in participant comprehension of the questions.

In the survey (Appendix A), participants responded to a series of introductory questions regarding their current occupation and length of participation in the SCCRMC. Respondents were then asked multiple questions regarding their relationships and interactions with other SCCRMC members. Respondents were asked to indicate: a) with whom they interact (defined as sharing information, collaborating on projects, or serving on a committee together) most frequently about the SCCRMC; b) which SCCRMC members have exposed them to new and innovative information; and c) which SCCRMC members they seek out for trustworthy information about the SCCRMC and coastal management issues. Respondents were allowed to nominate up to ten individuals for each question. Responses were used to generate three separate networks representing different indicators of social capital: interaction; innovation exchange; and trustworthy information. I visualized network data using NetDraw (Borgatti, 2002) and conducted analysis of the network with Ucinet (Borgatti et al., 2002).

As part of the LP CTI-CFF study, we distributed social network surveys to individuals in the CT6 and partner countries who participated in MPA, climate change, and fisheries

management REXs (Appendix B). Participants were identified through consultation with REX coordinators and through publicly available lists of participants. The survey was sent to 253 individuals. Most surveys were distributed in English via the online tool, Survey Monkey. However, due to Internet connectivity and English-language fluency difficulties, in Timor-Leste surveys were translated to Bahasa, hand distributed by a research assistant, left with respondents for one week, and collected. Without this change in protocol, Timor Leste would have been absent from this study.

123 individuals responded to the survey, yielding at 49% response rate with responses from all six countries. However, 19 individuals only responded partially; thus, the completed survey response rate is 41%. In the surveys, participants responded to a series of introductory questions regarding their REX participation and how much they valued REXs. Respondents then nominated individuals they turn to if they have questions about CTI-CFF. Respondents nominated up to five individuals within their country, and five individuals outside of their country. They also indicated whether they knew the nominee prior to participating in CTI-CFF and what motivates them to communicate with the nominee. I visualized the network using NetDraw (Borgatti, 2002) and analyzed all data network data using Ucinet (Borgatti et al., 2002).

### 1.6.3 Participant observation

I conducted participant observation at the following events: a 3-day workshop on Fisheries and Habitat Management for the DDBRMC; a DDBRMC council meeting; 2 monthly meetings of the SCCRMC; a 3-day coral reef monitoring training with SCCRMC participants; and a 3-day CTI-CFF REX on Monitoring and Evaluation held in Manila. By conducting participant observation at these events, I observed participants in the setting of the network and explored behaviors, norms, and social interactions among participants (e.g., Guest et al., 2013;

Spradley, 1980) and looked for behaviors and actions related to key themes of social capital and collaborative effectiveness. Through using qualitative participant observation as opposed to direct, structured observations, I was able to observe the meetings while also interacting with participants (Guest et al., 2013). During the meetings, I recorded observations related to the three target components of social capital (relationships, trust, and information and knowledge exchange) and the elements of collaborative effectiveness (e.g., internal legitimacy, governance mechanisms). All observations were analyzed and summarized following the events for relevant social capital and trends. I used the results of participant observation to complement the qualitative interviews and provide context regarding the operations of the networks.

### **1.7 Dissertation structure**

The subsequent chapters of my dissertation (each written as a self-standing journal article) detail the three networks I studied and address the research questions and themes identified above. In Chapter 2<sup>1</sup>, I examine the role of social capital (as analyzed through the indicator of information exchange) in the CTI-CFF REX network, explore the extent to which the network created capacity among CT6 participants, and highlight lessons learned that can be applied to other regional learning networks. Chapter 3 focuses on the creation of social capital in the SCCRMC and examines relationship patterns among participants, network characteristics that have promoted its sustainability, and how lessons learned from the SCCRMC can be applied to other collaborative networks. In Chapter 4, I compare social capital in the DDBRMC and the

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<sup>1</sup> Chapter 2 stemmed from a collaborative project, “Learning from the US Coral Triangle Initiative Support Program” project led Patrick Christie and Richard Pollnac. The study design and social network survey and interview instruments were developed in collaboration with the project team, particularly Patrick Christie, Todd Stevenson, and Melissa Luna. Interviews were conducted by multiple team members, and Melissa Luna and I compiled the roster for the social network survey respondents and coordinated distribution of the survey via Survey Monkey. This chapter was submitted to *Global Environmental Change* with co-authors Todd Stevenson and Patrick Christie, and the article is currently in press.

SCCRMC, examine how the networks differ in relation to theoretical components of collaborative effectiveness, and explore actions that can be taken to strengthen and sustain these networks. I conclude, in Chapter 5 by highlighting overarching findings regarding the role of social capital in collaborative networks and outlining lessons learned from my three study networks that could be applied to other collaborative ecosystem management networks.

## 2. The Coral Triangle Initiative and regional exchanges: Strengthening capacity through a regional learning network<sup>2</sup>

### Abstract

Natural resource management and conservation programs that promote building capacity and social learning among participants often lead to the formation of learning networks: a type of social network where learning is both a goal and potential outcome of the network. Through forming relationships and sharing information, participants in a learning network build social capital that can help a network achieve social and environmental goals. In this study, we explored social capital in a learning network that emerged through a large-scale marine governance effort, the Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security. Through a mixture of social network analysis and key informant interviews, we examined the major patterns of information exchange among individuals who had participated in regional learning exchanges (REXs); evaluated whether the network's structure resulted in information sharing; and considered implications for strengthening network sustainability, capacity building, and learning. We found that the REX network fostered information sharing among participants across national and organizational boundaries. While the network had individuals who were more central to information sharing, the network structure was generally decentralized, indicating potential resilience to changes in leadership and membership. Participants stressed the importance of the knowledge and connections they had acquired through the learning network;

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<sup>2</sup> This paper was submitted to *Global Environmental Change* with co-authors T. C. Stevenson and P. Christie. This research was supported by the Coral Triangle Support Partnership – a consortium of World Wildlife Fund, The Nature Conservancy, and Conservation International, funded through the U.S. Agency for International Development – as part of the “Learning from the US Coral Triangle Initiative Support Program” project (PIs: Patrick Christie and Richard Pollnac).

however, they expressed doubts regarding its sustainability and stressed the need for a strong coordinating entity. Our findings suggest that conservation learning networks have the ability to bridge cultural divides and promote social learning; however, a strong network coordinator and continuing efforts to support information sharing and learning are crucial to the network's strength and sustainability. The tangible learning and capacity development outcomes cultivated through REX network underscore the value of and need to invest in conservation networks that support peer-to-peer learning.

## **2.1 Introduction**

Programs that increase capacity and foster learning among participants are an integral component of many natural resource conservation and management initiatives. In general, these efforts are known as “capacity building,” processes wherein participants strengthen skills, knowledge, and relationships to promote the realization of joint goals (NRC, 2008). Capacity building activities may range from technical trainings with scientific experts to site visits where communities or agencies involved in resource management visit similar sites to exchange lessons learned (NRC, 2008).

By creating venues where individuals working toward common goals share ideas, capacity building programs often prompt the formation of learning networks: a type of social network where learning is a primary network objective and potential outcome (The Heinz Center, 2004). There are many different terms used to describe networks of individuals and/or organizations who come together to share ideas, from formal knowledge networks (Creech and Willard, 2001; Scarf and Hutchinson, 2003) to learning organizations (Manring, 2007) to learning communities and communities of practices (Davidson-Hunt, 2006; Berkes, 2009). Because these different types of programs all emphasize learning, the term “learning network” is

used to encompass various networks that emphasize knowledge transfer, promote peer-to-peer learning, and help build capacity (The Heinz Center, 2004).

Learning networks that offer tangible opportunities for peer-to-peer interactions (e.g., fisherman-to-fisherman, farmer-to-farmer), as opposed to participants solely receiving information from technical experts (who are often foreigners), are increasingly common in both marine and terrestrial management efforts. Programs like the *Campesino-a-Campesino* farmer-to-farmer network in Central and South America and the Locally Managed Marine Area (LMMA) network in the Indo-Pacific emphasize the importance of local knowledge and community-based management (LMMA Network, 2015; Rosset et al., 2011). Peer-to-peer learning networks operate at multiple scales. In addition to the regional LMMA network, for instance, there are also national LMMA networks, such as those in Fiji and the Solomon Islands, which link national and local governments, non-governmental organizations (NGOs), and communities (Cohen et al., 2012; Govan, 2009; Keen and Mahanty, 2006; Veitayaki et al., 2003).

When individuals with common interests and goals come together in a learning network, they have the opportunity to engage in social learning, a process of developing collective knowledge and shared values, which spurs behavioral and attitudinal change (e.g., Keen et al., 2005). Social learning in theory facilitates environmental program sustainability by fostering collective action; encouraging reflection and adaptation; and spurring changes in understanding and behavior that transcend participants and are diffused to wider communities (Keen et al., 2005; Muro and Jeffrey, 2008; Berkes, 2009; Reed et al., 2010).

Repeated interactions, sharing of ideas, and development of collective knowledge lead not only to learning, but to the development of social capital: goodwill generated through

repeated interactions among members of social network (e.g., Coleman, 1988; Adler and Kwon, 2002). Network participants get to know each other, form relationships, and build trust. Trust creates group cohesion, and groups that have more trust are able to work more efficiently toward achieving joint goals (Burt, 2005, 1997; Coleman, 1988; Ostrom, 1990). Relationships and trust built within a network help actors feel comfortable sharing information and engaging in social learning (Adler and Kwon, 2002; Lowry et al., 2009).

In practice, implementing networks that promote social learning and social capital development requires substantial investment of time and resources from network organizers and participants (e.g., Creech and Willard, 2001; The Heinz Center, 2004; Muro and Jeffrey, 2008). Information exchange and learning among network members are influenced by participants' availability constraints: network activities are often ancillary to the daily demands of participants' jobs (The Heinz Center, 2004). In the developing world, it is common for network coordinators to be foreign entities who may impose Western frameworks on learning activities, thus creating information and power imbalances in the network and limiting participant learning (Scarf and Hutchinson, 2003; Rosset et al., 2011). Even in groups of peers in a network, there are likely to be inherent power imbalances. In resource management networks, for instance, individuals operating at larger scales (e.g., national government actors) may exert influence over smaller scale (e.g., local government) actors, leading to inequitable learning outcomes (Reed et al., 2010). The realization of social learning in a network is further influenced by the participants themselves and how they interact with each other – e.g., whether the network is dominated by a few key individuals, or if participants split into smaller groups according to shared characteristics (e.g., Bodin and Crona, 2006, 2009; Newig et al., 2010; Belaire et al., 2011). In networks dominated by a few individuals, the central actors are in positions of power and can influence

other network members (e.g., Bodin and Crona, 2009; Muñoz-Erickson et al., 2010; Weiss et al., 2012). Power and influence can be applied for the good of the network to coordinate activities and promote information sharing (Isaac et al., 2007; Weiss et al., 2012). However, in a network with power vested in too few individuals the resulting power imbalances can be detrimental to network function, creating barriers to collaboration and leading to the disenfranchisement of peripheral actors (Bodin and Crona, 2009; Muñoz-Erickson et al., 2010; Reed et al., 2010).

In order to assess relationships within a learning network and evaluate its ability to promote learning outcomes, a commonly used tool is social network analysis (SNA). SNA applies social network theory to describe patterns among a group of interlinked individuals and/or organizations (Wasserman and Faust, 1994). Using SNA to examine interactions among learning network participants helps elucidate relationships, network structure and function, and the network's ability to achieve its social, management, and environmental goals (e.g., Vance-Borland and Holley, 2011; Belaire et al., 2011; Smythe et al., 2014). SNA also highlights the particular role of various actors in the network and identifies potential power imbalances among actors (Bodin and Crona, 2009).

We undertook a study of a learning network formed under the umbrella of the Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security (CTI-CFF) – a collaboration among six countries (Indonesia, Malaysia, Papua New Guinea, the Philippines, the Solomon Islands, and Timor Leste) to better manage the marine resources of the Coral Triangle region (CTI-CFF, 2009). CTI-CFF is an ambitious experiment in multinational marine governance, addressing a diverse set of goals from improved fisheries management to climate change adaptation. The operational scale and breadth of CTI-CFF – as well as the effort to have countries with such diverse cultural, political, and management contexts collaborate – is

unprecedented (Fidelman et al., 2012; Mills et al., 2010). An innovative component of CTI-CFF activities were topical regional exchanges (REXs): multi-day meetings where individuals from the Coral Triangle countries (the CT6) and technical experts worked together toward implementing CTI-CFF's main goals, such as designing a regional system of marine protected areas (MPAs). The meetings were supported by the U.S. Coral Triangle Initiative (USCTI) Support Program, a five-year effort that ended in 2014, was funded through the U.S. Agency for International Development, and provided over \$40 million USD to support CTI-CFF activities (Christie et al., 2014). The REXs emphasized fostering interactions among CT6 nationals and providing participants with opportunities to meet their regional peers and learn from each other. Though the meetings were funded with U.S. support, CT6 participants were involved in their implementation through giving presentations, chairing official sessions, and voting on future actions and responsibilities. An important outcome of the REXs was the development and distribution of products to advance marine conservation in the CT region, including a detailed framework for a regional system of MPAs (CTI-CFF, 2013), an early action climate change planning framework and guidelines (CTI-CFF, 2011), and a framework for implementing an ecosystem approach to fisheries management endorsed by CT6 government officials (Pomeroy et al., 2015).

Our exploration of information exchange within the REX network offers insights regarding conservation learning network design and sustainability, as well as strategies that can be used to encourage social learning and capacity building. In this study, we explored the following research questions in relation to the REX network and conservation learning networks in general: 1) What are the major characteristics of the REX network (e.g., emergent leaders, network groups)? 2) For conservation learning networks, what characteristics promote sharing

lessons among divergent network groups (e.g., sharing knowledge among different Coral Triangle countries, a key objective of the (REXs)? 3) What actions can be taken to strengthen conservation learning networks by improving their ability to increase capacity and promoting network sustainability?

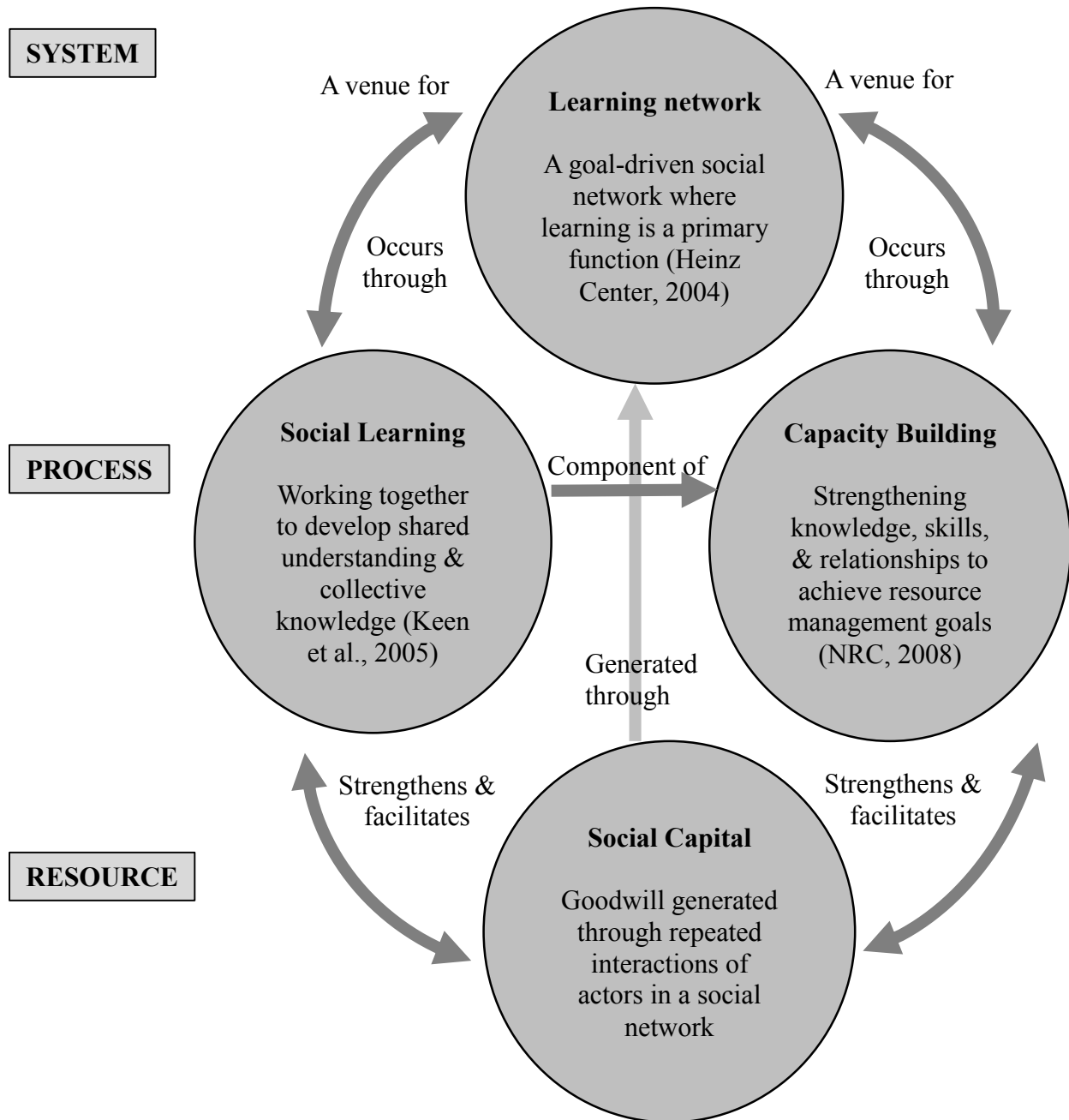
## **2.2 Methods**

### **2.2.1 Analytic approach**

Learning networks can be thought of as systems that provide venues where the processes of social learning and capacity building occur. In theory, social capital, a resource, is generated, strengthened, and sustained through these processes and creates a feedback loop where the generation of social capital strengthens and facilitates social learning and capacity building. We applied this conceptual framework of learning networks, capacity building, social learning, and social capital (Figure 1) to analyze the network that emerged through the REXs.

SNA offers a useful method for examining social learning, capacity building, and social capital development in a network. For instance, SNA helps identify network leaders. In learning networks, leaders are instrumental in disseminating knowledge within and beyond a network and can help the network function more efficiently (Berkes, 2009; Bodin and Crona, 2011; NRC, 2008; Newig et al., 2010). SNA also shows whether information exchange occurs among groups (e.g., different CT6 nations or organizations) in a network. REX participants come from a variety of nations and organizational sectors; however, people are often more comfortable interacting with those who they are similar to. This concept is known as “homophily” (Rogers, 1995) and can limit the potential for information sharing and transformative social learning (Burt, 2005; Crona and Bodin, 2006; Rogers, 1995). We complemented the SNA with key informant, semi-structured interviews in order to gather in-depth narrative data regarding participants’

experiences. Using a triangulated approach combining SNA and interviews helps validate and interpret research results (Patton, 2001).



**Figure 1.** Analytic framework (based on conceptual literature) demonstrating the ideal practical linkages between learning networks, social learning, capacity building, and social capital.

### 2.2.2 The REX network

The network formed over five years through the REXs is a useful example of a conservation learning network through which to examine the ability of networks to promote learning and capacity building. The REXs encompassed a wide array of topics, such as designing a regional MPA system (e.g., Walton et al., 2014; White et al., 2014), climate change planning, and linking mayors and governors in the CT6 to create a local government network (TetraTech, 2012). We focused specifically on three types of REXs, all of which were ongoing for over three years: the REXs for MPAs, climate change planning, and fisheries management. CT6 REX participants were generally representatives from national government environmental and fisheries agencies, NGOs, and the CTI-CFF Secretariat (the coordinating body for CTI-CFF), though the REXs also included regional technical experts from partnering NGOs and academic institutions. The REXs balanced presentations and trainings from technical experts with opportunities for CT6 participants to share local information and insights.

### 2.2.3 Data collection

The majority of data for this study was collected from June to October 2013 as part of a project identifying lessons learned, results, and outcomes for the USCTI Support Program (Christie et al., 2014). The lead author of this paper also conducted key informant interviews with CTI-CFF participants in the Philippines during a 7-month field season from November 2012 to June 2013.

#### 2.2.3.1 Social network surveys

Social network surveys (Appendix B) were distributed to individuals in the CT6 and partner countries who had participated in MPA, climate change planning, and fisheries management REXs. Participants were identified through consultation with REX coordinators and publicly available lists of participants. Prior to distribution, the survey was tested through

cognitive interviews (Beatty and Willis, 2007; Willis, 1999) with marine management professionals. The final web-based survey was beta-tested with key REX participants.

Participants were contacted through pre-notification emails prior to receiving the survey. Emails included background on the survey's purpose, indicated that other REX participants were also receiving the survey, and guaranteed response confidentiality (Dillman et al., 2009). One week after distribution of pre-notification emails, the survey was sent to 249 REX participants. Most surveys were distributed in English and via the online tool, Survey Monkey. Due to Internet connectivity issues and variable English-language fluency, in Timor Leste paper surveys were hand distributed by a research assistant, left with respondents for one week, and then collected. Without this change in protocol, Timor Leste would have been absent from this study.

A total of 123 individuals responded to the survey, yielding a 49% response rate, although the hand-distribution approach yielded a much higher response rate (86%) from Timor Leste (Table 1). While this change in sampling protocol may have affected data response rates for Timor Leste, we do not believe it affected the general conclusions of the study. 19 survey respondents only responded to the survey partially; thus the completed survey response rate was 41%. Of 111 respondents who indicated they attended REXs, 59% attended only one REX, 28.0% attended two REXs, and 14% attended three or more REXs.

In the survey, participants were asked a series of introductory questions regarding their REX participation, nationality, and organizational sector. These questions were used to create a dataset of attributes for all survey respondents. Respondents then nominated individuals they seek out if they have questions about coral reef management (e.g., MPA design, fisheries management challenges). Respondents nominated up to five individuals within their country and five individuals outside of their country and were asked to identify the nominee's organization,

whether they knew the nominee prior to participating in CTI-CFF, and their motivation for communicating with the nominee. For individuals who were nominated by survey respondents but did not respond to the survey, attribute data were obtained from information provided (nationality, organizational sector) by respondents. Due to the nature of the question – “If you have questions about CTI-related issues (e.g., MPAs, climate change planning, fisheries management) to whom do you go?” – the corresponding network was directional and ties among actors were not assumed to be reciprocal. In other words, if Actor A indicated that she went to Actor B with questions about coral reef management, it was not assumed that Actor B also went to Actor A unless Actor B also nominated Actor A.

**Table 1.** Per country, the number of respondents who were solicited to participate in the survey, total number of responses, total present in the network (respondents plus others from the country who were nominated), and the response rate (response rate = solicited/responded).

	<b>Solicited</b>	<b>Responded</b>	<b>Total in Network</b>	<b>Response Rate (%)</b>
Indonesia	69	27	50	39
Malaysia	37	10	19	27
PNG	14	4	11	29
Philippines	38	23	38	61
Solomons	20	10	30	48
Timor Leste	21	18	22	86
United States	30	18	24	60
Australia	6	6	12	100
Other	14	7	9	50
<b>Total</b>	<b>249</b>	<b>123</b>	<b>215</b>	<b>49</b>

By asking respondents to nominate up to ten individuals, as opposed to providing them with a roster of all REX participants and asking them to select every individual with whom they exchanged information, we imposed limitations on the number of connections in the network.

However, given respondent constraints on availability and internet access, we felt that our approach was more conducive to eliciting responses than providing them with a full roster of all REX participants. Notably, even though respondents were able to nominate up to ten individuals, on average, they only nominated three.

#### 2.2.3.2 Semi-structured informant interviews

The research team conducted a total of 110 semi-structured, qualitative interviews (Weiss, 1994) with national and regional informants who participated in CTI-CFF events, including national government representatives, domestic and international NGO partners, and academic scientists. Informants were selected using purposive sampling (Lonnner and Berry, 1986) to target individuals with extensive REX and CTI-CFF experience. Interviews addressed themes such as the relationships respondents built through REX participation, how the REXs created national and regional capacity, and the sustainability of CTI-CFF.

#### 2.2.4 Data analysis

Survey questions regarding motivation for communicating with nominees and introductory questions were summarized and analyzed in Microsoft Excel. We conducted statistical analysis of the network survey data using UCINET (Borgatti et al., 2002) and visualized the data with NetDraw (Borgatti, 2002). Interview recordings were transcribed by research team members, and transcripts were analyzed using the qualitative data analysis software Atlas.ti (Scientific Software Development, 2012). Throughout the analysis, qualitative and quantitative results were compared to validate observed findings.

##### 2.2.4.1 Description of network metrics

To describe the basic structure of the network, we calculated descriptive statistics including density, average degree, degree centralization, and fragmentation. Network density is the proportion of actors who have ties to other actors in the network as compared to the total

number of possible ties (Bodin and Crona, 2009; Wasserman and Faust, 1994). Average degree is the number of ties an actor has to others in the network and evaluates how well connected network actors are. Degree centralization calculates how much central actors dominate the network (Wasserman and Faust, 1994). Fragmentation represents the proportion of actors in the network that cannot reach each other through other actors and therefore cannot share information (Borgatti et al., 2002). For fragmentation, we calculated directional fragmentation and fragmentation assuming reciprocal ties – i.e., the assumption that when one REX participant approaches another with questions about CTI-CFF she is not just receiving information but also has the opportunity to share information. These descriptive network statistics were calculated for the entire network. Following calculation for the entire network, a new network was created with the same individuals but with the seven most central actor for each of the CT6 countries and the United States removed. Descriptive statistics were then recalculated in order to assess the network's vulnerability to removal of key individuals.

We used the indices of degree, in-degree, out-degree, and betweenness centrality to calculate basic positions of actors in the REX network and assess the role of influential individuals. The degree of an actor is the number of ties an actor has to others in the network (Wasserman and Faust, 1994). In directed networks like the REX network, there are two types of degree: in-degree, the number of actors that indicate a tie with a given actor, and out-degree, the number of ties that a given actor indicates having with others. In-degree centrality, also known as “prestige,” illustrates who is highly sought-after in the network as a source of information, whereas out-degree centrality highlights which actors seek out others to gain information (Bodin and Crona, 2009a; Haneman and Riddle, 2005). Betweenness evaluates the position of the actor in the network in relation to other actors (Wasserman and Faust, 1994).

As an additional node-level index and to observe different roles actors serve in sharing information, we calculated brokerage scores (Gould and Fernandez, 1989). Brokerage evaluates which actors serve as links to others in different groups and has been applied in resource management studies (e.g., Vance-Borland and, Holley 2011; Fischer et al., 2014). Brokerage provides an expansion on betweenness by incorporating actor attributes (e.g., nationality, organizational sector) and identifying the types of groups an actor bridges. There are five broker types: 1) a “coordinator” links two other actors, where Actors A, B (the coordinator), and C are in the same group; 2) a “gatekeeper” links two other actors in different groups, where A is from a different group than B (the gatekeeper) and C; 3) a “representative” links two actors in different groups, where A and B (the representative) are in the same group but C is from a different group; 4) a “consultant” links two actors in the same group, where A and C are from the same group but B (the broker) is from a different group; and 5) a “liaison” links two actors in different groups, where A, B (the liaison), and C are all from different groups. Brokerage scores were calculated for all actors using both nationality and organizational sector groupings.

We used relational contingency analysis, which provides a statistical means for evaluating inter-group interactions, to explore whether the REXs promoted information exchange and social capital development across national and organizational boundaries. Many authors have used contingency analysis to observe group dynamics in resource management networks (e.g., Crona and Bodin, 2006; Ramirez-Sanchez and Pinkerton, 2009; Belaire et al., 2011; Hoelting et al., 2014). Contingency analysis calculates whether internal and external links among identified network groups (e.g., nationality, organizational sector) are greater than would be expected by chance based on network permutations.

#### 2.2.4.2 Qualitative coding

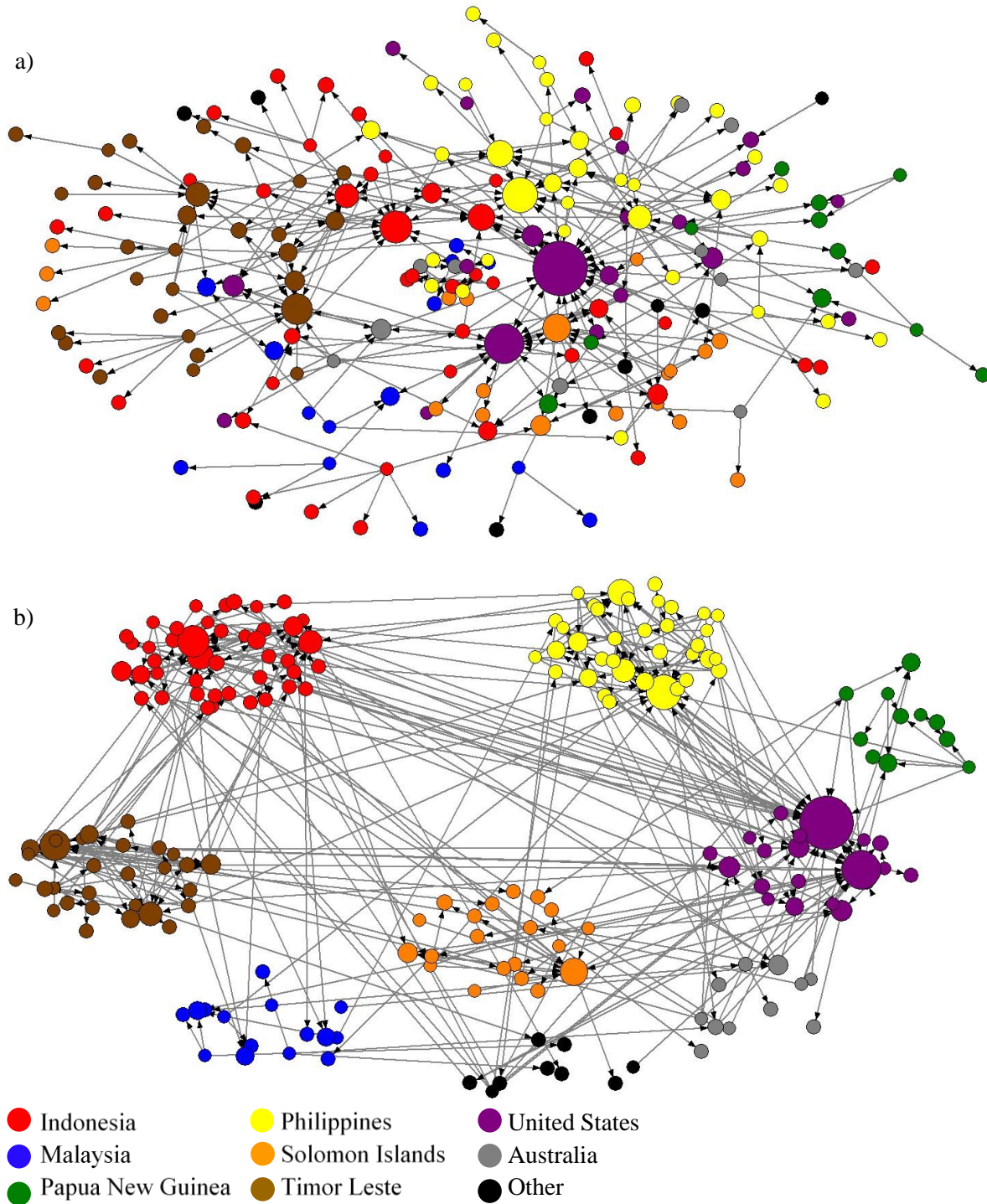
To analyze our interview data, we used a mixture of inductive and deductive coding methods. The research team first used provisional coding and hypothesis coding techniques (Miles and Huberman, 1994; Saldaña, 2010), where a set of 32 deductive codes were applied to the data based on expected themes. Further coding was conducted on a subset of code categories related to learning networks and capacity development. Inductive coding methods were used on these passages to explore themes that emerged in participants' narratives (Saldaña, 2010). Analytic memos were developed throughout the coding process to highlight potential links between qualitative and network data and overarching emergent themes.

### 2.3 Results

#### 2.3.1 Description and structure of the REX network

The 123 survey respondents nominated an additional 92 individuals, yielding a total of 215 nodes (i.e., individuals in the network). The network contained 19 isolates, respondents who did not nominate others and were not nominated themselves. We removed isolates from the full network diagram as they were not active in information exchange (Figure 2).

The REX network had a few highly central actors (Figure 2a). The two most central actors were from United States headquartered organizations involved in planning and coordination of the REXs. There were also CT6 participants who were highly central, including members of the Secretariat, national government employees in the Solomon Islands and the Philippines, and NGO staff from Timor Leste. The network diagram (Figure 2b) illustrates the existence of ties among participants from the different CT6 countries. Participants from Timor Leste, for instance, went to their peers from Indonesia when they had questions about CTI-CFF.



**Figure 2.** The REX network, with isolates removed (198 nodes, 328 ties) and nodes sized by in-degree centrality, i.e., which actors were sources of information. A) Network scaled with spring-embedding so nodes with the smallest path length are arranged closer together. B) Network clustered by country so that nodes of the same nationality are arranged together and then distanced within country clusters by spring embedding.

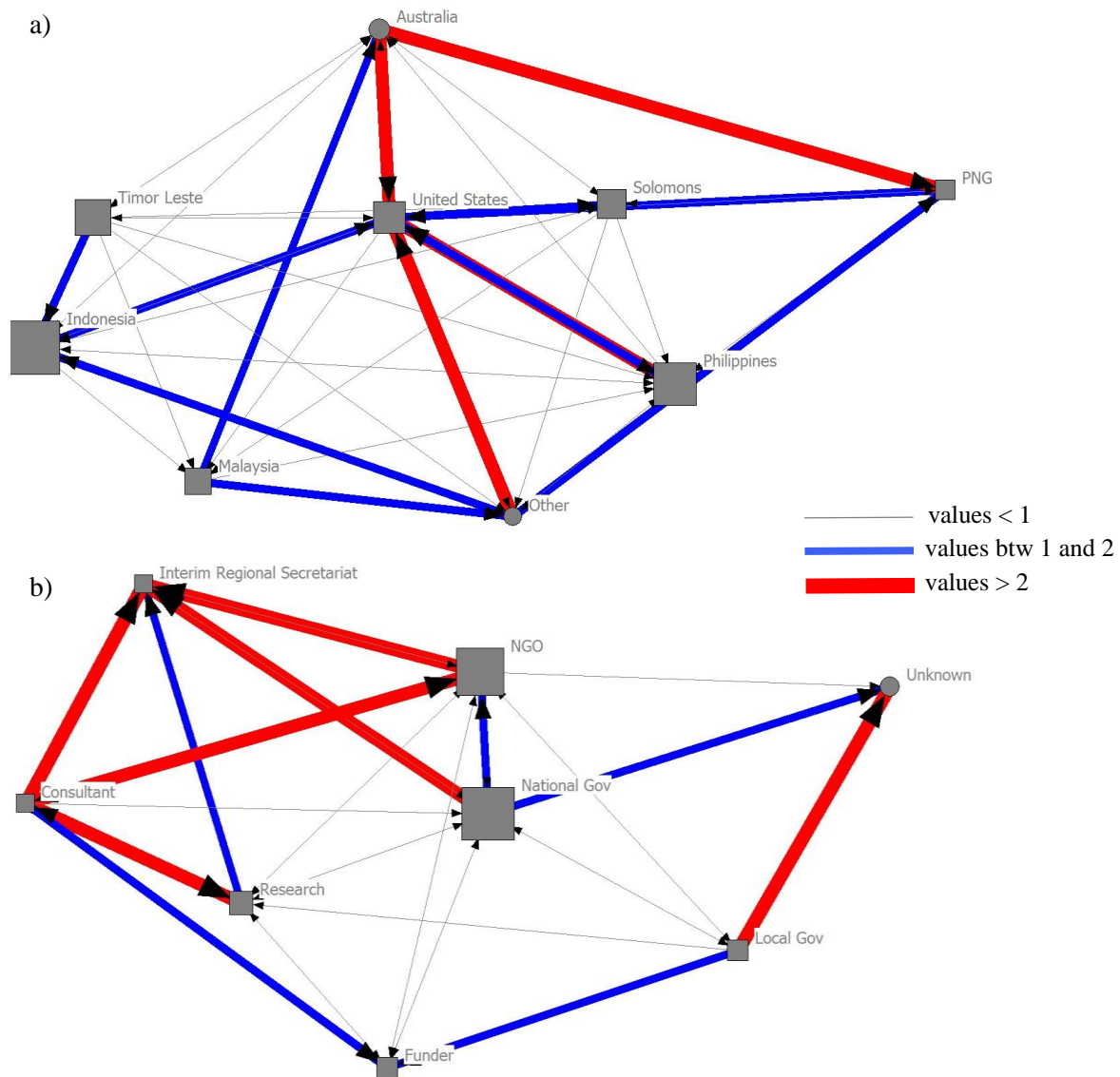
### 2.3.2 Information exchange among the CT6 and partners

When partitioning the network by country (Figure 3a), ties within and between countries were significantly different than what would be expected in a random network with the same number of actors ( $\chi^2 = 797.13, p = 0.0001$ ). The CT6 had greater than expected internal ties, indicating high levels of information exchange within countries. Papua New Guinea had a particularly high internal tie score (observed/expected = 14.03), which was attributable to the low number of respondents from the country ( $N = 11$ ) and relatively high density among these respondents. With the exception of Malaysia, ties were also greater than expected between the CT6 and the United States, demonstrating that CT6 participants sought out United States partners as information sources. The between-group ties for Timor Leste and Indonesia (observed/expected = 1.5) were the only CT6 between-group relations that were stronger than expected.

For communication across organizational sectors (Figure 3b), ties within and between groups were also significantly different than would be expected in a random network ( $\chi^2 = 233.86, p = 0.008$ ). For NGOs, researchers, national government, the Secretariat, and funders, internal ties were all greater than expected. There were also stronger ties between many of the organizational sectors and the Secretariat. The observed/expected tie ratio for NGOs to the Secretariat was 2.30, and the observed/expected ratio of national government to the Secretariat was 5.42. This demonstrates that Secretariat representatives were viewed as information sources. Conversely, ties to local government representatives were weak across all organizational sectors.

To determine whether the information sharing in the REX network was attributable to CTI-CFF and the REXs, respondents were asked whether they knew each nominated actor prior to participating in CTI-CFF. The responses showed a strong difference between within country

vs. out of country nominees. For within country nominees, respondents indicated that they had known 68% of nominees prior to participating in CTI-CFF (N = 194). Conversely, for out-of-country nominees, the majority of respondents (74%) did not know the nominees prior to CTI-CFF (N = 130), suggesting the REXs were central to the formation of new between-country ties.



**Figure 3.** Network diagrams showing connections among countries when partitioned by a) nationality and b) organizational sector. Nodes are sized by the number of ties within a group. Square nodes indicate groups where the observed/expected ratio is greater than expected (>1) and circular nodes indicate groups where the observed/expected ratio is less than expected (<1).

### 2.3.3 The role of influential individuals and network vulnerability

Due to the network's size, only scores for the top ten actors based on total degree centrality are reported (Table 2). However, of the top twenty most central actors, there were eight from Timor Leste; four from the Philippines; four from Indonesia; three from the United States; and one from the Solomon Islands. The high degree of central actors from Timor Leste is due to the difference in sampling methods and high response rate from Timor Leste respondents.

Two actors from the United States (Actors 1 and 2) had the highest in-degree and betweenness centrality scores. These individuals can be thought of as givers or sources of information, who had the ability to connect individuals in the network, though they could have alternately used their position to monopolize information and influence others. For brokerage, Actors 1 and 2 had high liaison scores, indicating that they served as bridges between CTI-CFF participants from different countries. Actor 1 had a high gatekeeper score, while Actor 2 had a high representative score, demonstrating that both of these individuals also linked actors from the United States to participants from other countries.

A few actors from within the CT6 were highly central. Actor 3, a government representative from the Solomon Islands, had high in-degree and out-degree centrality and a high representative and coordinator score, indicating a central position in brokering information exchange and linking actors from the Solomon Islands to each other and to other countries. There were also individuals from Timor Leste (e.g., Actor 4), the Philippines (Actor 9), and Indonesia (Actor 7) who were highly central and connected actors within their country to each other and to actors outside of their country.

**Table 2.** Centrality and brokerage scores for the top 10 most central actors in the REX network. Brokerage scores show the different values for all five brokerage roles: coordinator (coor), gatekeeper (gat), representative (rep), consultant (con), and liaison (lias). Actors 6 and 9 have brokerage scores of 0 for all roles because they were nominees who did not respond to the survey.

Nationality	Deg	Out-deg	In-deg	Betwe- -ness	Brokerage (Nationality)				
					<i>Coor</i>	<i>Gat</i>	<i>Rep</i>	<i>Con</i>	<i>Lias</i>
1. United States	27	6	25	1572.83	8	35	23	14	53
2. United States	21	7	16	1258.42	2	8	30	5	57
3. Solomons	16	8	9	635.17	15	9	27	4	8
4. Timor Leste	14	3	11	292.88	9	2	17	2	1
5. Timor Leste	13	10	3	120.47	9	0	12	0	0
6. Philippines	13	0	13	0.00	0	0	0	0	0
7. Indonesia	12	4	8	476.68	4	11	4	2	7
8. Indonesia	12	0	12	0.00	0	0	0	0	0
9. Philippines	12	4	8	202.50	19	3	7	0	0
10. Timor Leste	10	6	4	207.08	9	0	10	0	0

Network density decreased slightly with the removal of the seven most central actors; however, network density for the REX network was generally low (Table 3). For the complete network, the density of 0.007 indicates that only .7% of the total ties that are possible exist in the network. The low density may be partially an artifact of the sampling methods: since respondents were limited to selecting no more than ten actors, it is possible that some extant information exchange ties are not shown, although on average actors only nominated three individuals. Out-degree and in-degree network centralization with and without central actors are low, though they increased slightly with the removal of the central actors. The low centralization scores suggest that while there are a few actors with much higher centrality scores than others, the network is decentralized and not dominated by a few individuals. Directional fragmentation scores increased with removal of central actors (from 0.93 to 0.95) but were high, indicating a large

proportion of actors who are unable to reach others in the network. This is due to the directional nature of the network; actors can only reach each other if there are two-way ties between both actors. Undirected fragmentation scores, however, are considerably lower. For the entire network, the 0.33 fragmentation score specifies that only 33% of actors in the network are unable to reach other. This score increases to 0.47 with removal of central actors, suggesting a small degree of vulnerability to the removal of the most central individuals.

**Table 3.** Descriptive network statistics for the entire network, and the network with the most central actor for each of the CT6 countries and the U.S. removed.

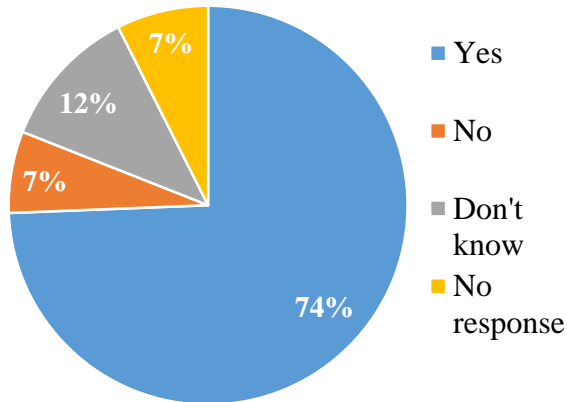
	<b>Entire Network</b>	<b>Central Actors Removed</b>
Network size	215	208
Number of ties	328	236
Isolates	19	26
Density	0.007	0.005
Average degree	1.53	1.14
Out-degree centralization	1.99%	2.85%
In-degree centralization	5.51%	6.25%
Fragmentation (directed)	0.931	0.95
Fragmentation (reciprocal)	0.330	0.47

#### 2.3.4 Learning and capacity building through the REX network

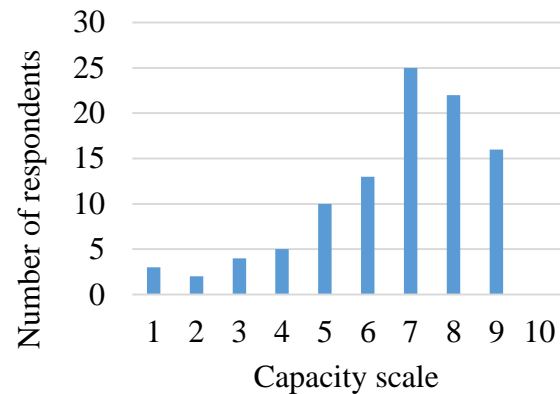
Respondents were asked two questions related to the capacity building potential of the REXs: 1) whether what they had learned at the REXs influenced them to take action in their country, and 2) the degree to which the REXs increased their capacity to implement new policies in their country. Seventy-four percent of respondents (N= 122) said that the information they learned at REXs had helped them take in-country actions (Figure 4a). Respondents also felt REX

participation increased their capacity to implement new policies: the mean response was 6.62 and the median was 7.00 on a scale of 1 (no increase) to 10 (significant increase) (Figure 4b).

a) REXs influencing in-country action



b) REXs increasing capacity to implement new policies



**Figure 4.** Respondents were asked two questions to assess the degree to which REXs affected in-country capacity: a) whether or not what they have learned at a REX has influenced them to take action in their country (N = 122), and b) “On a scale of 1 to 10 (with 1 signifying no increase and 10 signifying significant increase) to what extent have Regional Exchanges increased capacity to be able to implement new policies in your country?” (N = 100)

Confirmation bias, wherein respondents are likely to exaggerate outcomes of efforts they have been involved heavily in may partially account for the high value of REX activities in survey questions. However, the positive capacity building potential of the REXs was further supported through the more nuanced interview responses, as well as through the tangible capacity building tools produced through the REXs, such as the regional MPA system framework (CTI-CFF, 2013; White et al., 2014) . In interviews, respondents spoke at length about the network’s learning potential, citing both strengths of the existing REX structure and potential areas for improvement. Four key themes emerged through the interviews related to the patterns discovered regarding network structure and the potential for learning and capacity

building: 1) building relationships; 2) social learning; 3) disseminating lessons learned; and 4) network sustainability.

When discussing building relationships through the REXs, participants stressed the progression of their relationships over the years and their transformation from formal and professional to trusting and friendly:

“When we first started we had a regional exchange meeting, you know there was a pretty stiff formality...and then fast forward to today, there’s a real comfort level and ability to just communicate...amongst the different countries....” – U.S. participant

“...we’re doing this, doing the extra work because we’re friends.... If you have questions you just email them, or call them. It helps.”- Philippine participant

Over the years, participants engaged in social learning and were able to share experiences and ideas and develop shared values, leading to shifts in behavior and attitude:

“I find the learning exchanges extremely helpful because it’s almost sometimes the more intangible stuff, people can talk to each other...it does increase people’s exposure and knowledge.” – Indonesian participant

“[The REXs are] a good way of sharing what others have been doing, knowing what others have been doing, how they do it, what they have done. I think it’s a good way of meeting, bonding, networking.” – Malaysian participant

“...this [participant] who was always really cynical and always had negative things to say about everything we were doing, he actually came around...he was really happy.”- U.S. participant

An aspect of the REX network’s potential that the SNA does not capture is the links among participants and individuals who may not participate in REXs but are still involved in CTI-CFF, either at the national or community level. Respondents discussed how lessons-learned are disseminated horizontally and vertically with national and community-level peers after the REXs. However, respondents highlighted a need to increase dissemination, particularly at the community level:

“There’s a lot of capacity building but it’s really abstract...It’s done in capitals. It’s done in hotels. It’s not taking down and being given to those that really are going to implement [the interventions].” – Solomon Islands participant

“[People in the communities] want to see how they can participate. They want to see CTI do some work in their sites, in their areas. They want to see CTI, get it started. Is there improvement? If there is, where’s the improvement?” – Philippine participant

A final theme respondents discussed was the network’s sustainability – i.e., its ability to continue promoting capacity building and social learning in spite of changes in network funding, structure, and coordination. In addition to highlighting the need for strengthening the network by increasing vertical dissemination of lessons learned, informants stressed the importance of REX coordinators. Many national government informants noted how many additional responsibilities they have and how hard it is to be an active network participant.

“And again I don't want to play up USCTI but I think that support has been so pivotal for the launch in the first 5 years of this initiative...without USCTI support we won't have had all these senior official meetings, technical working groups, national plan of action.” – Indonesian participant

“[CTI-CFF] is not the only program, or not the only initiative or functions that a particular department is taking on. So the challenge is really balancing and finding an equilibrium where all the projects will get an equal and fair attention and involvement and participation....” – Philippine participant

## **2.4 Discussion**

Our study objectives were to examine the major characteristics of the REX network, explore what structural network characteristics promote information exchange, and consider strategies for strengthening and sustaining conservation learning networks. We found that the REXs led to the creation of cross-boundary connections (i.e., across CT6 countries and organizational affiliations) among participants, though communication within groups was stronger than between groups. While the network had a few highly central individuals, when these individuals were removed from the network general cohesion statistics exhibited minimal

change, demonstrating potential resilience of the network to changes in membership. In interviews, REX participants stressed the importance of information they learned and the connections made through the network; however, they expressed doubts regarding its sustainability without a coordinating entity. In this section, we will discuss our findings in relation to the ability of the REX network to promote learning and information exchange and offer recommendations for strengthening and sustaining conservation learning networks.

#### 2.4.1 Information exchange in the REX network

The REX network demonstrated low density, low centralization, and multiple groups within the larger network. This structure bears similarities to the “small-world” phenomenon, where a network is decentralized and sparse, with a high level of local clustering and a few bridges between groups (Watts, 1999). Other studies of large-scale ecosystem management networks have found similar low density structures due to the high social cost for actors in maintaining multiple connections (Ernstson et al., 2010; Fischer et al., 2014; Vance-Borland and Holley, 2011). While dense networks help generate social capital, they have limited ability to expose members to new information since members often have similar knowledge and experiences (Bodin and Crona, 2009; Coleman, 1988; Ernstson et al., 2010). For the REX network a denser network structure could constrain its ability to link actors with different perspectives and promote social learning (Belaire et al., 2011; Burt, 2005; Lauber et al., 2008; Newig et al., 2010). In examining ecosystem management networks involving diverse sets of actors, other authors have proposed that low density networks are useful for achieving management goals because they create opportunities for innovative ideas to enter the network, furthering the network’s capacity to achieve socio-ecological goals (Belaire et al., 2011; Smythe et al., 2014). The REX network, like many conservation learning networks, has complex goals (e.g., helping communities develop climate change adaptation plans) that require varied types of

knowledge, particularly given the socio-cultural diversity of the Coral Triangle. Thus, the small-world structure of the REX network could be useful for both the REX network and other conservation networks in helping them promote learning and achieve their ecosystem management goals.

The low centralization of the REX network— both for the entire network and with the most central actors removed – should make it less vulnerable to membership changes and increase its ability to promote equitable learning among members. Highly centralized networks provide efficient pathways for information sharing (Granovetter, 1973), a crucial first step in learning (Newig et al., 2010). A network that is too heavily dominated by a few actors, however, has limited ability for debate and deliberation, additional important steps in the learning process (Bodin and Crona, 2009; Newig et al., 2010). Like dense networks, highly centralized networks limit the network’s ability to access new information. In observing a marine governance knowledge exchange network in Australia, Weiss et al. (2012) found that the network was dense with low centralization, unlike the REX network. They posited that this structure led to redundant knowledge channels and limited the network’s ability to access management-relevant information. Highly centralized networks are also often characterized by power imbalances among members, with a few members who can monopolize information, thus creating barriers to collaboration and learning (Muñoz-Erickson et al., 2010; Reed et al., 2010; Weiss et al., 2012).

The relational contingency analysis demonstrated a higher level of interaction within countries and organizational sectors than across boundaries.<sup>3</sup> However, there were some

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<sup>3</sup> A caveat for interpreting the contingency analysis is that in the calculated observed/expected tie ratio, the expected value is a statistically derived estimate based on random permutations in a network with the same number of nodes. In reality, it is unrealistic to expect equal rates of interaction between and within groups since group members have shared characteristics that facilitate interactions (Rogers, 1995). Contingency analysis results are thus useful as a

instances where inter-group information sharing was higher than expected (e.g., Timor Leste and Indonesia; other CT6 countries and the United States; NGOs and national government). The existence of cross-boundary information exchange in the REX network should further its ability for learning and capacity building. The strength of ties within groups creates cohesion and social capital, but the ties across groups offer pathways for building bridging social capital, sharing knowledge, and developing collective knowledge (McEvily and Reagans, 2003; Burt, 2005). In interviews, respondents also highlighted the development and strengthening of relationships over the course of the REXs. Through engaging in the process of social learning and capacity building, participants developed shared interests, knowledge, and formed attachments, which made it increasingly easier for them to engage in social learning and work towards achieving joint goals.

The REX network structure, with smaller groups and bridges between groups, has been found in other ecosystem management network studies and is posited to be useful for supporting a diversity of specialized knowledge that can be used to further conservation and management actions (Bodin and Crona, 2009; Ramirez-Sanchez and Pinkerton, 2009). For inter-group knowledge exchange and social learning to occur a network must have brokers – participants who work actively to connect disconnected groups and have the ability to communicate with multiple types of individuals (Bodin and Crona, 2009, 2011; Keen et al., 2006). A number of brokers, from both within and outside of the CT6, were present in the REX network. The brokers within the CT6 tended to serve as coordinators linking others within their own country, or representatives connecting individuals within their country to those outside of it. The two most

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preliminary assessment of which groups have stronger ties and highlighting areas where there may be the potential to strengthen interactions.

central brokers from outside the CT6, who were from the United States and part of the USCTI Support Program, acted as strong liaisons, connecting actors across the CT6. Given their involvement in coordinating network activities, the central role of the two U.S. actors is not surprising. Central individuals occupy positions of power in a network that can hinder collaboration and learning. In the REX network, however, by connecting individuals with divergent views and sources of information, the network brokers served in a beneficial capacity that could help change individuals' opinions, promote reflection and learning, and increase the capacity building potential of the network (Burt, 2005; Ernston et al., 2010; Fischer et al., 2014). Other resource management network studies have demonstrated the positive ability of network brokers to disseminate information across network boundaries and promote learning among members (e.g., Isaac et al., 2007; Lauber et al., 2008).

Capacity building programs in developing countries are sometimes dominated by foreign technical experts and funders who impose Western learning frameworks that do not resonate with participants and hinder learning (Scarf and Hutchinson, 2003; Rosset et al., 2011). Though the two most central actors in the REX network were from the United States, both had been actively involved in the region for many years. Their regional experience and knowledge is likely to have helped these individuals serve as information brokers and use their powerful position to promote information sharing and learning. Additionally, the existence of central CT6 nationals demonstrates the importance of local perspectives in the network. The Philippines, Timor Leste, Indonesia, and the Solomon Islands all had individuals who were highly valued as sources of information, but who also actively sought out others to discuss CTI-CFF issues. For instance, the third most central individual in the REX network (Actor 3) was a government representative from the Solomon Islands. Actor 3 had high coordinator and representative

brokerage scores, which suggests his/her value both in linking individuals within the Solomon Islands (the coordinator role) and connecting individuals in the Solomon Islands to outsiders (the representative role). Many key informants mentioned Actor 3 in their interviews, and spoke of Actor 3's personal and professional growth over the course of the REXs. In Actor 3's interview, the informant spoke of the empowerment, mentorship, and learning she/he acquired through the REXs. Other CT6 informants echoed the theme of empowerment in their interviews and stressed how the REXs not only exposed them to new information, but helped them gain confidence to take on leadership roles in their countries. Informants also discussed how the REX coordinators created an environment that made them feel comfortable sharing ideas and stressed the value of interactions they had with their peers. The balance the REXs achieved between technical information, local perspectives, and participant interactions provides an example of how even in a network where technical expertise and fiscal capacity is provided by foreign organizations, opportunities for equitable social learning and empowerment of participants are still possible.

#### 2.4.2 Strengthening and sustaining the REX network

The REXs were supported by the six-year USCTI Support program – the U.S. Agency for International Development-funded effort – which closed in September 2014. The support and leadership of the USCTI was essential in the development of CTI-CFF and the REX network, as well as the production of key products like the regional MPA framework and climate change adaptation plans (CTI-CFF, 2011; CTI-CFF, 2013). Coordinators are often highlighted as crucial to network functioning by helping plan activities and serving as bridges among groups (e.g., Provan and Kenis, 2007; NRC, 2008; Berkes, 2009). Informants noted the importance of the USCTI's coordination in their interviews, and the two most central actors in the network were involved in REX coordination. Many informants stressed that without individuals or a group

responsible for leading network activities, participants would not have the time or capacity to plan activities themselves, a common problem for learning networks (The Heinz Center, 2004).

The close of the USCTI program is likely to temporarily leave the REX network without a coordinating entity. The last REX was sponsored by the USCTI and held in Cebu in July 2014; currently, no new funds have been allocated to support the continuation of the REXs. However, the end of outside funding for the REXs could present an opportunity for CT6 participants to take ownership of the network and rely on regional knowledge and capacity. Other studies have shown that networks that value local knowledge and participants' perspectives and are not overly dependent on outside support are stronger and more sustainable (Scarf and Hutchinson, 2003; Rosset et al., 2011). If the REX network continues, it will still be necessary to have a coordinating body. At the time of our study, the CTI-CFF Secretariat was not yet fully ratified, but since then official ratification of the Secretariat was confirmed in November 2014 (CTI-CFF, 2014). This presents an opportunity for the Secretariat to take on the role of network coordinator. It may take time before the Secretariat is able to serve in the same capacity and with the same level of fiscal resources as the USCTI. However, three Secretariat members were among the twenty most central actors in the REX network, and two of the representatives also had high brokerage scores, demonstrating that REX participants already viewed Secretariat members as useful sources of information. If the Secretariat can fulfill the network coordinator role, this will help sustain the networks' information sharing and learning functions.

For conservation learning networks to realize their ecosystem management goals, the networks and the social learning that occurs within them should go beyond the initial set of participants and extend to the broader management community (Manring, 2007; Reed et al., 2010). REX network members have an opportunity to act as brokers between the network and

other national and regional networks they may participate in (Newell et al., 2004). In so doing , they can share the information learned through the REXs with others, further increase regional and local capacity, and gain access to new information (Davidson-Hunt, 2006; NRC, 2008). In interviews, informants provided examples of how knowledge dissemination beyond the REXs currently occurs. For instance, informants in the Philippines and Solomon Islands described national debriefing processes that occur after the REXs with members of the National Coordinating Committees (committees that spearhead national implementation of CTI-CFF activities), where REX participants share what they learned with their national counterparts who did not attend. The post-REX briefings with national counterparts are a useful tool to extend knowledge dissemination, and could be applied to other conservation networks to further the reach of social learning beyond network participants.

## **2.5 Conclusions**

The findings of this study are useful for CTI-CFF and the REX network, as well as for other environmental conservation and management programs considering how to implement learning networks. The new connections formed among members from across the CT6 as a direct result of the REXs demonstrate that even in instances where there are socio-cultural differences, a shared cause can bring participants together. While versatile leaders, like those present in the REX network, who actively work to bridge these divides are crucial to conservation learning networks, so is having an interactive environment that allows for continued in-person interactions among participants. The emergence of CT6 leaders in the REX network, as well as the strong sense of ownership participants expressed regarding REX activities, demonstrates that even externally-funded networks can overcome embedded power imbalances, highlight participant knowledge, and empower local leaders.

In most conservation learning networks, as in the REX network, participating in network activities is generally only one among many responsibilities members have as part of their job. Without the existence of a coordinating body to lead activities and prompt interaction, network members are unlikely to have the capacity to implement and sustain activities. The support that the REX network received from the USCTI is typical of many similar learning networks in the developing world, which are often supported by foreign funding organizations. The REX network demonstrated the benefits to this approach, such as the potential for increased fiscal capacity and technical expertise. However, if learning networks have an opportunity for a local coordinating body, such an entity may be better positioned to emphasize the importance of local knowledge, encourage social learning, and sustain network functions. Learning networks should also stress to members the importance of broadening the network and disseminating lessons-learned to peers in their professional communities who are not learning network participants.

Many authors have called for the use of social network analysis in the examination of collaborative marine conservation and management programs (Alexander and Armitage, 2014; Bodin and Crona, 2009; Mills et al., 2014). Our study provides one template of an approach others can take when applying social network analysis to resource management and conservation learning networks. The network formed through the CTI-CFF REXs offers a useful example of how learning networks have the ability to cross cultural and geographical divides and encourage learning and capacity building among participants, as well as strategies that can be used to promote social learning within a network. The tangible learning and capacity development outcomes cultivated through the REX network underscore the value of and need to invest in conservation networks that support peer-to-peer social learning.

### 3. Social Capital in Collaborative Networks: A Philippine Case Study

#### **Abstract**

Marine management programs operating at ecosystem scales offer opportunities for collaboration among diverse participants and create interlinked networks of actors. In these collaborative networks, through cooperating toward shared goals, participants create and maintain relationships, build trust, and share information and knowledge – thus generating forms of social capital. Social capital is a crucial component to a network’s success and can facilitate collective action and achievement of joint goals. In this study, I present an assessment of social capital in a collaborative network in the Philippines, the Southeast Cebu Coastal Resource Management Council (SCCRMC), which links seven municipalities to jointly manage their marine resources. Using social network analysis (N = 38) and qualitative interviews (N = 15) with individuals who were most active in the SCCRMC, I explored the extent to which social capital – as evaluated through indicators of interactions, innovation exchange, and trustworthy information – developed in the SCCRMC and if social capital transcended traditional municipal management boundaries. The network exhibited a core-periphery structure, with a high density core of actors who were involved in the management and coordination of SCCRMC activities. The most central individuals in the network represented a range of municipalities, had been active in the network since its initiation, and were members of the management committee. In interviews, informants stressed the strong bonds they formed with fellow participants and how these relationships made it easier to achieve the group’s goals and mobilize outside support. The social capital created across municipal boundaries – the traditional unit of coastal resource management in the

Philippines – provides evidence regarding the ability of collaborative networks to bridge political boundaries and promote ecosystem-based management.

### **3.1 Introduction**

Since the pre-colonial era, marine policy and conservation in tropical countries have gone through many different phases. In the colonial era, traditional management systems were replaced by highly centralized policies that mirrored those of the colonizing nations (Christie and White, 2007, 1997). These systems were generally composed of command-and-control mechanisms that imposed strict sanctions on noncompliant actors and were enforced through bureaucratic government agencies (Gunningham and Sinclair, 1998; May, 2002). This top-down, centralized system presented a stark contrast to traditional systems where local communities controlled coastal areas through mechanisms such as taboos, customary marine tenure systems, and periodic closures (Cinner and Aswani, 2007; Cinner et al., 2005; Johannes, 1978). Top-down approaches often centered on single actions, such as management of one fishery stock or establishment of small marine protected areas (MPAs). In recent years, however, there has been an increasing push for expanding the ecological and social scale of marine conservation programs. These larger scale approaches focus on management of entire or larger ecosystems, bridge traditional management boundaries, and offer multi-institutional collaboration opportunities (e.g., Adger et al., 2006; Christie et al., 2009; Eisma-Osorio et al., 2009; Mills et al., 2010). Scaled-up programs involving collaboration among various institutions in a defined area occur at many different scales, from multi-national collaborations like the Coral Triangle

Initiative on Coral Reefs, Fisheries, and Food Security<sup>4</sup> to subnational programs that connect smaller units of local government who are engaged in more decentralized efforts.

Scaled-up collaborations are, in essence, environmental institutions – agreed-upon sets of rules and practices that dictate and constrain social behaviors (Keohane et al., 1993; Koremenos et al., 2001; Underdal, 2002). Environmental institutions are elements of environmental governance systems (Lebel et al., 2006) and function as interlinked networks of actors (Miles, 2006). Thus, scaled-up collaborations are also collaborative networks that foster cooperation and allow diverse stakeholders to develop shared ownership of their joint resources and environmental problems (Belaire et al., 2011; Koontz et al., 2004; Schneider et al., 2003). By creating connections among policy makers, managers, scientists, and resource users involved in environmental management, collaborative networks have the potential to lead to increased conservation successes (Knight et al., 2006; Vance-Borland and Holley, 2011).

Through cooperating toward shared goals, network participants have opportunities to create relationships, build trust, and share information – thus generating and sustaining forms of social capital (Feiock, 2008). Social capital – goodwill generated among connected actors – is an outcome of and resource produced through exchanges occurring among individuals in a network (e.g., Adler and Kwon, 2002a; Burt, 1997; Woolcock and Narayan, 2000). In collaborative networks working to achieve ecosystem management goals, social capital can facilitate collective action among members, help achieve management goals, and be a major factor in determining network success (Bouma et al., 2008; Coleman, 1988; Pretty and Ward, 2001). Three attributes of social capital – relationships, trust, and information and knowledge exchange – are highly

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<sup>4</sup> See Chapters 1 and 2 of this dissertation for a full description of the Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security.

relevant to ecosystem management networks. Exchanging ideas and disseminating knowledge and solutions are key ecosystem management network functions and have the ability to increase the network's capacity to respond and adapt to environmental problems (Crona and Bodin, 2006; Keck and Sakdapolrak, 2013; Lauber et al., 2008; Schneider et al., 2003). Participants who have strong relationships to others in the network (i.e., bonding ties) are likely to feel more comfortable exchanging information and working together (Adler and Kwon, 2002). In theory, networks with bonding ties allow for the quick flow of information and the emergence of collective norms and values that help actors achieve goals (Burt, 2005; Coleman, 1988; Lauber et al., 2008). However, networks with participants who have not worked together previously – which is not uncommon for new ecosystem management networks – are likely to be characterized by multiple subgroups of actors with shared characteristics (e.g., organizational affiliation, political jurisdiction). The tendency of actors to form ties to others with whom they share characteristics is a concept known as “homophily” (Rogers, 1995). Information exchange within a subgroup is likely to be made easier due these shared characteristics (Crona and Bodin, 2006). While a homophilous subgroup can allow for quick flow of information, it may limit infusion of new ideas and innovations and hinders information exchange among subgroups (Rogers 1995; Burt 2005). Different subgroups often have different sources of information and ideas regarding ecosystem management; thus, if there are links between the groups (i.e., bridging ties), both groups will have access to more information that can be used to help the group achieve its social and ecological management goals (e.g., Gould and Fernandez, 1989; Granovetter, 1973). Information and knowledge exchange are also facilitated by trust among actors – e.g., whether they feel comfortable with each other and believe others will follow through on their commitments (Ballet et al., 2007; Ring and Van de Ven, 1994; Thomson and

Perry, 2006). Trust is developed through repeated interactions and interpersonal contact (Burt, 2005) and creates cohesion within a group. Though it takes time for individuals to develop trust and feel comfortable freely sharing information (Bryson et al., 2006), groups that have more trust are likely to be able to achieve their goals more efficiently and effectively (Coleman 1988; Ostrom 1990).

The three elements of social capital explored in this study – relationships, trust, and information and knowledge exchange – are important to ecosystem management networks because they have the potential to facilitate collective action and help members work together toward achieving socio-ecological goals (e.g., improved ecosystem condition and resource user livelihood). Despite their importance to network function, these components of social capital are often overlooked in studies of collaborative networks, particularly for larger-scale networks operating at ecosystem levels. In practice, implementing networks that promote the development of relationships, trust, and information and knowledge exchange and harness these social capital attributes to help members achieve socio-ecological goals is a difficult process that can be hindered by many factors. For instance, information and knowledge exchange among network members are influenced by participants' availability constraints: network activities are often ancillary to the daily demands of participants' jobs (The Heinz Center, 2004). Additionally, power imbalances within a network often hinder the formation of relationships and trust and impair knowledge exchange. For instance, individuals operating at larger scales (e.g., national government actors, international donors) may exert influence over smaller scale (e.g., local government, resource user) actors, leading to inequitable and/or limited knowledge exchange among members (Reed et al., 2010). There are also likely to be power asymmetries among network actors. Individuals who are more powerful can apply their power for the good of the

network to coordinate activities and promote information sharing (Isaac et al., 2007; Weiss et al., 2012). However, in a network with power vested in too few individuals the resulting power imbalances can be detrimental to network function, creating barriers to collaboration and leading to the disenfranchisement of peripheral actors (Bodin and Crona, 2009; Muñoz-Erickson et al., 2010; Reed et al., 2010).

Given the practical difficulties in applying social capital in ecosystem management networks to help networks achieve their goals, it is important to examine whether social capital exists in collaborative networks and the extent to which it can help them achieve their goals. One tool for examining social capital in a collaborative network is social network analysis (SNA). SNA applies social network theory to describe patterns among a social network – a group of interlinked and interacting individuals and/or organizations (e.g., Borgatti et al., 2009; Wasserman and Faust, 1994). SNA has been increasingly applied to examine marine management and conservation collaborations and provide recommendations for strengthening collaborative efforts (e.g., Cohen et al., 2012; Hoelting et al., 2014; Smythe et al., 2014; Weiss et al., 2012).

I undertook a study of social capital in a collaborative network in the Central Visayas Region of the Philippines, the Southeast Cebu Coastal Resource Management Council (SCCRMC). The Philippines has a devolved governance system that grants coastal resource governance authority to municipal governments (White et al., 2006). Under this decentralized structure, municipalities can enact management actions like the development of coastal management plans and the designation of small-scale MPAs. Local communities, known as *barangays*, are also involved in coastal management and are often responsible for MPA management and enforcement. The Philippines has recently experienced a push to implement

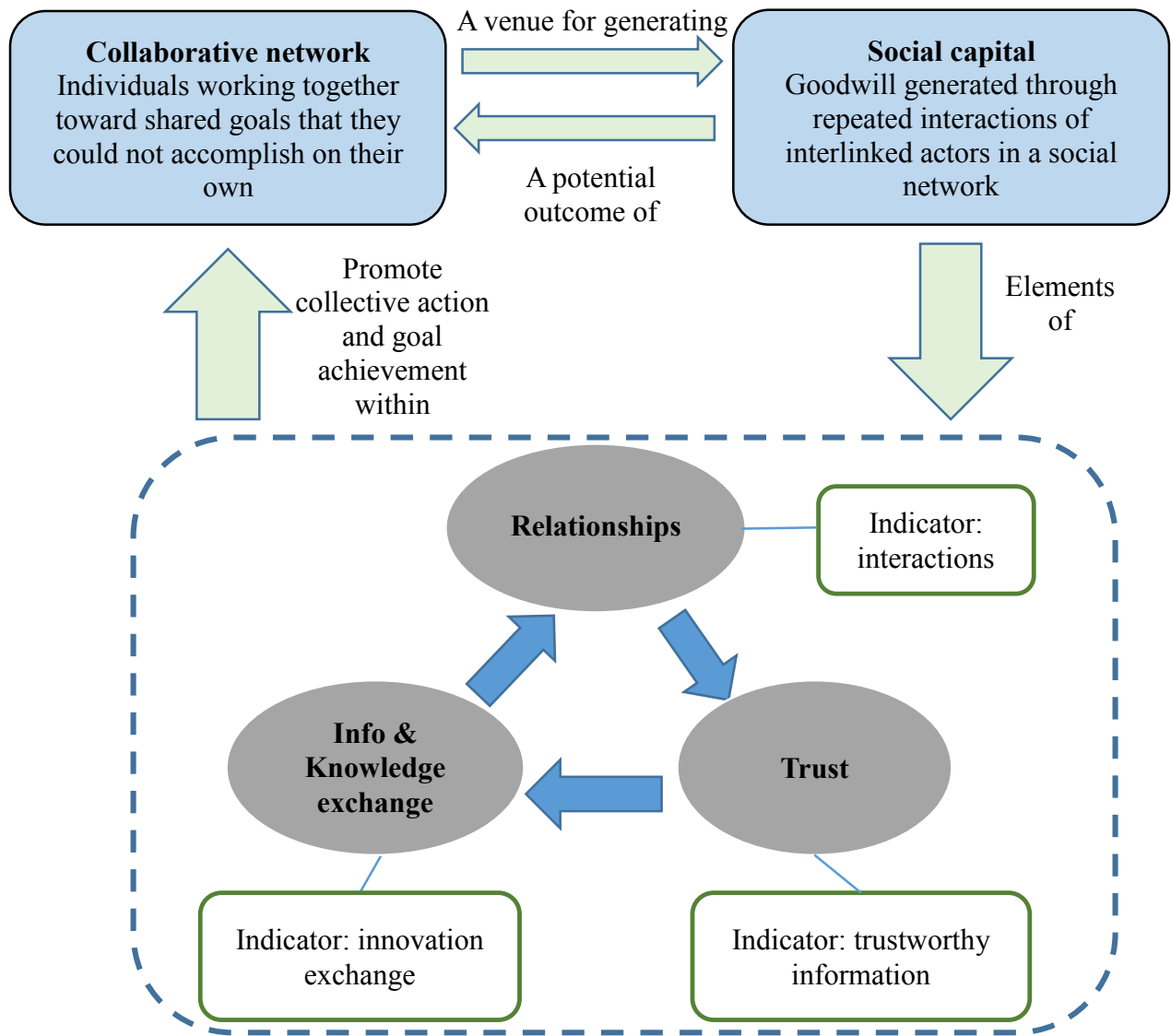
more ecosystem-based approaches, which has resulted in a number of collaborative initiatives throughout the country that link adjacent municipalities (e.g., Armada et al., 2009; Christie et al., 2009; Eisma et al., 2005). The SCCRMC represents one such initiative, and connects seven municipalities in Southeast Cebu to jointly manage their marine resources.

Understanding the extent to which social capital developed in the SCCRMC and transcended conventional municipal management boundaries provides insights regarding the role of social capital in network function. I examine relationship patterns among SCCRMC members with respect to three social capital attributes – relationships, information and knowledge exchange, and trust. Specifically, I explored the following research questions: 1) To what extent is there evidence of social capital development (as demonstrated through indicators of interactions, innovation exchange, and trustworthy information) among SCCRMC members? 2) In the SCCRMC, has social capital transcended and bridged traditional management groupings (i.e., municipalities)? 3) How can lessons learned by examining social capital in the SCCRMC be applied to strengthen the design and implementation of other collaborative networks?

## **3.2 Methods**

### **3.2.1 Analytic approach**

Collaborative networks function as venues for generating social capital. The social capital attributes explored in this study – relationships, trust, and information and knowledge exchange – are part of a feedback loop where one element (e.g., trust) can facilitate the achievement of another (e.g., information and knowledge exchange). Together, these elements of social capital promote collective action among members of a collaborative network and allow members to work together toward achieving goals they would not be able to achieve on their own (Figure 5).



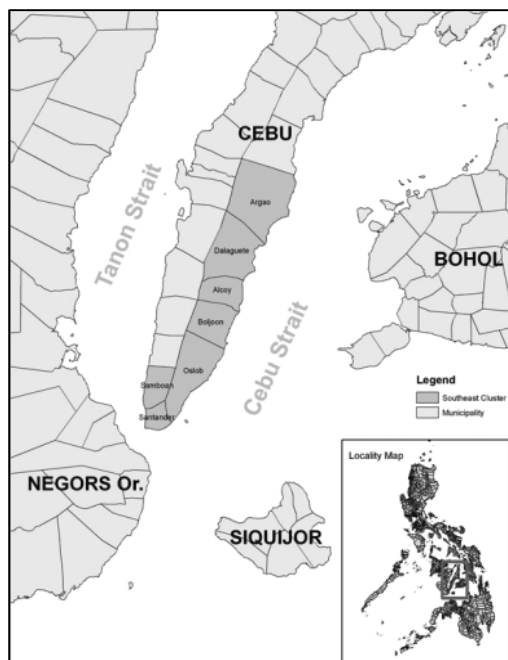
**Figure 5.** Analytic framework (based on the conceptual literature) showing the linkages between collaborative networks, social capital, and elements of social capital. The framework also highlights indicators used in this the social network survey to evaluate the three elements of social capital.

SNA offers a useful method for examining social capital in collaborative ecosystem management networks. For instance, SNA helps identify network leaders and can be used to discover which individuals in the network are most central in information and knowledge

exchange or which individuals are most trusted by their fellow network members. SNA also shows whether social capital exists among subgroups in the network, such as municipalities in the SCCRMC who were not working together previously. I complemented the SNA with semi-structured interviews in order to gather in-depth narrative data regarding participants' experiences.

### 3.2.2 The Southeast Cebu Coastal Resource Management Council

The SCCRMC is a collaborative management effort among seven municipalities in Southeast Cebu, covering an estimated 726 hectares of coral reefs and 118 kilometers of coastal shoreline (Figure 6) (Eisma-Osorio et al., 2009). Initial collaboration among the municipalities began in the early 2000's under a United States Agency for International Development project on coastal resource management (pers. comment, 2-10-12). Coastal Conservation and Education Foundation (CCEF), a domestic NGO, expanded upon these efforts from 2005 to 2009 and helped the municipalities sign an official Memorandum of Agreement and agree on collaborative activities and goals (Eisma-Osorio et al., 2009). SCCRMC activities have included establishment of an MPA network, alignment of municipal fisheries ordinances, and joint patrolling of municipal waters. The SCCRMC meets monthly and is governed by an executive committee consisting of the seven municipal vice mayors, and a management committee composed of appointed municipal coastal management staff. Despite termination of CCEF funding over six years ago, the SCCRMC has sustained itself through contributions from member municipalities (40,000 pesos, or ~\$1000 USD per year) and additional funding from provincial and national agencies.



**Figure 6.** The area of the Southeast Cebu Coastal Resource Management Council (from Eisma-Osorio et al., 2009). Municipalities that are part of the SCCRMC are highlighted in grey.

### 3.2.3 Data collection

I collected data for this study during a 7-month field season in the Philippines (December 2012 to June 2013). I used a multi-methods approach, combining semi-structured interviews, social network surveys, and participant observation at SCCRMC meetings and events. Using a complementary multi-methods approach helps validate and interpret research results (Patton, 2001). For instance, though social network analysis shows patterns of relationships and information exchange among participants, through probing participant perceptions of their experiences, qualitative interviews can further explain these patterns and offer insights as to why they occurred.

#### 3.2.3.1 Social network surveys

A research assistant and I distributed social network surveys (Appendix A) to 38 SCCRMC members. Respondents were selected by soliciting advice from members of the SCCRMC management committee and using past meeting minutes to identify individuals who

had been active (e.g., attending meetings, participating in SCCMRC-led trainings) in the SCCRMC the previous year. The initial round of respondents was asked to identify other individuals in their municipality who were also active in the SCCRMC; these individuals were then surveyed as well. At least four individuals from each of the seven municipalities were surveyed, and all of the individuals who the SCCRMC management committee indicated were active in the SCCRMC were surveyed. Although the survey did not include all individuals in the seven municipalities involved in coastal management, by surveying active SCCRMC members I targeted the core individuals active in the network. Prior to distribution, the survey was tested through cognitive interviews (Beatty and Willis, 2007; Willis, 1999) with marine management professionals to ensure clarity of survey wording and optimal participant comprehension of survey objectives and questions. Though many respondents spoke English, surveys were translated from English to Cebuano with the help of a research assistant to aid in participant comprehension of the questions.

In the survey, participants responded to a series of introductory questions regarding their current occupation and length of participation in the SCCRMC. Respondents were then asked multiple questions regarding their relationships and interactions with other SCCRMC members. Respondents were asked to indicate: a) who they interact (defined as sharing information, collaborating on projects, or serving on a committee together) with most frequently about the SCCRMC; b) which SCCRMC members have exposed them to new and innovative information; and c) which SCCRMC members they seek out for trustworthy information (a component of trust) about the SCCRMC and coastal management issues. Although there are similarities among these indicators, I chose to use separate questions to assess each element of social capital to probe carefully the different elements of social capital and potential similarities and differences

among them in the networks. All respondents completed the survey in my presence or the presence of my research assistant, and we explained the survey and the questions prior to the start of the survey. During administration of the survey, respondents were encouraged to ask questions if they were unclear about any of the questions or concepts.

Respondents were allowed to nominate up to ten individuals for each question.

Responses were used to generate three separate networks representing different indicators of social capital related to relationships, information and knowledge exchange, and trust: interaction (as an indicator of relationships); innovation exchange (as an indicator of information and knowledge exchange); and trustworthiness of information (as an indicator of trust). Due to the nature of the questions, the corresponding networks were directional and ties among actors were not assumed to be reciprocal. For instance, if Actor A indicated that Actor B had exposed her to new ideas and information, it was not assumed that actor B had also exposed Actor A to new ideas and information unless Actor B also nominated Actor A. The directionality of the network helps illustrate nuances in network structure regarding leadership and network position – e.g., who in the network is viewed as a source of information as opposed to who seeks out information from others.

The introductory questions in the survey regarding professional affiliation and length of participation in the SCCRMC were used to create a dataset of attributes for all survey respondents and to divide the network into relevant subgroups and observe relationships within and across subgroups (e.g., municipal affiliation). For individuals who were nominated by survey respondents but did not respond to the survey themselves, attribute data were derived from the identifying information (e.g., municipality, professional affiliation) survey respondents provided about those whom they nominated.

### 3.2.3.2 Semi-structured interviews

I conducted semi-structured, qualitative interviews (Weiss, 1994) with a total of 15 SCCRMC participants (Appendix C), including respondents in 6 out of the 7 municipalities active in the SCCRMC, as well as staff from assisting NGOs. Informants were selected using purposive sampling (Lonner and Berry, 1986) to target individuals with extensive experience and knowledge about the SCCRMC. All municipal informants were members of the management council and NGO representatives who had worked extensively with the SCCRMC. Interview questions addressed themes related to the nature of social capital in the SCCRMC, factors affecting collaborative sustainability, and participant perceptions of their experiences. Interview questions were pre-tested with marine management professionals with collaborative network experience to ensure question clarity. Interviews lasted between 45 to 90 minutes. All interviews were recorded (with consent from participants), and transcribed following the interview.

### 3.2.4 Data analysis

#### 3.2.4.1 Social network analysis

I conducted statistical analysis of the social network survey data using Ucinet (Borgatti et al., 2002) and visualized the data using NetDraw (Borgatti, 2002). To evaluate the nature of social capital in the SCCRMC, descriptive statistics including density, average degree, average distance, degree centralization, and fragmentation were calculated and compared for all three networks generated (interaction, innovation exchange, and trustworthy information). Network density is the proportion of actors who have ties to other actors in the network as compared to the total number of possible ties (Bodin and Crona, 2009; Wasserman and Faust, 1994). Average degree is the number of ties that an actor has to others in the network, and average distance is the average path length between two actors in the network (i.e., how many individuals are between Actor A and B). Both statistics evaluate how well connected network actors are by showing the

average number of other actors they are connected to and how far away they are from other actors, i.e., how easy is it for actors to interact with others in the network. Degree centralization is a measure of how much central actors dominate the network (Wasserman and Faust, 1994) and shows whether social capital is distributed equitably among network actors, or if it is concentrated in a smaller subgroup of individuals. Fragmentation is a metric of the proportion of actors in the network that cannot reach each other through other actors and therefore cannot interact, build trust, and share information directly with each other (Borgatti et al., 2002).

To test whether there were links among the different indicators of social capital, I applied the Quadratic Assignment Procedure (QAP) test. The QAP test uses a bootstrapping method to calculate the correlation between matrices representing different relations for the same set of actors (Haneman and Riddle, 2005; Krackhardt, 1987; Lubell et al., 2012). Using the interaction, innovation exchange, and trustworthy information networks, I calculated Jacquard correlation coefficients to determine whether there were significant correlations between each set of relationships.

To observe if social capital transcended traditional municipal management groupings in the network, I applied relational contingency analysis to statistically evaluate interactions among subgroups. Because municipal government is the typical unit of coastal management in the Philippines, I expected to find more interactions within municipal subgroups than between municipalities. Relational contingency analysis provides a mechanism to test this assumption and calculates whether internal and external links among identified network subgroups (the municipalities) are greater than would be expected by chance based on network permutations (e.g., Belaire et al., 2011; Bodin et al., 2006; Haneman and Riddle, 2005) and enabled me to determine levels of interaction among SCCRMC participants from different municipalities.

Additionally, the UCINET core-periphery function (Haneman and Riddle, 2005) was applied to all three networks. The core-periphery function uses an algorithm to calculate permuted matrices where the density of the core is maximized and the density of the periphery is minimized and assigns actors to either a high density core or a low density periphery (Borgatti and Everett, 1999; Vance-Borland and Holley, 2011). Using the core-periphery function helps further illustrate the structural characteristics of the three networks and show where social capital is most highly concentrated. Given that each municipality contains one or two individuals who are more involved in SCCRMC activities and that these individuals generally work together on the management committee, I expected many of management committee members to be part of higher density network core.

#### 3.2.4.2 Qualitative interview analysis

Interviews were coded using a mixture of inductive and deductive coding methods. Deductive coding (e.g., Miles and Huberman, 1994; Saldaña, 2010) helps test existing assumptions through the application of *a priori* codes to the data, while inductive coding (e.g., Corbin and Strauss, 1990; Glasser and Strauss, 1967) allows for common themes to emerge through the participants' narratives. First, I applied provisional and hypothesis coding techniques (Miles and Huberman, 1994; Saldaña, 2010), methods where pre-existing codes related to expected interview themes are generated, to deductively create a set of codes related to key aspects of social capital (e.g., trust, bonding relationships, and learning) and collaborative effectiveness (e.g., sustained funding, governance structure). Following deductive coding, I used inductive coding (e.g., Corbin and Strauss, 1990; Glasser and Strauss, 1967) to explore and identify common themes related to social capital and collaborative effectiveness that emerged through participants' accounts of their experiences that were not obvious from pre-existing key aspects of social capital. Throughout the coding process, analytic memos were developed to

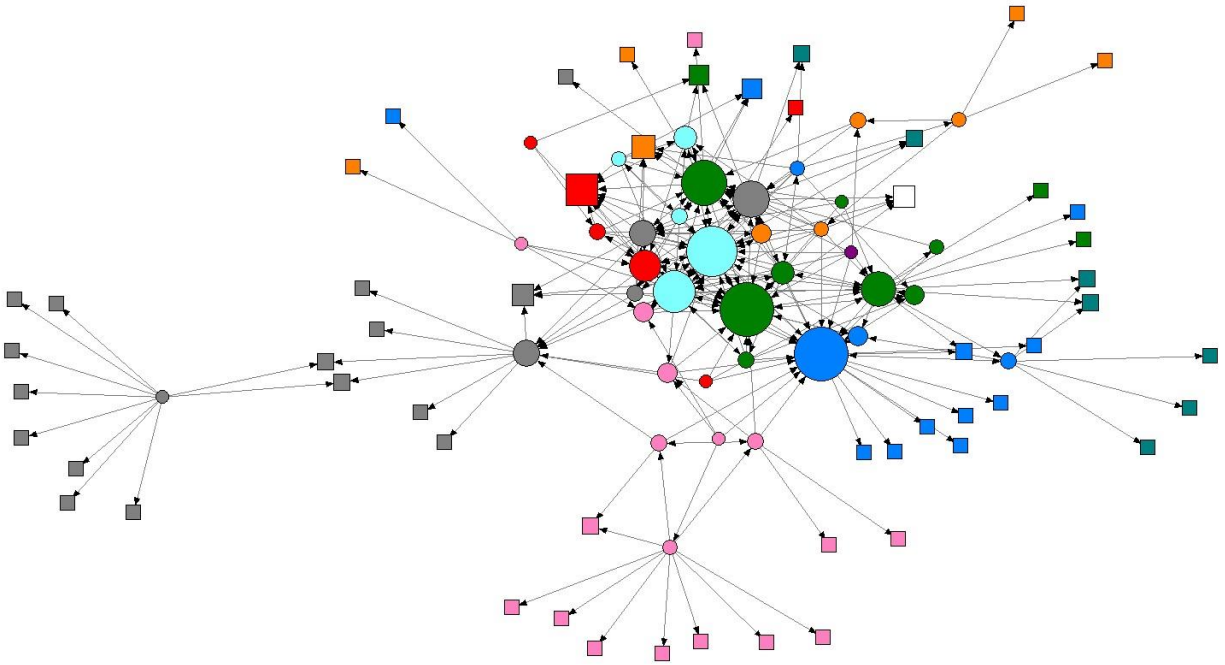
highlight potential ties between the qualitative and the social network data, emergent themes, and links to the theoretical literature on collaborative effectiveness and sustainability.

### 3.3 Results

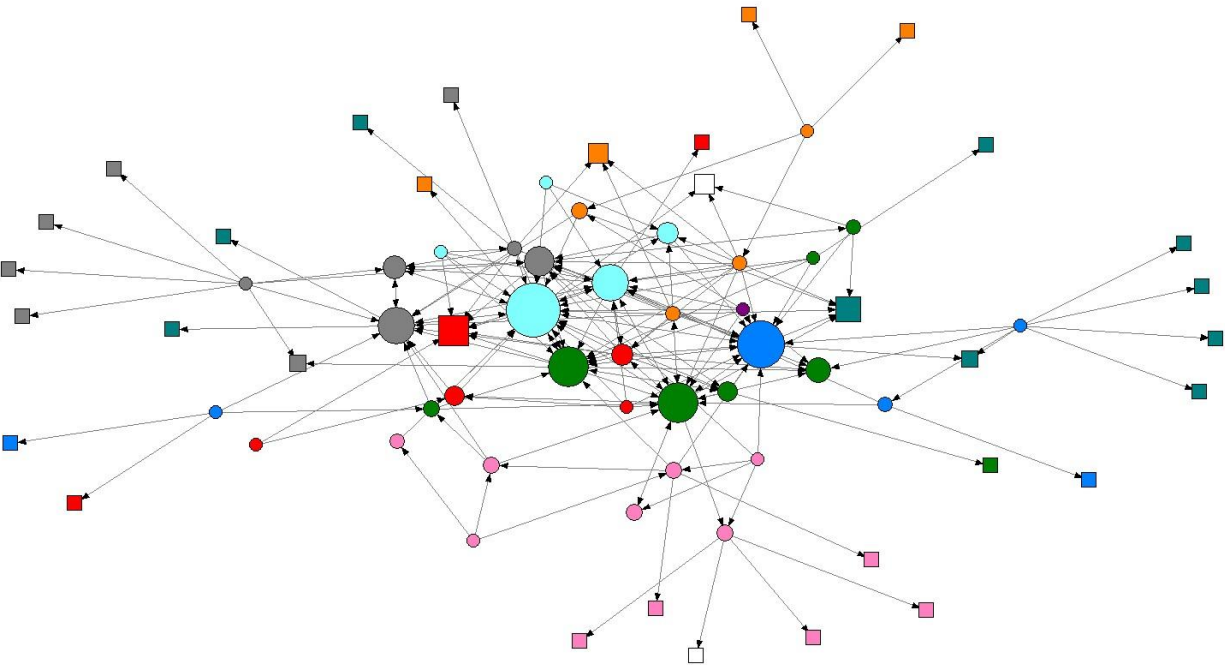
#### 3.3.1 The development of social capital in the SCCRMC

The 38 survey respondents nominated 56 additional individuals for the interaction network (94 nodes total); an additional 33 individuals for the innovation exchange network (71 nodes total); and an additional 32 individuals (70 nodes total) for the trustworthy information network (Figure 7). In all three networks, individuals were present from each of the seven participating SCCRMC municipalities, as well as one neighboring municipality and Cebu City, the capital of the province where CCEF and national and provincial environmental staff are generally based (Table 4). In the interaction and the innovation exchange networks, the highest percentage of individuals were from member municipalities (Dalaguete, 22.34%, and Samboan, 16.90%, respectively), though in the trustworthy information network the highest percentage of individuals (30%) was from Cebu City and were NGO and national agency staff. For organizational affiliation, municipal staff represented the highest percentage for all three networks, though coastal law enforcement staff (individuals who were part of the *bantay dagat*, the *barangay* coastal law enforcement teams) and elected officials were also strongly represented in the networks (Table 4). With the exception of coastal law enforcement staff, there was limited representation of other *barangay* representatives (e.g., other individuals who are part of the *barangay* MPA management committees; *barangay* officials) in the networks, with the interaction network having the highest percentage (10.64%). The interaction network did not contain any isolates, but the innovation exchange and trustworthy information networks contained one isolate – i.e., an individual who chose not to respond to the question and thus was not linked to any others in the network. Isolates were removed from the network diagrams.

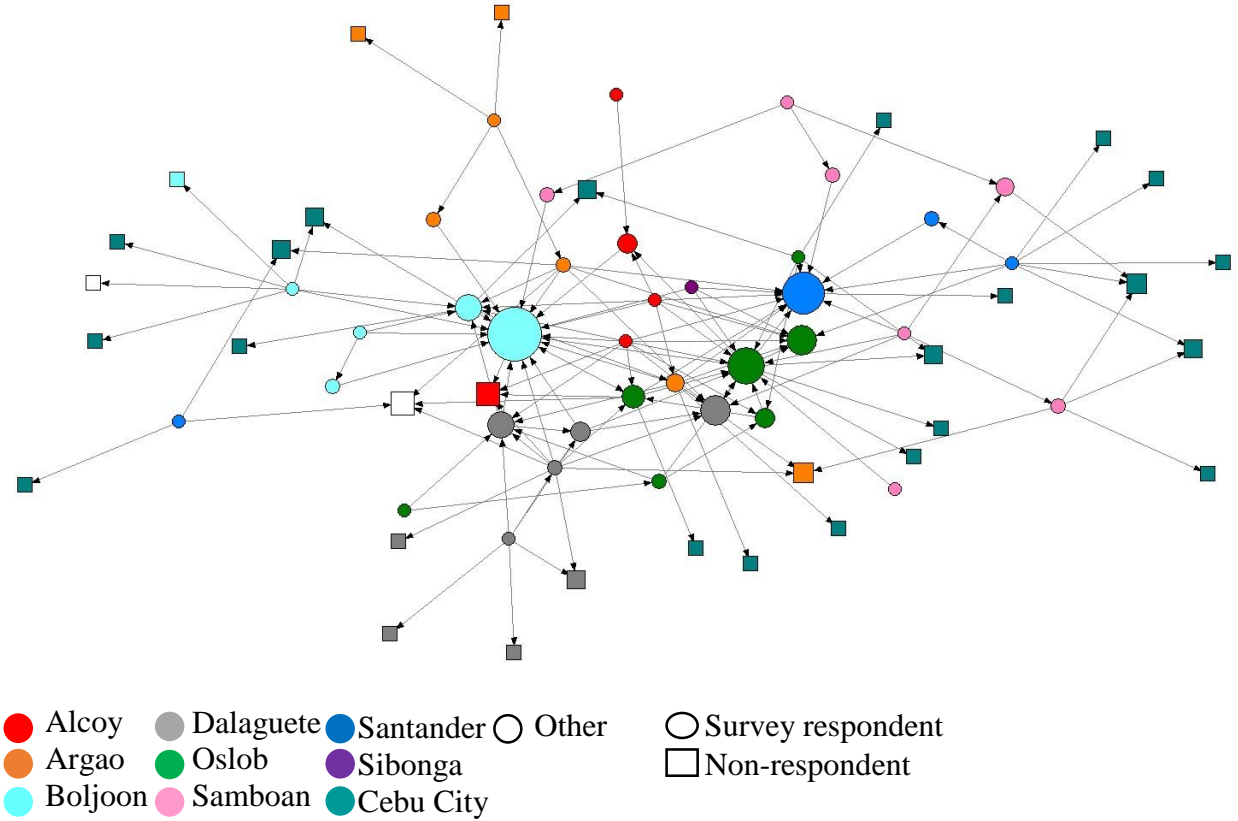
a) Interaction network



b) Innovation exchange network



c) Trustworthy information



**Figure 7.** The three SCCRMC social capital networks. The diagrams show the networks for: a) interaction (94 nodes, 267 ties), where members were asked, “thinking about the past 12 months, who have you interacted with most frequently about the SCCRMC?” b) innovation exchange (70 nodes, 189 ties), where members were asked, “which members of the SCCRMC have exposed you to new or innovative ideas and information?” and c) trust (69 nodes, 139 ties), where members were asked, “who do you turn to for trustworthy information about the SCCRMC or related issues?” Networks are scaled with spring embedding so more similar nodes are closer together, and all nodes are sized by in-degree centrality. Circular nodes indicate individuals who responded to the survey; square nodes indicate non-respondents.

All three networks demonstrated a low density, sparsely connected structure, though the density of the innovation exchange network was the highest (0.038) and trustworthy information was the lowest (0.029) (Table 5). Low density is partially attributable to the sampling methods; respondents were confined to nominating no more than ten individuals for each question, thus limiting the number of possible ties in the network. The sparsely connected structure was reflected in low average total degree scores, ranging from 1.99 in the trustworthy information

network to 2.84 in the interaction network. All three networks had moderate in-degree centralization, with the innovation exchange network having the highest at 25.12%, suggesting that the innovation exchange network is more dependent on a few central individuals for new and innovative information about the SCCRMC. Despite the higher centralization scores, all three networks had low undirected fragmentation scores, ranging from 0 in the information exchange network to 0.029 in the trust network, which indicates that pathways exist allowing most actors in the network to reach each other. QAP correlation results suggested modest significant correlations between types of social capital indicators. The correlation between trustworthy information and innovation exchange was the highest ( $r = 0.3173, p = 0.0002$ ), which is not surprising given that these two indicators both relate to types of information shared. The correlation between interaction and innovation exchange was the next highest ( $r = 0.2773, p = 0.0002$ ), with the correlation between interaction and trustworthy information as the lowest ( $r = 0.2119; p = 0.0002$ ).

The central members in each network were individuals who had been involved in SCCRMC activities for a number of years and were generally members of the management committee. The top three most central individuals were the same for all three networks: a municipal employee from Oslob, a municipal employee from Boljoon, and a member of the SCCRMC coastal law enforcement team from Santander. The importance of these management committee members, as well as the high in-degree centralization scores (particularly for the innovation exchange network), suggest the importance of management committee members to social capital in the SCCRMC.

**Table 4.** Network composition by municipality and organizational affiliation of the information exchange, innovation diffusion, and trustworthy information networks. <sup>1</sup> = member municipality; <sup>2</sup> = non-member municipality or city.

	<b>Interaction</b>		<b>Innovation Exchange</b>		<b>Trustworthy information</b>	
	<i>Number of Actors</i>	<i>Percentage of Network</i>	<i>Number of Actors</i>	<i>Percentage of Network</i>	<i>Number of Actors</i>	<i>Percentage of Network</i>
<b>Municipality</b>						
Alcoy <sup>1</sup>	6	6.38	7	9.86	5	7.14
Argao <sup>1</sup>	9	9.57	8	11.27	7	10.00
Boljoon <sup>1</sup>	5	5.32	5	7.04	6	8.57
Dalaguete <sup>1</sup>	21	22.34	11	15.49	9	12.86
Oslob <sup>1</sup>	11	11.70	9	12.68	8	11.43
Samboan <sup>1</sup>	18	19.15	12	16.90	7	10.00
Santander <sup>1</sup>	15	15.96	6	8.45	4	5.71
Sibonga <sup>2</sup>	1	1.06	1	1.41	1	1.43
Cebu City <sup>2</sup>	7	7.45	10	14.08	21	30.00
Unknown	1	1.06	2	2.82	2	2.86
<b>Organizational affiliation</b>						
Municipal staff	30	31.91	28	39.44	22	31.43
Coastal law enforcement staff	20	21.28	8	11.27	8	11.43
Other <i>barangay</i> staff	10	10.64	4	5.63	2	2.86
Provincial staff	2	2.13	3	4.23	5	7.14
National agency staff	2	2.13	5	7.04	4	5.71
NGO staff	6	6.38	7	9.86	14	20.00
Elected municipal official	17	18.09	13	18.31	10	14.29
Police	2	2.13	3	4.23	3	4.29
Unknown	5	5.32	0	0.00	2	2.86

**Table 5.** Descriptive network statistics for the information exchange, innovation diffusion, and trust networks.

	Interaction	Innovation exchange	Trustworthy information
Network Size	94	71	70
Isolates	0	1	1
Pendants	42	28	24
Number of Ties	267	189	139
Density	0.031	0.038	0.029
Average Degree	2.84	2.662	1.986
Centralization (Outdegree)	7.781	10.633%	11.783%
Centralization (Indegree)	18.65%	25.122%	22.075%
Fragmentation (directed)	0.734	0.769	0.882
Fragmentation (symmetric)	0	0.028	0.029
Average Distance	2.681	2.492	2.397

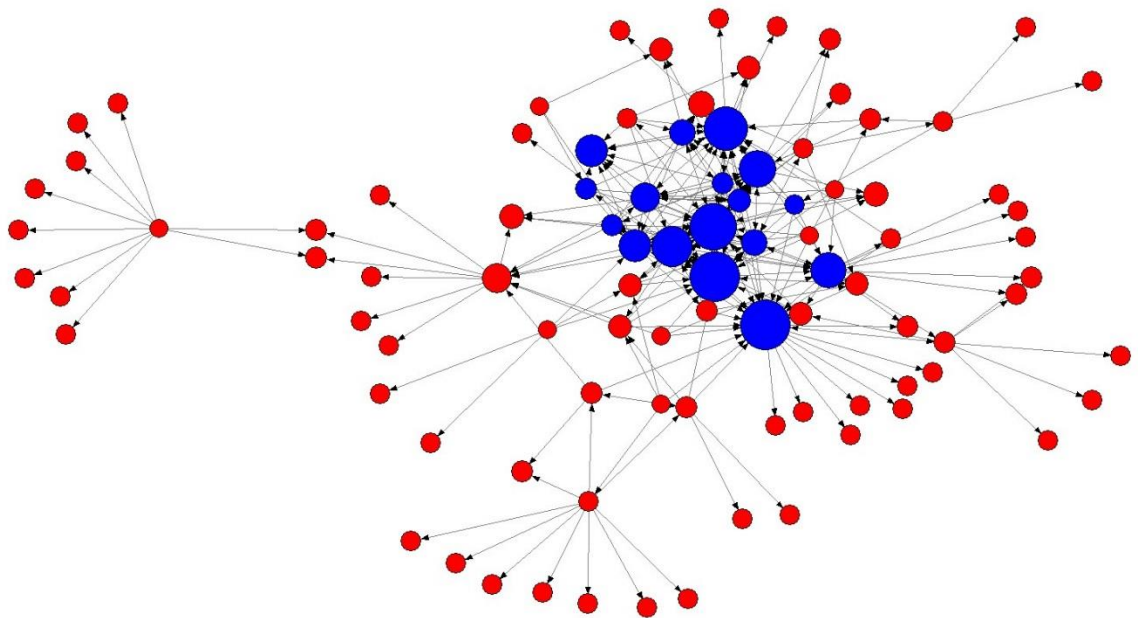
### 3.3.2 Social capital and network subgroups

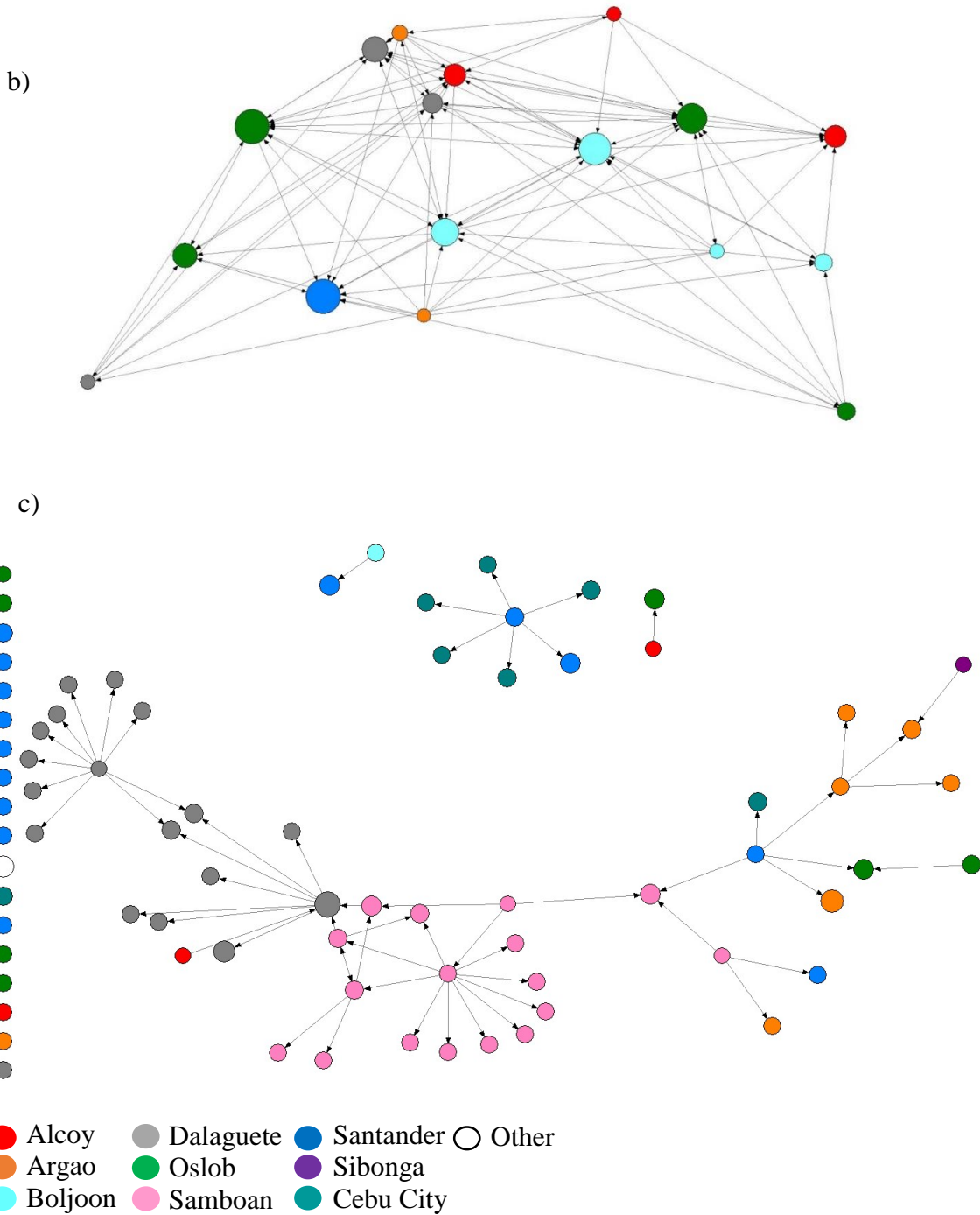
When partitioning the network by municipality to see if there was evidence of greater social capital between as opposed to within municipalities, relational contingency analysis produced no significant results (interaction:  $\chi^2 = 102.71$ ,  $p = 0.92$ ; innovation exchange:  $\chi^2 = 86.20$ ;  $p = 0.99$ ; trustworthy information:  $\chi^2 = 141.04$ ,  $p = 0.45$ ). The lack of significance indicates that ties of social capital within and between municipalities were not significantly greater than would be expected by chance in random networks of the same size. These results suggest that contrary to my expectations of finding stronger connections within municipalities than between them, the networks did not exhibit significant structural groupings based on municipal affiliation.

While the networks did not contain distinct structural groupings by municipality, all three demonstrated a core-periphery structure, with a more densely connected core and a less connected periphery. The Core-Periphery test in UCINET yielded a core of 17 individuals for the interaction network, with a density of 0.364 among the core, as compared to a density of 0.044 between the periphery and core, and 0.010 among peripheral actors (Figure 8). For the

innovation exchange network, the core contained 15 individuals, with a density of 0.357 among the core, 0.051 between periphery and core actors, and 0.013 among peripheral actors. In the trustworthy information network, the core had 17 members, with a density of 0.206 among the core (the lowest core density of the three networks), 0.030 between the periphery and the core, and 0.013 among peripheral actors. There was an overlap of actors in the core of each network, with 11 actors who were present in the core of all three networks. The 11 overlapping core actors represented six out of seven member municipalities, and as expected the members of the management committee were part of the core with 10 out of the 11 actors were or had been members of the SCCRMC management committee. Samboan was the only member municipality without any representatives in the network cores.

a)





**Figure 8.** An example of the core-periphery structure in a) the interaction network (94 nodes, 267 ties), color-coded to show the core (blue) vs. the periphery (red), with nodes sized by in-degree centrality; b) the high density (17 nodes; 99 ties; density = 0.364) core of the interaction, color-coded by municipality and sized by in-degree centrality in the entire network; c) the low density periphery of the interaction network (77 nodes; 60 ties; density = 0.044), color-coded by municipality and sized by in-degree centrality in the entire network.

### 3.3.3 Social capital and network effectiveness

While the social network analysis demonstrated that social capital was created among individuals from different municipalities in the core of the network and that SCCRMC members were central to social capital ties in all three networks, the interviews elucidated how social capital influenced the effectiveness and sustainability of the SCCRMC. For instance, in discussing the relationships they developed with other SCCRMC members, many participants stressed the strength of these bonds and how close they felt with fellow members. They described how the strong bonds they maintained made it easier to communicate and share information with other SCCRMC members and that they also increased their enthusiasm for participating in the network:

“And we feel the brotherhood, sisterhood of the working group and we find harmony in working [together].... So we can really communicate anytime, anywhere. We can call each other up.” – Santander participant

“It’s brotherly, it’s sisterly, the bonding that we have.... If I have a problem or query....I don’t hesitate to ask [other SCCRMC members] directly.... They answer directly, you know. The bonding is strong...it’s very nice.” – Dalaguete participant

Informants also highlighted how participating in the SCCRMC and the strong connections with other members helped the network come together to achieve its goals, such as joint enforcement of municipal waters:

“[There are] more apprehensions because of the cluster. Local government units have more apprehensions because the cluster provides the trainings [and members] gain knowledge.” – Dalaguete participant

“Fish have no boundaries, and we cannot...enforce our rules or ordinances outside of our municipality. That’s why through this...clustering [it] enabled us to apprehend violators outside our jurisdiction. So that’s one of the rationale, why we enter this clustering.” – Alcoy participant

The social capital formed within the SCCRMC allowed the council and participants within it to respond constructively to negative external social and ecological stressors. In discussing a 2012 typhoon (Typhoon Pablo) that degraded many of the coral reefs in Southeast Cebu, informants noted how through the SCCRMC and with the assistance of CCEF they were able to respond to the damage to their reefs:

“Last December 4, the typhoon came and we almost [went] back to zero...I requested the CCEF to conduct this [coral reef] assessment for [the SCCRMC]. What if the area is already hopeless; what’s the use of continuing to protect it as an MPA.... But the initial recommendation is there is still a chance to recover what is needed - protection, continued protection.” – Boljoon participant

“Of course the CCEF has given us some insights about rehabilitation of [the] coral reef. Meaning coral reef[s] can be rehabilitated, meaning if you have sandy coastal areas it can be rehabilitated through planting, with the technology. And I think [that is] one example of some new insights that can be learned through the council.” – Argao participant

Other participants stated that because of the strength of the group, they were able to address internal problems, such as a participating municipality who was not as active as the others and had high levels of illegal fishing:

“The remaining six municipalities are very strong in the cluster. So the cluster can move even if [the other municipality] separate[s].” – Dalaguete participant

“It’s very insulting if you talk directly with them. But at least when we share...our reports, at least they know that we doing our best in protecting our coastal waters. So at least [we] hope that they will also be encouraged to do so in the future.

The social network analysis demonstrated that management committee members were viewed as network leaders and key sources of information. This theme was reflected in interviews: SCCRMC members spoke at length regarding the council’s governance structure. For instance, informants discussed how the management council provided continuity for SCCRMC activities and helped address issues that necessitated additional effort either before or after monthly meetings of the entire council:

“We have [the] CMC – the cluster management committee – [which] will convene to tackle the issues that could not [be] resolve[d] during the monthly meetings of the SCCRMC.” – Dalaguete participant

“[The] executive director will convene the cluster management [committee] if there are very important tasks so that prior to the...presentation of that issue to the [entire] council, the cluster management committee [will] be convinced of that purpose.” – Alcoy participant

SCCRMC participants cited the lessons they had learned through the network as one of the greatest benefits of their participation and discussed how sharing information with and learning from other participants increased capacity to manage coastal resources in their own municipalities.

“We found out during our series of meetings that one municipality is expert in one thing, like apprehension...and the other municipality is very slow. So what we did is we practiced this outsourcing...it’s more of an exchange of expertise [between municipalities].” – Boljoon participant

“Every meeting each municipality has to speak about their experience for that month in terms of coastal law enforcement and what are the problems [they encountered] and action[s] taken so that each municipality that [is attending] can replicate...the good deeds [other] municipalities have [implemented]. So we keep on exchanging ideas every meeting.” – Alcoy participant

Though social capital existed among municipal coastal managers and others who participate regularly in SCCRMC meetings – including elected officials, coastal law enforcers, and a few national agency representatives – there were limited links from the municipal level to the *barangay* level. Many community members in coastal *barangays* are active in coastal management and participate in activities that contribute to SCCRMC goals through participation in community organizations, the *barangay* council, or MPA management committees. Although *barangay* staff and *bantay dagat* members were present in all three networks (particularly in the interaction network), the majority of these individuals were on the networks’ peripheries and were not well connected to network leaders. The limited representation of *barangay*

representatives in the innovation exchange and trustworthy information networks is partially an artifact of sampling methods, as only 21% of respondents were *barangay* representatives. In the interviews, participants discussed ways in which *barangay* members were informed of SCCRMC activities and lessons:

“The key leaders in the coastal areas will be invited by the host municipality during the meeting...the *barangay* councilor, chairman of [the] environment...the *barangay* captain, the *bantay dagat* – [they] were invited.” – Alcoy participant

“Every month, even if there is no council meeting, in our locality...we are also conducting information [campaigns] so that [the *barangay*] will know how the council operated and what the program of the council is.... We have real transparency, yeah?” – Oslob participant

Despite these mechanisms for vertical dissemination from municipal managers to *barangay* members, NGO staff who worked at both the *barangay* and municipal level expressed doubts regarding the community’s familiarity with SCCRMC activities:

“I think [the SCCRMC] involves the community, but in terms of meetings, only a few. I think only a few are invited due to perhaps funds because they provide the lunch, and...if they invite all the [community organizations], the fisherfolk organizations, it also involves funds.” – NGO staff

“[The community members] are probably aware that there’s a council. But to what extent the council is helping them, they don’t know. They know the council exists. Why? Because during meetings, like for example, they have a rotation [among] municipalit[ies].... So, [that] probably helps in the awareness aspect of the existence of the council, but, you know, in a year probably one or two meetings [are held] in [each] municipality, so fishermen really [don’t] know if [the] issue brought up at the previous meeting was addressed, or if there [was] impact.” – NGO staff

A final theme informants touched upon was the gradual development of a shared group identity, which they felt made it easier to achieve the network’s goal and sustain its activities, particularly in relation to mobilizing resources and gaining outside support:

“Maybe that’s the reason why we are getting assistance [from the province] – because at least they can see the council is strong...they trusted us, they are confident giving to us...[because] it produces good results and good accomplishment[s].”- Argao participant

“Our vice mayor of Alcoy [was] the first chairman [of the SCCRMC]. And he was so convinced, he was very supportive of the council. He kept on encouraging other

municipalities to participate in the council. Now we have already reached the stage where at least the rest...we are already convinced of the effectiveness of the council. So that's why even without CCEF we can already stand." – Argao participant

### 3.4 Discussion

The objectives for this study were to examine the extent to which social capital developed within the SCCRMC, explore whether social capital bridged traditional municipal management groupings, and consider how the lessons learned from the SCCRMC could be applied to the design and implementation of other collaborative networks. I found that social capital – as evaluated through interaction, innovation exchange, and trustworthy information, which were used as indicators for relationships, information and knowledge exchange, and trust, respectively – had formed across municipal boundaries among SCCRMC participants. All three networks exhibited a core-periphery structure (e.g., Borgatti and Everett, 1999), with a high density core of actors who were involved in the management of the SCCRMC and a strong overlap of core members in each network, and a low-density periphery with actors who were less connected to the core. In interviews, informants stressed the strong bonds they established with their fellow participants and how these relationships made it easier to work together toward achieving the SCCRMC's goals and gain outside support. Though some participants discussed how lessons were disseminated from the municipal to the *barangay* level, others expressed doubts about whether *barangay* members were fully aware of SCCRMC activities and their effects.

Opportunities for strengthening vertical integration were also apparent in the social capital indicator networks, particularly the innovation exchange and trustworthy information networks, which contained limited presence of *barangay* representatives. A potential limitation to these findings is that the survey methods imposed boundaries on the network through confining the number of individuals a respondent could nominate and using an ego-centric approach to

identifying survey respondents. This may have led to individuals who are active in the SCCRMC not being represented in the network, or existing connections among members not being shown; however, the sample included individuals who are highly active in the SCCRMC and thus provides a useful subset for analysis of the network. In this section, I will discuss these findings in relation to the ability of the SCCRMC to foster social capital across municipal boundaries and the links between social capital and network effectiveness and sustainability.

#### 3.4.1 Social capital and network subgroups

The lack of significance for the contingency analysis for all three networks indicates that municipal affiliation is not a controlling factor in the structure of the interaction, innovation exchange, and trustworthy information networks; neither relationships within nor between municipalities were greater than would be expected by chance in random networks of the same size. This implies that the SCCRMC promoted the generation of social capital among individuals from different municipalities and that municipal affiliation did not hinder the development of social capital among participants. This was a surprising finding since many collaborative networks demonstrate strong relationships within subgroups based on shared characteristics (e.g., Belaire et al., 2011; Crona and Bodin, 2006; Hoelting et al., 2014). As many informants noted, municipalities in Southeast Cebu were not working together prior to the formation of the SCCRMC. Participation in the council is thus responsible for the development of social capital among members. The inter-municipality social capital in the SCCRMC demonstrates the ability of collaborative networks to promote the development of new connections among participants across traditional subgroup boundaries. A few other studies have also documented the ability of collaborative resource management networks to bridge geographical and organizational management boundaries. Schneider et al. (2003), for instance, found that a watershed partnership promoted collaboration among participants and created linkages across levels of government;

these bonding relationships increased collaborative effectiveness. Similarly, Mandarano (2007) found that in a watershed partnership between New York and New Jersey, strong bonding linkages were created among participants, which facilitated information sharing and promoted network success.

While municipal affiliation was not the main factor influencing the structure of social capital in the SCCRMC, the networks each exhibited a core-periphery structure dominated by individuals who were or had been management council members. Combined with the high in-degree centralization scores of management council members, this indicates that SCCRMC participants view management council members as network leaders and key sources of new information. The interviews highlighted how the dense relationships among SCCRMC leadership helped foster shared norms and trust in the group, which are tools that can be harnessed to aid the SCCRMC in achieving its goals (Burt, 2005; Lauber et al., 2008). Centralized networks like the SCCRMC offer efficient structures for disseminating information, integrating the knowledge of different participants, and encouraging collective action (Crona and Bodin, 2006; Fischer et al., 2014; Mills et al., 2014). However, for the SCCRMC and other similar networks, a decentralized structure may be more advantageous for forming consensus among participants (e.g., municipal managers, municipal elected officials, and *barangay* representatives who regularly attend SCCRMC meetings), providing equitable access to information, and increasing the network's problem solving abilities (Mills et al., 2014; Smythe et al., 2014). In the SCCRMC, the central actors served as active bridges between network subgroups, thus providing a mechanism for sharing divergent sources of information with individuals who might not otherwise have access to it (Bodin and Crona, 2009; Newig et al., 2010; Smythe et al., 2014). Additionally, the low fragmentation of the network and presence of

peripheral actors who were often *barangay* representatives demonstrate that there are some potential pathways for engaging local communities. Although centralized networks can be vulnerable to the removal of key individuals (Bodin and Crona, 2009; Muñoz-Erickson et al., 2010; Newig et al., 2010), the multiple actors present in the SCCRMC network cores are likely to increase the resilience of the network to the removal of central actors.

A feature of the SCCRMC evident in the social network analysis and through the interviews was the limited representation of community representatives in the innovation exchange and trustworthy information networks. This suggests opportunities for increasing diffusion of new coastal management information and ideas from the municipal to the *barangay* level. Many of the SCCRMC's goals (e.g., joint enforcement against entry of commercial fishers into municipal waters, aligning fisheries ordinances) operate at the municipal level (Eisma-Osorio et al., 2009), and thus the generation of social capital among municipal managers is an important network outcome. The low representation of *barangay* representatives in the innovation exchange and trustworthy information networks may be a partial artifact of sampling individuals identified as being active in the SCCRMC and not sampling a wider range of individuals involved in community-level coastal management. However, the need to diffuse elements of social capital such as knowledge exchange beyond active network members and to the broader community is often cited as an important network function (Manring, 2007; Reed et al., 2010) and one that SCCRMC members and others in similar collaborative networks should consider. Community members who are informed and educated about coastal management activities are more likely to be supportive of them and motivated to comply with management measures (Howe, 2001; Liebowitz, 2007). Eisma-Osorio et al. (2009) particularly highlighted the need for the SCCRMC to engage *barangay* stakeholders in SCCRMC management decisions and

to help coordinate MPA management among *barangays* in different municipalities. Some of the SCCRMC's main goals, like continued implementation of a network of MPAs and successful enforcement against destructive fishing practices, are highly dependent on the actions of *barangay* members since MPAs are established at the *barangay* level and managed by *barangay* members. Thus, for the SCCRMC awareness in *barangays* of SCCRMC activities and social capital between municipal managers and *barangay* members has the ability to influence the success of SCCRMC activities.

While the opportunities for the SCCRMC to foster social capital between the municipal and *barangay* level could help increase support for and collective action toward the achievement of SCCRMC goals, it is also important for the network to link to provincial and national agencies, as well as NGOs. National agencies and NGOs often may be able to provide additional financial or technical support to collaborative networks. Demonstrating legitimacy and value to individuals outside of the network, like those in provincial and national agencies, is an important component of network success as it can help garner political support and funding (Bryson et al., 2006; Provan and Kenis, 2007; Provan et al., 2008). In a 2009 assessment of the SCCRMC, Eisma-Osorio et al. (2009) stressed the importance of assisting NGOs and government agencies providing technical trainings for participating municipalities to improve the capacity of the network to achieve its goals. Similarly, in observing community perceptions of MPA success for MPAs in the SCCRMC and in Danajon Bank, Christie et al. (2009) found that perceptions of the technical skill of assisting NGOs were significantly correlated with perceived increases in fish abundance. Although CCEF ended its official support for the SCCRMC in 2009, it has continued to provide technical expertise upon request, particularly in response to adverse ecological events, like the 2012 typhoon. Other studies have highlighted how donor-funded coastal management

programs often fail once donor support ends (e.g., Gurney et al., 2014; Pollnac and Pomeroy, 2005). However, as a domestic NGO (as opposed to a foreign organization, like many donor supported projects) CCEF informants who were interviewed spoke of how CCEF has been able to provide more passive assistance to the SCCRMC despite the close of its official program. This support has proven to be a great asset to the operations and confidence of the SCCRMC.

#### 3.4.2 Social capital and collaborative network effectiveness

The high centrality scores of the SCCRMC management council members, as well as their membership in the network core, suggest the strength of the network's governance structure. Governance is instrumental in collaborative network success, and provides a mechanism for streamlining information exchange and network operations (Bryson et al., 2006; Provan and Kenis, 2007; Stone et al., 2010). The participant-governed structure employed by the SCCRMC is a highly flexible and adaptable structure and facilitates close relationships among members (Provan and Kenis, 2007). For the SCCRMC, pairing the participant-governed structure with an internal management subgroup helps streamline and increase the efficiency of network efforts and provides a central mechanism through which information can flow (Cohen et al., 2012; Provan et al., 2008).

The ability of the SCCRMC to foster social capital among network subgroups, as well as to higher level agencies and NGOs, has many implications for the network's effectiveness and sustainability. Cohesive networks with strong bonds and social capital among participants, like those in the SCCRMC, can help develop collective norms, strengthen group trust, and promote collective action toward network goals (Adler and Kwon, 2002; Coleman, 1988; McEvily and Reagans, 2003). Social cohesion and strong social capital within a network also help create a more resilient social system that is able to respond and adapt to socio-ecological changes (Keck

and Sakdapolrak, 2013; Tompkins and Adger, 2006). For the SCCRMC, the social capital within the group helped them respond constructively to typhoon damage to their coral reefs and problems with a member municipality who was still engaging in fishing activities prohibited by the SCCRMC, such as commercial fishing in municipal waters.

The social capital among municipalities offers multiple pathways for sharing new ideas and information that can be applied to strengthen municipal capacity. Informants stressed the importance of the lessons they learned from fellow SCCRMC participants at monthly meetings, and how it provided them with new practices that they then implemented in their own municipalities, thus strengthening municipal management capacity. The low density structure of the innovation exchange network may further its ability to promote innovation diffusion and learning among members. Networks with dense connections are often composed of individuals with similar perspectives and knowledge, thus limiting exposure of network members to new ideas (Bodin and Crona, 2009; Coleman, 1988; Ernston et al., 2010). However, low density networks composed of many subgroups are more likely to concentrate different types of information (e.g., Belaire et al., 2011; Burt, 2005; Crona and Bodin, 2006; Newig et al., 2010). Other analyses of ecosystem management networks have found that low density networks contain individuals with different experiences and knowledge and thus offer increased opportunities for innovative ideas to enter the network and increase the network's capacity to achieve ecosystem management goals (Belaire et al., 2011; Smythe et al., 2014).

### **3.5 Conclusions**

Though collaborative ecosystem management networks have varying contextual factors that influence them, the findings of this study regarding the role of social capital in the SCCRMC have implications for the design and implementation of other ecosystem management networks.

The social capital developed across municipal boundaries – the conventional unit of coastal management in the Philippines for the past three decades – provides new empirical evidence regarding the ability of networks to bridge political boundaries and promote ecosystem-based management. The governance structure of the SCCRMC and the emergence of management committee members as network leaders highlights how coherent governance can influence a network's success and sustainability, even after the termination of outside assistance.

The strong bonds formed among SCCRMC members, the emergence of a collective identity, and the multiple pathways of information sharing emphasize the ways that a collaborative network can strengthen management capacity and mobilize individuals toward shared goals. Although the formation of network connections among members is instrumental to success, it is important to ensure that there are mechanisms for creating connections beyond the network. Links beyond the network may be to higher levels of government (like provincial and national agencies for the SCCRMC) who can provide financial and technical support for activities, or to community members who are also active in ecosystem management and whose actions will influence a network's ultimate success. Ties to assisting NGOs, who may be able to provide technical expertise and support, even without long-term fiscal contributions, are also an important factor in a network's development and implementation. The connections between CCEF and the SCCRMC offer a potential model for other NGOs who are assisting similar collaborative networks. Although assistance is likely to be project-based and have a limited term, an NGO who provides moral support and continues to stay in contact with the network helps the network access technical expertise when needed and feel confident about its ability to achieve defined goals.

This study contributes to the growing body of literature highlighting the role of social capital in collaborative ecosystem management, and provides an empirical approach assessing different elements of social capital that can be applied to other collaborative networks. The lessons learned regarding the role of social capital in the SCCRMC can be used in the design and implementation of other collaborative networks both in the Philippines and globally. The SCCRMC's ability to foster social capital among participants and harness it to work toward the network's socio-ecological goals highlights the potential benefits of well-designed collaborative networks.

## Chapter 4: Comparing social capital in two subnational marine management networks in the Central Visayas Region, Philippines

### Abstract

Natural resource management programs often apply collaborative approaches fostering cooperation among diverse partners to address socio-ecological problems that partners could not address on their own. Collaborative programs create interlinked networks of actors and can generate social capital, a resource that can be used to facilitate collective action and help network members work together more effectively toward achieving shared goals. I explored the links between social capital and collaborative effectiveness by comparing two marine management networks in the Philippines – the Southeast Cebu Coastal Resource Management Council (SCCRMC) and the Danajon Double Barrier Reef Management Council (DDBRMC). Through qualitative interviews and participant observation, I analyzed the development of social capital in the networks and how it supported network function. I found that each network developed varying levels of social capital among participants. In the SCCRMC, which had sustained itself over a longer period of time, strong member relationships facilitated establishment of network goals and a coherent governance structure. As a network with a larger geographic extent and entailing more government units than the SCCRMC, the DDBRMC struggled to establish an effective governance system and accountability mechanisms. Although participants gained capacity through the network, they were unable to sustain activities without outside funding. The lessons learned through the DDBRMC and SCCRMC demonstrate the benefits and challenges of collaborative networks, and highlight strategies for networks to sustain their activities.

## 4.1 Introduction

Over the past few decades and as an alternative to top-down governance processes, natural resource management programs have increasingly turned to collaborative approaches (Koontz et al., 2004; Lauber et al., 2008; Lubell, 2004). Collaborative ecosystem management programs foster cooperation and allow diverse stakeholders to develop shared ownership of their resources and environmental problems (Schneider et al., 2003; Belaire et al., 2011). These programs function as environmental institutions that dictate and constrain activities (Keohane et al., 1993; Koremenos et al., 2001; Underdal, 2002) and create interlinked networks of actor (e.g., organizations, member nations) (Miles, 2006). Interlinked individuals working together towards shared goals in collaborative networks form relationships, build trust, and share information; in doing so they build forms of social capital (Feiock, 2008). For ecosystem management networks, social capital has tangible benefits, such as facilitating collective action, aiding communication and learning, and increasing trust so that members can work together more effectively toward achieving shared goals (Adler and Kwon, 2002; Burt, 1997; Coleman, 1988).

Collaborative networks must consider numerous design and implementation components that influence their ability to achieve socio-ecological goals (Table 6). An initial requirement participants must address is agreement upon network goals, such as the environmental issue the network is designed to address, what it will achieve (e.g., improved resource condition, ongoing collaboration between parties), and how it will achieve these goals (Huxham and Vangen, 2005). After participants have agreed upon goals, they must decide how they will operate and work jointly to achieve these goals – the governance structure. A network's governance structure is critical its ability to harmonize network and member organization activities, produce results, control the flow of information and resources, and sustain activities (Goldsmith and Eggers, 2004; Keohane et al., 1993; Thomson and Perry, 2006). Ostrom (1990) asserts that governance

arrangements that allow institutions to design rules and decision-making procedures matching local circumstance are one of the main design principles of common pool resource institutions.

**Table 6.** Theoretical components of collaborative effectiveness and links to social capital.

<b>Components</b>	<b>Description</b>	<b>Links to social capital</b>
Establishing clear goals	<ul style="list-style-type: none"> <li>• Members should agree on problems to be solved, actions to take, and outcomes to achieve (Huxham and Vangen, 2005; Keohane et al., 1993)</li> <li>• Members should agree on goals for the collaboration as a whole, the participating institutions, and the individual participants (Huxham and Vangen, 2005)</li> </ul>	<ul style="list-style-type: none"> <li>• Social capital among members fosters collective action (Adler and Kwon, 2002; Coleman, 1988) and helps members reach agreement on goals</li> </ul>
Designing a governance structure	<ul style="list-style-type: none"> <li>• Collaborations should design a governance structure to promote effective network operations (Bryson et al., 2006; Provan et al., 2008; Thomson and Perry, 2006)</li> <li>• Appropriate governance structures help align network and member policies and aid capacity building (Keohane et al., 1993; Ostrom, 1990)</li> </ul>	<ul style="list-style-type: none"> <li>• Social capital fosters collective action and shared norms and helps members agree on governance structure (Thomson and Perry, 2006)</li> <li>• Governance structure helps control the flow of information in a network (Goldsmith and Eggers, 2004), thus strengthening information exchange and social capital.</li> </ul>
Building trust among participants	<ul style="list-style-type: none"> <li>• Building trust helps groups accomplish their goals by creating member cohesion and encouraging compliance with rules and norms (Ostrom, 1998; Ring and Van de Ven, 1994; Thomson and Perry, 2006)</li> </ul>	<ul style="list-style-type: none"> <li>• Trust is a key component of social capital and allows groups to work together toward shared goals (Belaire et al., 2011; Coleman, 1988; Lauber et al., 2008)</li> </ul>
Creating mechanisms for transparency and accountability	<ul style="list-style-type: none"> <li>• Transparency and accountability mechanisms ensure member actions align with collaborative goals (Chayes and Chayes, 1993) and increase member compliance (Keohane et al., 1993; Ostrom, 1990)</li> </ul>	<ul style="list-style-type: none"> <li>• Accountability and transparency provide mechanisms for demonstrating members are following through on their actions and achieving goals, thus increasing trust and building social capital (Huxham and Vangen, 2005).</li> </ul>
Demonstrating internal and external legitimacy	<ul style="list-style-type: none"> <li>• Legitimacy relates to how members and those outside of the network perceive its effort (Bryson et al., 2006; Provan et al., 2008)</li> </ul>	<ul style="list-style-type: none"> <li>• Bridging social capital to those outside the network provides pathways for information exchange (Burt, 1997;</li> </ul>

	<ul style="list-style-type: none"> <li>• Internal legitimacy helps avoid member tensions and furthers trust (Provan and Kenis, 2007)</li> <li>• External legitimacy promotes outside support (e.g., fiscal support, technical expertise) for the network (Bryson et al., 2006; Provan and Kenis, 2007)</li> </ul>	<p>Granovetter, 1973), thus generating external legitimacy.</p> <ul style="list-style-type: none"> <li>• Bonding social capital among members contributes to internal legitimacy by fostering the development of shared norms (Burt, 2005; Coleman, 1988)</li> </ul>
Building capacity among members and constituents	<ul style="list-style-type: none"> <li>• Member organizations and the network should have the capacity to implement and devote resources toward agreed upon actions (Keohane et al., 1993; Underdal, 2002)</li> <li>• Actions taken by member institutions with their constituents (e.g., state governments, local governments, resource users) are key to achieving network success (Hanf and Underdal, 1990)</li> </ul>	<ul style="list-style-type: none"> <li>• Social capital facilitates information exchange and learning within the network, increasing member capacity (NRC, 2008)</li> <li>• Bridging social capital from members to constituents increases local implementation capacity (NRC, 2008; Reed et al., 2010).</li> </ul>

Trust – whether individuals feel comfortable with each other and believe others will follow through on their commitments (Ballet et al., 2007; Ring and Van de Ven, 1994; Thomson and Perry, 2006) – is an essential element of social capital and important component of collaborative effectiveness. Trust is developed through repeated interactions and interpersonal contact (Burt, 2005). Networks with ‘member trust’ are more cohesive and enable collective action by encouraging members to adhere to rules and social norms, as well as reassuring actors that others will not take advantage of them (Ballet et al., 2007; Ostrom, 1990; Ring and Van de Ven, 1994; Thomson and Perry, 2006). Strongly linked to trust is the need for transparency and accountability mechanisms to monitor the network’s progress and members’ actions and help members trust their peers. A network with strong transparency and accountability structures is more adaptable and better positioned to ensure participants will comply with network measures (Chayes and Chayes, 1993; Keohane et al., 1993; Page, 2004).

Another important component in sustaining collaborative networks is their legitimacy, or how the network is perceived by members (internal legitimacy) and those outside of the network but linked to its activities (external legitimacy), such as funders, stakeholders, and resource users (Bryson et al., 2006; Provan and Kenis, 2007; Provan et al., 2008). Internal legitimacy helps avoid member tensions and aids the development of participant trust, while external legitimacy enables participants to garner support for the network, like funding and governmental endorsements of the program.

A final component of network effectiveness is the need to build capacity among members and their constituents. “Capacity building” is processes wherein participants strengthen skills, knowledge, and relationships to promote the realization of joint goals (NRC, 2008). While participating organizations generally want to comply with network agreements, they may not have the skills and knowledge necessary to implement the network’s recommendations (Chayes and Chayes, 1993). If members are noncompliant with agreed upon network actions then it will be difficult for the network to achieve its goals and address the problem it was designed to solve. Additionally, for environmental networks management often occurs at multiple levels; thus, member organizations must ensure their constituents are aware of and complying with network recommendations (Hanf and Underdal, 1990). Collaborative networks offer a venue where participants can engage in capacity building activities like exchanging knowledge with other participants or receiving advice from technical experts.

In theory, various attributes of social capital – like relationships, trust, and information and knowledge exchange – have the ability to influence each component of network effectiveness (Table 6). For instance, the relationships and trust developed among network participants can further the network’s capacity to achieve collective action (Adler and Kwon,

2002; Coleman, 1988). Although power imbalances within a network may hinder the development of relationships and trust among members (e.g., Bodin and Crona, 2009; Reed et al., 2010), when conditions allow for their creation, member relationships and trust can facilitate agreement on network goals. Similarly, while factors like the amount of time members have to participate in network activities influences the level of information and knowledge exchange (The Heinz Center, 2004), governance structure often may aid the flow of information in a network (Goldsmith and Eggers, 2004). The potential information sharing benefits of social capital (Burt, 2005; Schneider et al., 2003) can support network governance and strengthen information exchange. Through sharing information about their efforts, members promote transparency and demonstrate accountability to their peers – activities that are likely to increase member trust (Huxham and Vangen, 2005; Thomson and Perry, 2006). Member trust and strong bonding relationships often foster shared norms (Burt, 2005; Coleman, 1988; Lauber et al., 2008), thus supporting internal legitimacy. Conversely, bridging social capital from those within the network to outside organizations may provide pathways for information transfer with external actors (Burt, 1997; Granovetter, 1973) and offer opportunities to build external legitimacy. Social capital also has the ability to facilitate information exchange and learning among network members, thus increasing member capacity (Adler and Kwon, 2002; NRC, 2008). Furthermore, bridging social capital to constituent communities offers potential pathways for dissemination of lessons learned and can lead to increased capacity for local implementation of network goals (Ernstson et al., 2010; NRC, 2008; Reed et al., 2010).

The Philippines has an extensive infrastructure for marine management, and a devolved governance system that vests municipal governments with autonomy to manage their coastal resources (White et al., 2006). Under this decentralized structure, municipalities can enact

management actions like the development of coastal management plans and the designation of marine protected areas (MPAs). Local communities, known as *barangays*, are involved in coastal management and are often responsible for MPA management and enforcement. In recent years, there has been an increased push for municipal governments to work with their neighboring municipal governments, which has resulted in multiple collaborative initiatives throughout the country that link adjacent municipalities to achieve ecosystem-based approaches (e.g., Armada et al., 2009; Eisma-Osorio et al., 2009; Horigue et al., 2012). To explore the links between social capital and collaborative network effectiveness, I conducted a comparative study of two marine management networks in the Central Visayas Region, Philippines. The first such network I observed, the Southeast Cebu Coastal Resource Management Council (SCCRMC) represents a long-standing network that has sustained itself for many years. I compared the SCCRMC to the Danajon Double Barrier Reef Management Council (DDBRMC) – a newer network than the SCCRMC and still working to cement its activities and structure, and thus more vulnerable than the SCCRMC. Specifically, I explored the following research questions and themes: 1) What are the nature of the differences between a sustainable and a nascent collaborative network in regards to elements of social capital, such as relationships, trust, and information exchange? 2) In the DDBRMC and SCCRMC, how does social capital influence their ability to meet key components of collaborative effectiveness? 3) How can the lessons-learned from the SCCRMC be applied to strengthen and sustain the DDBRMC and other similar networks?

## **4.2 Methods**

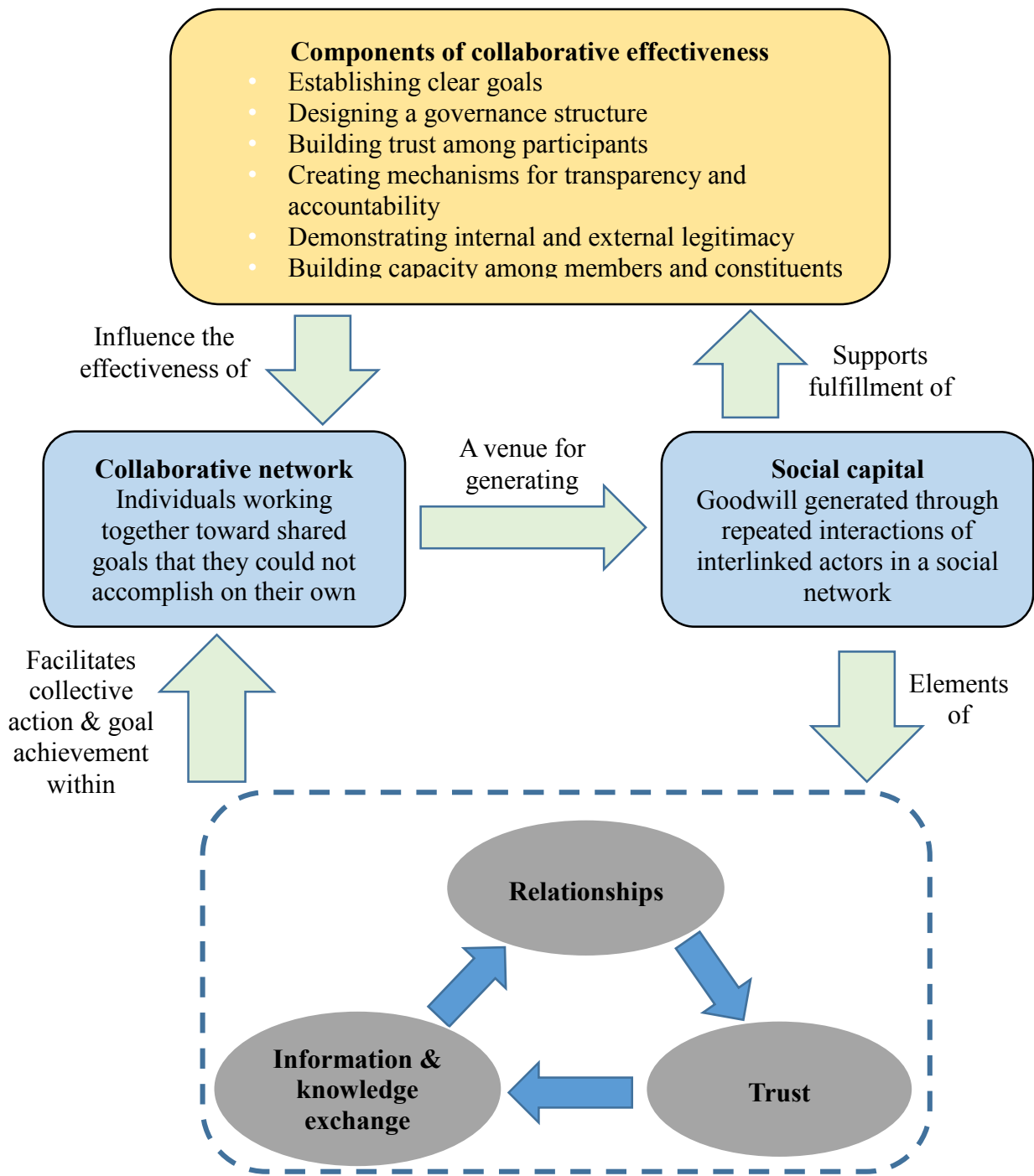
### **4.2.1 Analytic approach**

Collaborative networks function as venues for generating social capital. Relationships, trust, and information and knowledge exchange are elements of social capital and part of an

feedback loop where one element (e.g., trust) can facilitate the achievement of another element (e.g., information and knowledge exchange). The six components of collaborative effectiveness (establishing clear goals; designing a governance structure; building trust among participants; creating mechanisms for transparency and accountability; demonstrating internal and external legitimacy; and building capacity among members and constituents) influence the efficiency and effectiveness of collaborative networks. Similarly, social capital can support the ability of a collaborative network to fulfill the components of collaborative effectiveness (Figure 9).

#### 4.2.2 Study sites

The SCCRMC is an effort among seven municipalities in Southeast Cebu, covering an estimated 726 hectares of coral reefs and 118 kilometers of coastline (Figure 10) (Eisma-Osorio et al., 2009). Collaboration among the municipalities began in the early 2000's under a United States Agency for International Development (USAID) project on coastal management. Coastal Conservation and Education Foundation (CCEF), a domestic NGO, expanded upon these efforts from 2005 to 2009. CCEF helped the municipalities create an official Memorandum of Agreement (MOA) and decide upon the governance structure and goals (Eisma-Osorio et al. 2009). Regular activities of the SCCRMC have included the establishment of a network of MPAs, aligned fisheries ordinances, and joint patrolling of municipal waters. The SCCRMC is governed by an executive committee consisting of the seven municipal vice mayors, and a management committee composed of municipal coastal management staff. The management committee oversees and coordinates the SCCRMC's regular activities, such as monthly meetings. Despite termination of CCEF funding in 2009, the SCCRMC has sustained itself through contributions from member municipalities (40,000 pesos, or ~\$1000 USD per year) and additional funding from provincial and national agencies.

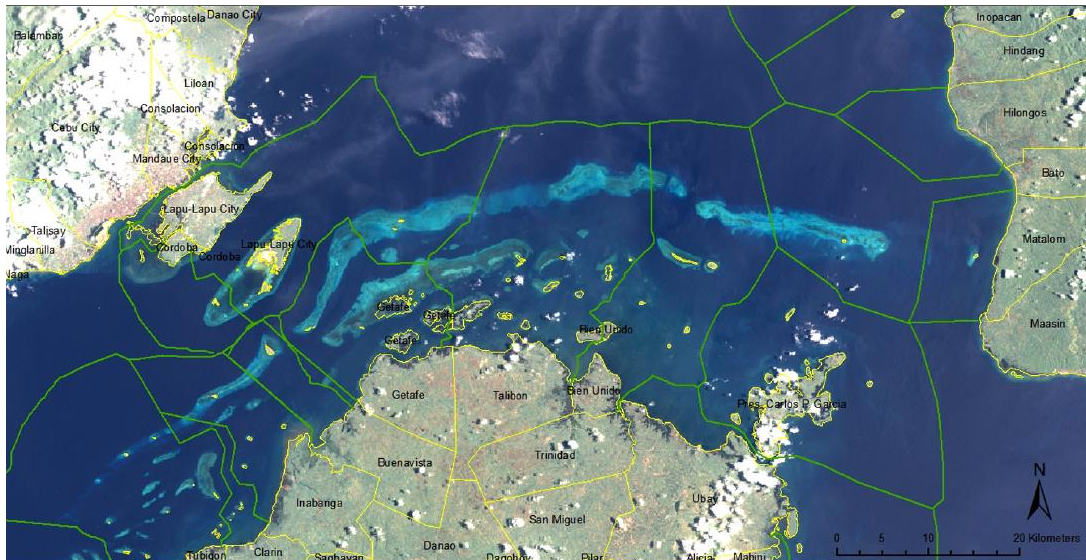


**Figure 9.** Analytic framework (based on the conceptual literature) of the links among collaborative networks, social capital, and the six components of collaborative effectiveness.

The Danajon Double Barrier Reef Management Council (DDBRMC) was initiated in 2010 through CCEF's Danajon Bank Project. Danajon Bank is a unique double barrier reef that includes the provincial waters Leyte, Southern Leyte, Cebu, and Bohol, and covers a total area of 27,200 hectares, 699km of coastline, and over 40 offshore islands (Figure 11). There have been numerous community-level efforts in Danajon Bank to promote the establishment of small-scale MPAs and MPA networks and engage community members in collaborative processes to designate and manage MPAs (e.g., Armada et al., 2009; Hansen et al., 2011; Martin-Smith et al., 2004). CCEF's Danajon Bank Project builds off of these previous efforts to promote collaboration among the municipalities, provinces, and administrative regions in the area. The DDBRMC encourages municipalities and provinces to work together on activities such as shared coastal management strategies and harmonization of municipal fisheries policies (CCEF, 2013). Through the coordinating efforts of CCEF, DDBRMC members signed a MOA and selected officers in 2012. Despite numerous activities conducted under the auspices of the DDBRMC and CCEF's project, since the termination of CCEF's project funding in 2013 the DDBRMC has been inactive. However, other projects in the areas, such as the Ecosystems Improved for Sustainable Fisheries Project (ECOFISH), funded by USAID, have been active in the Danajon Bank region in the intervening years and are currently attempting to resurrect the DDBRMC (pers. comment from ECOFISH staff, 10-2014).



**Figure 10.** The area of the Southeast Cebu Coastal Resource Management Council (from Eisma-Osorio et al. 2009). Municipalities that are part of the SCCRMC are highlighted in darker grey.



**Figure 11.** The area of the Danajon Double Barrier Reef Management Council (from CCEF, 2013).

There are many different collaborative efforts throughout the Philippines with similar ecosystem management goals as the SCCRMC and DDBRMC. I chose to use the SCCRMC and DDBRMC as representative cases because despite many shared characteristics (e.g., their

support from CCEF, the history of collaboration in each region, and the similar network goals) they have had different trajectories and outcomes. They thus offer useful comparative cases in which to explore the links between social capital and collaborative effectiveness and identify conditions that may hinder collaborative effectiveness and social capital development.

#### 4.2.3 Qualitative interviews

I conducted semi-structured, qualitative interviews (e.g., Patton, 2001; Weiss, 1994) with members of the SCCRMC and DDBRMC, as well as NGO representatives who were active in either one or both of these networks, to probe participant perceptions of their experiences (Appendix C). Informants were selected using purposive sampling (Lonnner and Berry, 1986) to target individuals with extensive experience and knowledge about the networks. I recruited informants prior to the interviews via telephone calls where I provided them with information about the study and asked if they would be willing to participate in an interview. Interview questions addressed themes related to the nature of social capital in the networks, factors affecting collaborative sustainability, and participant perceptions of their experiences. Interview questions were pre-tested with marine management professionals with collaborative network experience to ensure clarity of interview questions. All interviews were recorded (with consent from participants), and transcribed following the interviews. I interviewed 15 SCCRMC participants, including respondents in 6 out of the 7 municipalities active in the SCCRMC and assisting NGOs. For the DDBRMC, I interviewed 26 informants, including respondents in 12 out of 19 municipalities in the collaboration and assisting NGOs. All respondents were the individual(s) in their municipality who were the most active in and knowledgeable about SCCRMC and DDBRMC.

#### 4.2.4 Participant observation

I conducted participant observation at the following events: a three day workshop on Fisheries and Habitat Management for the DDBRMC; a DDBRMC council meeting; two monthly meetings of the SCCRMC; and a three day coral reef monitoring training with SCCRMC participants. By conducting participant observation at these events, I observed participants in the setting of the network, explored behaviors, norms, and social interactions among participants (e.g., Guest et al., 2013; Spradley, 1980), and looked for behaviors and actions related to key themes of social capital and collaborative effectiveness. Through using qualitative participant observation as opposed to direct, structured observations, I was able to observe the meetings while also interacting with participants (Guest et al., 2013). During the meetings, I recorded observations related to the three target components of social capital (relationships, trust, and information and knowledge exchange) and the elements of collaborative effectiveness (e.g., internal legitimacy, governance mechanisms). All observations were summarized and analyzed following the events for relevant social capital and trends, and SCCRMC and DDBRMC observations were compared for similarities and differences. I used the results of participant observation to complement the qualitative interviews and provide context regarding the operations of the networks.

#### 4.2.5 Qualitative analysis

I used a mixture of inductive and deductive coding methods. Deductive coding (e.g., Miles and Huberman, 1994; Saldaña, 2010) helps test existing assumptions about qualitative data through the application of *a priori* codes to the data, while inductive coding (e.g., Corbin and Strauss, 1990; Glasser and Strauss, 1967) allows for common themes to emerge through the participants' narratives. First, I used provisional and hypothesis coding techniques that allow for pre-existing codes based on expected themes to be applied to the data (Miles and Huberman,

1994; Saldaña, 2010). I deductively created a set of codes that reflected expressions of key aspects of social capital (e.g., relationships and trust) and collaborative effectiveness (e.g., governance and accountability mechanisms). I applied these codes to relevant interview passages. I then used inductive coding (e.g., Corbin and Strauss, 1990; Glasser and Strauss, 1967) to explore and identify common themes that emerged through participants' accounts of their experiences that were not obvious from pre-existing key aspects of social capital.

Throughout the coding processes, I developed analytic memos to highlight overarching emergent themes and notable trends in the data. By qualitatively observing the similarities and differences between interview themes and narrative passages from SCCRMC and DDBRMC members, I compared results from the SCCRMC and the DDBRMC interviews to observe prevalent themes in respondent narratives and identify key differences in the networks.

## **4.3 Results**

### **4.3.1 Observations of social capital in the SCCRMC and DDBRMC**

The SCCRMC and DDBRMC were different in many respects. The SCCRMC, for instance, has lasted for over seven years is composed of seven municipalities in one island province, while the DDBRMC only lasted for two years and entailed 19 municipalities over four different island provinces, a much larger geographic area. Despite their differences, it was clear that each had resulted in the creation of social capital among members. This was evident at meetings and trainings, where the nature of interactions was convivial and participants spoke easily with one another during official information sharing sessions, as well as at social breaks. Due to the smaller size of the SCCRMC, in meetings participants sat together around a large table, and all municipalities communicated openly and shared information easily, even when discussing controversial issues like illegal fishing and the need for increased municipal enforcement. The ease of information sharing among individuals demonstrated the close

relationships they had built, and their frank discussion of controversial issues implied a level of trust among participants. At lunches following the meetings, there was also notable mixing and interactions among municipalities. The individuals I spoke with during the social portions of the SCCRMC meetings were excited to tell me about the SCCRMC, their achievements, and the group identity they had formed. However, in DDBRMC meetings, due to the larger size of the group, participants were often split geographically (i.e., with adjacent municipalities) into smaller working groups. This provided a chance for some cross-municipality interaction, but only with a small number of participants. The meetings also had opportunities for information and knowledge exchange through full group discussions, where participants shared relevant experiences (e.g., successful enforcement strategies) though there was less opportunity for full group discussions than in the SCCRMC. Overall the geographic clustering created a more disconnected dynamic and during social events participants tended to stick to their smaller groups and not interact with individuals from other provinces.

#### 4.3.2 Building relationships and establishing clear goals

Building relationships with fellow members is one of the first steps in generating social capital and greatly aids the establishment of clear network goals, another important preliminary step in network development. In the SCCRMC, respondents spoke of how their relationships became stronger over the years and created a group camaraderie.

“We cannot be otherwise but to be intimate with them...maybe if it is the military we can [say] we are comrades, brother in arms. But we are not in the military, so we still may call them brothers in work.” – SCCRMC participant

Danajon Bank participants felt that they were beginning to grow closer with their fellow members the more they worked together. They attributed the closeness to the regular meetings

and expressed hope that these opportunities would continue so that the bonding among participants could become stronger.

“We became close because of this collaboration, because of [these] meeting[s], because of [these] conferences, seminars, and trainings. We became closer and closer. We feel like brothers, and we share everything just for the sake of resource management. So that is the best thing that we would like to maintain.” – DDBRMC participant

Both DDBRMC and SCCRMC respondents stressed the beneficial nature of the relationships they developed and how those relationships helped them work with peers to establish and achieve shared goals, like coordinated enforcement of illegal fishing.

“So the closeness of our friendship is helpful especially if the illegal fishers from their town will fish in our municipal waters, [or] our illegal fishers will fish there, so that’s the time that we can communicate to each other.” - DDBRMC participant

“We are very close and we can really discuss everything that arises, especially problems on the district fisher folk, what they have encountered in our town, illegal fishers, we discuss with each other because sometimes we have different problems....” – SCCRMC participant

In discussing the initial goal establishment process, SCCRMC respondents indicated that goal-setting occurred in the group’s first years and involved most participants. Commitments were formalized through the MOA, signed by mayors of the seven participating municipalities, which outlined the SCCRMC’s agenda and member responsibilities.

“We learned that [these] municipalit[ies] have common ecosystems with common issues to address. Say for instance the problem of illegal fishing in another municipality is also affecting the problem of illegal fishing in one adjacent municipality... Also in partnership with CCEF... they shared to us [that] the destruction of one ecosystem in one municipality will surely affect the abundance of the ecosystem in other municipalities.... We realized that there is a need for us to unite and form uniform polic[ies].” – SCCRMC participant

“So they signed a Memorandum of Agreement, a MOA...the MOA says that they want to create a council, and these are the activities of the council.... At the same time, one of the priorities at that time is policy – fisheries regulation has to have a policy agreed upon by municipalities.” –NGO staff

The DDBRMC also had a MOA, signed by the governors of the four provinces and some of the municipal mayors outlining the goals of the network and member responsibilities.

Participants noted that they were happy to contribute improved protection of Danajon Bank; however, they had concerns regarding the whether the goals of the network aligned with their municipal coastal management goals and expressed doubts regarding the ability of the network to align management activities across different provinces.

“I think there is still a conflict because there [are municipalities] that are in favor of the fishermen. Like if we are going to implement marine protected areas where these fishermen get their daily needs. So I think there is still a concern about that.” –DDBRMC participant

“I think it helps a lot to join force to protect Danajon Double Barrier Reef. However, there’s a big challenge in how to harmonize the policies in each municipality considering that it involves two regions and four provinces.” – DDBRMC participant

A major factor influencing the ability of DDBRMC members to form productive working relationships and a common recurring theme across informants was the issue of political will – i.e., whether the mayor and other municipal officials were supportive of coastal management activities and were motivated to help coastal managers achieve their goals and enforce regulations. Some respondents discussed how lack of mayoral support created difficulties in coordinating activities and directly hindered their ability to work with other municipalities to achieve the DDBRMC’s goals.

“We cannot work with [our neighboring municipality] religiously, holistically because...our Mayors cannot work together because they have political issues, no? So that is some factors that will affect collaboration in the real sense.” – DDBRMC participant

“You know, sometimes, relationships matters. [One municipality] one time was not in contact with our governor, so we don’t really go to that area [to patrol]. But sometimes, especially when anti-illegal trafficking of marine corals [was occurring], we [were] going there secretly and apprehend[ing]. When we got that very big bowl of corals, the mayor

was mad because we don't coordinate with them.... So one thing that hampers our collaboration in this Danajon Bank [is] sometimes [the] relationship with the leaders.” – DDBRMC participant

#### 4.3.3 Designing a governance structure

Both the SCCRMC and DDBRMC had governance structures in place to manage network activities. The SCCRMC's governance system involved municipal mayors, vice mayors, and coastal managers. SCCRMC participants highlighted the strength of this multi-tiered structure and how it instilled confidence in members that the SCCRMC could accomplish its goals.

“In our organizational structure, the vice mayor sits in the council, they elect their own chairman, vice chairman, treasurer, and then each municipality appointed two representatives; we call [them] cluster management committee members. And then among the cluster management committee members, we appointed an executive director.” – SCCRMC participant

“Although the mayors are the signatories of the MOA, they also agreed after several meetings that it should be the vice mayor who would attend every council meeting.... Of course the vice mayor is also very busy, and they don't know how to really implement programs because they are just vice mayor. So, you need to have another body – the Cluster Management Committee...this is now the implementing arm. So you have the policy-making, decision-making body and there's the implementing arm.” – NGO staff

The DDBRMC appointed an executive committee to spearhead its activities composed of the four provincial mayors, and with CCEF acting as the Secretariat. The structure was not as detailed as that of the SCCRMC and involved high level politicians, as opposed to municipal officials and coastal managers, which led some participants to express doubts regarding the structure's sustainability.

“My concern is more or less the ability of this council. Because I am proposing that the chairman of the council should not be a politician, because a politician will just come and go. So I'm proposing a private person or a private organization act as the chairman of the council...because once a politician will be elected as chairman, we cannot assume sustainability...in an organization you cannot have a sustained initiative if you have this politician act[ing] as chairman.” –DDBRMC participant

“The only way to do it is there should be somebody up there, like the CCEF that does the Secretariat work...because we cannot work directly [with each other] because we are different provinces. Like the governor of Bohol could not just call the mayor of Cordova or the mayor of Lapu Lapu City to go attend a meeting. So there should be an umbrella or a higher body that would somehow steer....” – DDBRMC participant

#### 4.3.4 Building trust and creating mechanisms for transparency and accountability

In the SCCRMC, from working together for so many years, participants trusted each other and believed their fellow participants were working in good faith to achieve the network’s goals. Trust was facilitated by monthly meetings where members provided each other with updates and had opportunities to demonstrate they were following through on commitments. In the SCCRMC, the monthly in-persons updates, along with distribution of minutes from the previous meeting that provided a record of topics discussed and agreed upon actions, were the main accountability mechanisms.

“The system of our meeting is, we really have that follow up [on] issues. So, in the follow up, that is the time wherein we can monitor what has been agreed in the previous meetings and then if there is no result, then we should come up with a resolution how to treat that concern.” – SCCRMC participant

As compared to the SCCRMC, DDBRMC respondents expressed more doubts regarding the extent to which they trusted fellow members. When respondents were asked about whether they trusted their fellow participants and what could be done to strengthen trust, they frequently raised the issue of political will. If the mayor and other high level officials in the municipality were supportive of network and coastal management efforts (e.g., imposing fines on individuals who fished illegally inside MPAs), then members felt they had the support to implement activities. Respondents indicated that when their peers from other municipalities had mayors who were not supportive, it was difficult to trust that those individuals and municipalities would implement network activities like joint enforcement against illegal fishing was much more difficult.

“Because the only person who can do that is the mayors in the different municipalities. If they [have] strong political will then they can stop [these] illegal fishers because that is the perennial problem, you know? That is our problem, that’s a big problem, the illegal fishers.” – DDBRMC participant

“Interviewer: What makes you feel more confident that these municipalities are going to do what they say they will do?”

Respondent: Because their mayor and these guys that are in [coastal resource management] are really dedicated to do these things. Unlike this, the one municipality, the guys are dedicated, but their leader is not. That’s one of the critical concerns. Because they will not really give them full support regarding logistics.... [The] mayor depends on [the illegal fishers who] vote for him to win election, that’s why he is really hesitant to do these things.” – DDBRMC participant

The DDBRMC meetings were less frequent than the SCCRMC due to the difficulty of coordinating meetings for individuals from nineteen different municipalities and four different provinces, as well as supporting the fiscal costs of participant travel to meetings. The decreased meeting frequency made it harder for participants to receive regular updates. Although previous meeting minutes were distributed at subsequent meetings, the executive committee only met quarterly, and participants indicated they rarely received updates during interim periods. Additionally, many of the municipal managers who participated in topical trainings (e.g., fisheries and habitat management) did not attend higher level council meetings, creating a disconnect between the operational level and the higher governance system.

“I think that other than the meetings during the council, perhaps there could be small groups or inter-organization collaborations also just to strengthen up. Because these big meetings only happen once, twice in a year.... So I think it’s a matter of really sitting down and participating and committing in the planning, and then tracking it.” – NGO staff

#### 4.3.5 Demonstrating internal and external legitimacy

The SCCRMC fostered strong relationships among participants that supported internal legitimacy and enabled members to achieve network goals. Through achieving network goals and demonstrating the positive impacts of the SCCRMC, the group was able to demonstrate external legitimacy, which helped it secure outside support for ongoing activities.

“If we will unite as one voice, then to all the additional donors like the governor or congressman, they will look at us if we present to them as several bodies instead of only one [municipality]. So that is the issue of better access to funds if we will form this alliance, network.” – SCCRMC participant

“Maybe that’s the reason why we are getting assistance because at least they can see that the council is strong, meaning they trusted us. They are confident giving to us [because] at least [the SCCRMC] has produced good results and good accomplishments.” – SCCRMC participant

DDBRMC participants were supportive of network activities and felt unity with fellow participants, thus beginning to build internal legitimacy. The CCEF trainings were instrumental to the formation of internal legitimacy, as they offered participants opportunities to interact and build relationships. While the DDBRMC had attracted some higher level political support through the involvement of the provincial mayors, the network did not appear to have as much external legitimacy as the SCCRMC. Informants spoke of the help they received from CCEF, but they had not yet received substantial support from national agencies, like funds to contribute to meeting costs or support further technical trainings.

“It forms like a camaraderie with member municipalities and a closeness with each other...because we have common visions...of conserving and protecting our marine resources.” – DDBRMC participant

“For me I think the result of this collaborative aspect is that we were able to rally behind, get the support of the other municipalities in this effort to conserve the seas, the marine ecosystem. Because a certain municipality could not make it alone, so there is a need to collaborate with other municipalities.... If we are just acting individually, we cannot conserve the entire ecosystem....” – DDBRMC participant

#### 4.3.6 Building capacity among members and constituents

##### 4.3.6.1 Learning from fellow network members

Information and knowledge exchange with other network are important mechanisms for increasing member capacity. Both SCCRMC and DDBRMC participants cited information exchange and lessons learned from other members as key network benefits. Participants

discussed how they learned about successful management strategies other municipal coastal managers implemented, which they replicated in their own municipalities, and the utility of receiving regular updates about issues in their neighboring municipalities.

“But when we sit together with other [municipalities] I have learned so many things from the collaboration. Like for example how, Talibon [taught] me how to prepare the [fisheries] ordinances, to protect implementation [of enforcement]. So they offer to share with us their strategies, [which are] very useful for us.” – DDBRMC participant

“We learned that they imposed [fines of] 1000 pesos per hundred meters of fishing gear. So it means that they are enforcing [a] much higher penalty than our municipal ordinance. So I’ve learned that it’s also one good strategy to really push illegal fishers to stop using that kind of fishing [gear]. Because if they got caught, they will be imposed a higher penalty than before. So it’s really a learning in the side of the policy adjustment, or policy harmonization to the other municipalities implementing the coastal resource management laws.” – DDBRMC participant

“Because every meeting...you learn something new, you learn new things in attending monthly meeting [of] the cluster. Oh, this is what happened in Santander, this is what happened in Argao, like that. So new things, there are new things that you learn during meetings.” – SCCRMC participant

Although the DDBRMC was a younger network than the SCCRMC, it was clear that participants already built capacity through engaging in network activities. Through learning about coastal management in other municipalities, participants acquired information they then applied in their own municipalities. Additionally, network activities like joint enforcement against illegal fishing increased capacity to meet coastal management goals.

“It’s really been a great help to us in increasing our capability and scale towards implementing projects and collaborating with other people.” – DDBRMC participant

“I have learned so much on their policies, which I can share here, which I can use here. In fact I’m preparing all this output because I want to present it after election, I cannot do it now, you know, this is an election year. You cannot do as much as you want to do.” – DDBRMC participant

#### 4.3.6.2 Building capacity through NGO assistance

In addition to the information SCCMRC and DDBRMC participants learned from other municipalities, being part of the network provided opportunities to learn from assisting NGOs like CCEF.

“I think because of this support of the CCEF through trainings they really have given the stakeholders, the members, knowledge and skills in terms of marine conservation and collaboration.” – DDBRMC participant

“Of course the CCEF has given us some insights about rehabilitation of [the] coral reef. Meaning coral reef[s] can be rehabilitated, meaning if you have sandy coastal areas it can be rehabilitated through planting, with the technology. And I think [that is] one example of some new insights that can be learned through the council.” – SCCRMC participant

As a newer network, DDBRMC members felt their capacity to continue functioning was dependent on outside support, particularly from CCEF.

“If you create a council among the [municipalities] without intervention of NGOs, [what is] the sustainability of it? Who will plan it? How much will municipality A will contribute, how much municipality B will contribute, and who will man the council? Because we are dependent on the local chief executive. Unlike if there is an NGO, which is the Secretariat, so they can do the Secretariat work to remind, call the meeting.” – DDBRMC participant

“It’s so good that there are NGOs like CCEF that that help in the steering. Because sometimes if there is no initiative from the outside, the tendency is for each [municipality] to work on its own.” – DDBRMC participant

The SCCRMC solved the issue of coordination and financial capacity through yearly member contributions and a detailed governance structure. Although the SCCRMC sustained itself without fiscal support from CCEF for a number of years, members still expressed how much they benefitted from being able to contact CCEF when they needed outside technical assistance.

“Like what happened in the last typhoon when our LGU was hit by a storm surge and destroyed. I’m very busy contacting people who have program of rehabilitation assessment.... It’s by chance that the group of the CCEF group has this unit to handle this

project. Because the LGU cannot really do it, they observe the destruction...but what are they going to do next to decide whether this is hopeless or not? It's beyond their capacity. So we are still dependent upon outside technical support.” – SSCRMC participant

#### 4.3.6.3 Disseminating lessons to constituents

Both DDBRMC and SSCRMC members discussed how they worked to share lessons learned from other municipal coastal managers and through CCEF with their constituents at the *barangay* level. However, both networks had limited representation at meetings from individuals involved in *barangay* coastal management. While at each SSCRMC meeting individuals from the hosting *barangay* were invited to attend, due to the larger size and geographic scope of the DDBRMC, only municipal managers attended meetings and trainings.

“[Whichever] municipality will host the monthly meeting the vice mayor and the mayor will invite all the *barangay* captains of that municipality, all the *bantay dagat*.... So that is a time that we will know who are the *barangay* captains.” – SSCRMC participant

“Every month, even if there is no council meeting, in our locality...we are also conducting information [campaigns] so that [the *barangay*] will know how the council operated and what the program of the council is.... We have real transparency, yeah?” – SSCRMC participant

“So what they are doing, what they share to me during our meetings or conferences, I still also pass on, because every month we are meeting with our POs, our fisherfolk organizations. I'm sharing them what I have learned from the other, from the collaborative with the other municipalities, collaboration.” – DDBRMC participant

“Aside from the CCEF sponsored Danajon wide council, what I am also requesting is the...[people's organizations] who manage MPAs in the Danajon Bank will have also their own kind of council. So from the *barangay* level, to the municipal level, then to the Danajon wide area level.... Because if you will just leave it to the [municipal] level, I don't think it will [succeed].” – DDBRMC participant

## 4.4 Discussion

In this study, I applied a new framework linking key elements of social capital and components of collaborative effectiveness to explore the nature of the differences in social capital between a sustainable and a nascent collaborative network. I observed how social capital influences the ability of networks to function effectively, and considered how lessons learned

through the SCCRMC and DDBRMC can be applied to other collaborative networks. I found that while the longer tenure of the SCCRMC provided increased opportunities for members to develop relationships, DDBRMC members also felt strong connections to their peers. In the SCCRMC, participant relationships facilitated the establishment of network goals and a coherent governance structure, both of which helped build internal and external legitimacy. Trust among SCCRMC participants was furthered through regular updates at monthly meetings, which served as a useful mechanism for establishing and ensuring member accountability. The DDBRMC lacked an effective governance structure and strong accountability and transparency mechanisms – all factors that led to a lack of trust among participants. While both networks increased member capacity, there was an identified opportunity in each for stronger dissemination of information and capacity to the *barangay* level. In this section, I will discuss these findings in relation to the overall ability of the SCCRMC and DDBRMC to build social capital and fulfill the components of collaborative effectiveness (Table 7). I will also consider lessons-learned and recommendations for strengthening both networks, as well as other similar ecosystem management networks.

**Table 7.** Summary findings for collaborative effectiveness in the SCCRMC and DDBRMC

<b>Components</b>	<b>SCCRMC</b>	<b>DDBRMC</b>
Establishing clear goals	<ul style="list-style-type: none"> <li>• Established at beginning of program with input from participants</li> <li>• Goals articulated in Memorandum of Agreement</li> </ul>	<ul style="list-style-type: none"> <li>• Goals articulated in Memorandum of Agreement</li> <li>• Not all participating municipalities in full agreement with goals</li> </ul>

Developing an appropriate governance structure	<ul style="list-style-type: none"> <li>• Multi-tiered governance structure including mayors, vice mayors, and municipal managers</li> <li>• Council management committee responsible for coordinating general SCCRMC activities and providing oversight</li> </ul>	<ul style="list-style-type: none"> <li>• Executive committee composed of provincial governors, and CCEF as Secretariat</li> <li>• Concern among participants regarding sustainability of governance structure and involvement of high level politicians</li> </ul>
Building trust among participants	<ul style="list-style-type: none"> <li>• Participants developed strong relationships that promoted trust and confidence in other members</li> <li>• Trust reinforced through interactions in monthly meetings</li> </ul>	<ul style="list-style-type: none"> <li>• Participants began to build trust though some did not yet fully trust fellow members</li> <li>• Trust influenced by political will and support or lack thereof of municipal mayors</li> </ul>
Creating mechanisms for transparency and accountability	<ul style="list-style-type: none"> <li>• Monthly meetings with verbal updates from participating municipalities the main mechanism for demonstrating accountability</li> <li>• Meeting minutes from the previous meeting outlining actions and commitments distributed at each meeting</li> </ul>	<ul style="list-style-type: none"> <li>• Limited opportunities for updates due to infrequent meetings and limited communication between meetings</li> <li>• Lack of representation of municipal managers at all meetings</li> </ul>
Demonstrating internal and external legitimacy	<ul style="list-style-type: none"> <li>• Strong relationships among participants helped establish a common vision and internal legitimacy</li> <li>• SCCRMC successes helped attract outside support and establish external legitimacy</li> </ul>	<ul style="list-style-type: none"> <li>• Through interactions at CCEF trainings, participants began to form camaraderie and establish internal legitimacy</li> <li>• Limited evidence of external legitimacy and support from higher levels of government</li> </ul>
Building capacity among members and constituents	<ul style="list-style-type: none"> <li>• Members implemented best practices acquired from other members in their own municipalities</li> <li>• Members received valuable technical assistance and knowledge from CCEF</li> <li>• Limited participation of barangay members in monthly meetings</li> </ul>	<ul style="list-style-type: none"> <li>• Sharing of best practices among members promoted peer-to-peer learning and capacity</li> <li>• Members felt they did not have the capacity to continue network activities without outside support</li> <li>• Very limited participation of barangay members in network activities</li> </ul>

4.4.1 Building social capital in collaborative networks

Both the SCCRMC and DDBRMC demonstrated concrete progress in regards to key attributes of social capital, such establishing relationships, building trust, and exchanging information and knowledge. As an older network, SCCRMC participants had more opportunities

to build relationships, trust, and exchange information and knowledge, thus generating greater social capital than the DDBRMC. However, interviews with DDBRMC informants highlighted the strides made in building social capital over a much shorter period of time. Lauber et al. (2008) similarly found that participants in a collaborative community-based management network who had not worked together previously formed bonding ties that helped them develop shared community conservation goals and agree upon initial project ideas (e.g., community forest plans). Though participants in networks like the DDBRMC and SCCRMC come from different localities, their shared perspective as coastal managers promoted the formation of bonding ties among members (Burt, 2005; Rogers, 1995). In studying estuary management partnerships, both Schneider et al. (2003) and Mandarano (2009) found that participants collaborated toward shared causes and formed bonding ties with others in the network that fostered trust and collective action. For the SCCRMC, the continued interactions over the years strengthened the social bonds among group members, an important consideration since social capital is a resource requiring continued maintenance (Adler and Kwon, 2002). Additionally, SCCRMC members formed a group identity and shared vision, crucial components in facilitating participant collaboration toward shared goals (Crona and Bodin, 2006; Isaac et al., 2007).

Strong, repetitive ties among actors, where many individuals in a group are connected (as in the SCCRMC) foster group trust (Ernstson et al., 2010; Lauber et al., 2008), as do repeated interactions (Burt, 2005). In the SCCRMC, the stability of the group, their regular meetings, and the shared connections between multiple members created strong, trusting bonds. In the DDBRMC, however, due to its larger size and more infrequent meetings, it was more difficult for individuals to form strong relationships and build trust. Trust is a function of reputation and past behavior (Burt, 2005). In the DDBRMC, municipalities with histories of political leaders

who were unsupportive of coastal management activities were not trusted by other members. Perhaps through more opportunities to meet and demonstrate commitment (e.g., through monthly like those of the SCCRMC), trust could have been generated among DDBRMC members; however, for some members it is likely that only higher level political change would increase trust in their peers. It is also likely that the political complexity of the DDBRMC hindered the development of the same levels of relationships and trust that were generated in the smaller, less complex SCCRMC.

Information exchange and knowledge dissemination are key functions of collaborative ecosystem management networks (Crona and Bodin, 2006; Lauber et al., 2008; Schneider et al., 2003), and both the SCCRMC and DDBRMC supported these functions. Despite limited trust and weaker relationships among DDBRMC members, participants felt comfortable enough to share information and knowledge, which promoted participant learning. In the SCCRMC, having a regular information sharing forum was crucial to strengthening this component of social capital. For the DDBRMC, meetings were always coordinated by CCEF, highlighting the influential role of an outside organization in leading activities and providing learning opportunities. Given that network participants generally have many other job responsibilities, network coordinators like CCEF are often instrumental in sustaining network activities (e.g., Provan and Kenis, 2007; The Heinz Center, 2004).

#### 4.4.2 Creating an effective collaborative network

The SCCRMC's governance structure emerged as a key strength and main factor that helped the group to sustain itself after termination of CCEF funding and presents a potential governance model that other collaborative networks can apply to sustain their activities. The governance set-up of the SCCRMC, where a committee within the group was responsible for

overseeing network activities represents a participant-governed model that is highly flexible and helpful for facilitating closer relationships among members (Provan and Kenis, 2007). The participant-led management committee provided a central entity for information sharing and activity coordination, mechanisms that are useful for streamlining network activities (Cohen et al., 2012; Provan et al., 2008).

The DDBRMC, on the other hand, had a less comprehensive governance structure, with a small executive committee composed only of provincial governors and CCEF acting as the secretariat. The inclusion of provincial politicians in DDBRMC governance was necessary for the different provinces and municipalities operating under them to be able to collaborate. However, provincial politicians operate at a higher level and have more diverse responsibilities and less time to devote to the DDBRMC than the vice mayors and coastal managers in the SCCRMC governance system. Many actions for the DDBRMC occur at the municipal level – as demonstrated by the involvement of municipal coastal managers in DDBRMC trainings. The challenges the DDBRMC faced in determining an appropriate scale for governance and activities are common for regional collaborations. Regional programs often have to determine what is a manageable size for the collaboration and balance tradeoffs between geographic extent of the targeted region and existing governance and social opportunities that can promote collective action (e.g., Bryson et al., 2006; Mills et al., 2010; Sharfman, 1991). For the DDBRMC, a governance structure incorporating municipal managers or officials (e.g., mayors or vice mayors, like the SCCRMC) may have been better suited to coordinate network activities and sustain its activities after the termination of CCEF's program. However, the logistical difficulties of regularly bringing together municipal managers from nineteen municipalities across a much wider geographic region than the SCCRMC may have been overly complex, unmanageable, and

costly. For other collaborative networks, this underscores the necessity of thinking about the appropriate scale of collaborative management activities.

Trust among SCCRMC members was aided by the mechanisms the group had in place to monitor member actions and establish accountability, thus increasing the possibility that participants would comply with network demands (Keohane et al., 1993; Page, 2004). The SCCMRC's monthly meetings provided a forum for members to demonstrate they were following through on their commitments. The less frequent meetings of the DDBRMC and limited communication between meetings made it difficult to promote transparency, further limiting the development of member trust. Additionally, CCEF trainings were the mechanism that allowed DDBRMC members to develop trust and establish internal legitimacy, and members stressed that they did not have the capacity to coordinate these activities on their own. The DDBRMC members' dependence on CCEF reinforces the important role CCEF played in the DDBRMC and why the group failed to sustain itself following the end of CCEF's project. The unsustainability of programs following the termination of outside funding is a common problem for tropical coastal management efforts (Gurney et al., 2014; Pollnac and Pomeroy, 2005). If the DDBRMC had generated increased external legitimacy – such as obtaining funding from national and provincial agencies to support project activities (e.g., continued meetings and trainings), like the SCCRMC had – this could have provided one potential solution for sustaining activities in lieu of CCEF support. The external legitimacy the SCCRMC generated was crucial in its sustainability by providing fiscal and technical support for regular network functions (e.g., meetings, coral reef monitoring), but also instilling group members with increased pride in their efforts and offering an additional incentive to sustain their activities.

The SCCRMC's governance structure and internal and external legitimacy boosted member capacity by providing numerous opportunities for peer-to-peer learning. Strong bonding ties among members within a network, such as those within the SCCRMC, promote learning (Newell et al., 2004), thus increasing capacity. DDBRMC members also indicated that they benefited from sharing information with other members. Other resource management studies have found that peer-to-peer interactions are a key source of learning about new management innovations and increasing local capacity (Isaac et al., 2007; Rosset et al., 2011). However, despite increased member capacity, both the SCCRMC and DDBRMC had limited involvement of *barangay* representatives in their activities. For both networks, goals like decreased illegal fishing and stronger MPA enforcement are affected by actions at the *barangay* level. Community members who are informed and educated about coastal management activities are more likely to be supportive of activities and comply with management measures (Howe, 2001; Liebowitz, 2007). For networks to realize their ecosystem management goals, the networks and the social learning that occurs within them should go beyond the initial set of participants and extend to communities who are involved in management (Manring, 2007; Reed et al., 2010). Collaborative networks like the DDBRMC and SCCRMC members have the opportunity to strengthen their role as brokers between the network and community members. In doing so, they can share the information learned through network activities with others, helping increase local capacity and the ability of the network to effect change at multiple scales (Davidson-Hunt, 2006; NRC, 2008).

#### **4.5 Conclusions**

The SCCRMC and DDBRMC offer two examples of how social capital can be developed through and contribute to the effectiveness of collaborative networks, as well as challenges to operational effectiveness. Both networks demonstrate that even with participants who have not worked together previously, collaborating toward a shared cause helps network members build

social capital, share information, and increase capacity, all of which can be used to support achievement of network goals. As a network that sustained itself beyond the termination of donor funding, the SCCRMC offers a model that other networks can consider for overcoming the common development problem of program cessation once external support terminates. The SCCRMC developed a set “success mechanisms” – e.g., a strong governance structure, frequent meetings, member contributions, and high levels of internal and external legitimacy – that enabled it to sustain network activities. While there are different contextual factors at play that will influence a given collaborative network, the SCCRMC’s “success mechanisms” are useful strategies that can be applied in the implementation of other collaborative networks.

The DDBRMC represents a more politically complex network – encompassing four different provinces, 19 municipalities, and many small islands – as opposed to the seven municipalities and one island province in the SCCRMC. The number of different political units in the DDBRMC was a major hurdle that was difficult for members to overcome. Political tensions between municipalities attenuated member relationships and trust, and at times hindered collaboration toward network goals. Additionally, a governance structure that only involved high-level politicians created a disconnect between the operational level of municipal coastal managers and the governance of the network in which they were involved. The challenges the DDBRMC faced highlight the need for coordinators to think carefully about the appropriate scale for network activities and consider whether geographic or political complexity may undermine the achievement of network goals.

Collaborative networks are becoming increasingly common in ecosystem management, and my analysis offers empirical evidence regarding potential social benefits of these networks and barriers to success. The framework developed and applied in this study linking elements of

social capital and collaborative effectiveness offers a novel analytic approach for examining the effectiveness of collaborative ecosystem management networks. The design and implementation components outlined throughout this paper are essential to consider at all stages in network development. In collaborative networks, by fostering collective action and helping develop shared norms, social capital offers a foundation that supports collaborative effectiveness. The lessons learned through the DDBRMC and SCCRMC demonstrate the benefits of social capital for collaborative networks, and highlight ways in which networks can work to function effectively and sustain their activities.

## 5. Conclusions

The overarching objectives of my dissertation were to: 1) explore the role of social capital in marine management collaborative networks operating at multiple geographic scales; 2) compare multiple collaborative networks and understand how three attributes of social capital – relationships, trust, and information and knowledge exchange – influence the networks’ effectiveness and ability to create increased capacity for management; and 3) contribute to the theoretical understanding of collaborative network function in the context of marine management and provide recommendations for other collaborative ecosystem management networks. The Regional Exchange (REX) network of the Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security (CTI-CFF) and the Southeast Cebu Coastal Resource Management Council (SCCRMC) and Danajon Double Barrier Reef Management Council (DDBRMC) in the Philippines serve as three representative collaborative marine management networks operating at diverse scales and entailing varying levels of political complexity. Despite their differences, they all shared common goals of connecting marine managers to engage in ecosystem approaches to management, share lessons among members, and increase capacity. By comparing social capital in collaborative networks operating at different geographic and political scales but sharing socio-ecological and management goals, I identified conditions that promote the generation of social capital and discovered key network characteristics that contribute to effective network functioning. In Chapters 2 and 3, I presented new empirical evidence regarding the ability of networks to bridge traditional management and socio-cultural boundaries, promote social capital generation, and increase the capacity of members to manage coastal resources. In Chapter 4, I applied a new framework linking key elements of social capital and components of collaborative effectiveness that offers a novel analytic approach for examining collaborative network

effectiveness and which can be applied to other networks. Although there has been an increased push in the field of marine and coastal conservation and management toward larger-scale and more collaborative programs, there has been limited empirical research regarding the social outcomes of these efforts. I offer empirical evidence that demonstrates some of the social benefits of these networks, as well as potential challenges and barriers to success. The findings I discussed throughout my dissertation and summarized below can be used to strengthen the design and implementation of collaborative ecosystem management networks.

### **5.1 CTI-CFF, SCCRMC, and DDBRMC findings**

For all three networks, new relationships were formed among individuals who had not worked together previously and often had different perspectives and management approaches. In the REX network, despite large socio-cultural differences participants were able to form relationships that they used to exchange information and learn from each other. These cross-national ties were evident in the social network analysis and underscored in participant interviews, where participants spoke about how much they valued what they learned in the REXs and their relationships with other participants. In the SCCRMC, participants formed social capital – as evidenced through indicators of interactions, innovation exchange, and trustworthy information – across municipal boundaries, the conventional unit of coastal management in the Philippines. Moreover, not only did the social capital networks measured in the SCCRMC demonstrate the formation of connections across municipal boundaries, they showed no significant groupings of social capital by municipal affiliation. This was a surprising finding since many collaborative networks demonstrate strong relationships within subgroups based on shared member characteristics (e.g., Belaire et al., 2011; Crona and Bodin, 2006; Hoelting et al., 2014), and one which suggests that the sustained activities of the SCCRMC led to the creation a group identity and relationships that members valued as much as their municipal identities.

Both SCCRMC and DDBRMC participants spoke extensively of the bonds they formed with their fellow participants and the camaraderie they developed through a shared vision of better conservation and protection of their marine resources. For the DDBRMC, however, even with some elements of social capital among participants (e.g., information and knowledge exchange), political tensions among municipalities (e.g., distrust of mayors who supported illegal fishing activities) undermined the ability of participants to form productive relationships, limited trust, and hindered collaboration toward network goals. Although Danajon Bank is an ecosystem that would benefit from a coordinated approach to management, without longer, sustained outside support to catalyze the DDBRMC and help it design an appropriate self-sustaining governance structure, it may be too complex of a region for a truly collaborative network approach to ecosystem management. The challenges faced by the DDBRMC highlight the need for collaborative networks to think carefully about the appropriate scale of activities and what can be achieved realistically given time, budgetary, and organizational constraints.

The importance of network leaders in coordinating activities and supporting implementation and sustainability, whether these are members within the network or outside organizations, was a common finding across all three networks. In the REX network, numerous Coral Triangle nationals emerged as leaders in the network analysis. This finding supports other scholars who have highlighted the importance of local knowledge and peer-to-peer interactions in networks (e.g., Rosset et al., 2011; Scarf and Hutchinson, 2003). Many previous studies have found that the involvement of foreign technical experts in networks (particularly in coordinating and leadership roles, as was the case for the REX network) can lead to power imbalances and limit opportunities for local perspectives. The REX network, however, emphasized the role of member experiences and knowledge and involved participants in the design of network

activities. It was thus able to combine the benefits of foreign technical expertise and coordinating capacity with the value of peer-to-peer learning, which resulted in equitable learning outcomes and the empowerment of local leaders. The emergence of local leaders in the REX network demonstrates that even in an externally-funded network, when designed to allow sufficient participant interaction, networks can overcome embedded power imbalances and offer opportunities to highlight participant knowledge and empower participants.

Network leaders, like the local leaders who emerged in the REX network, are most effective in promoting network success when they work actively to bridge divides across network subgroups (e.g., serving as bridges between countries or municipalities in the network) and link the network to other networks with similar goals. In the SCCRMC, the strong connections among network leaders and the ability of the network core to help the group maintain connections to higher levels of governance (e.g., provincial and national agencies) and outside assisting organizations like CCEF helped the SCCRMC gain outside financial support and technical expertise that were instrumental in sustaining its activities.

In the REX network, the SCCRMC, and the DDBRMC, as in most collaborative ecosystem management networks, participating in network activities is only one among many responsibilities members have as part of their jobs. A coherent governance structure and coordinating body to lead the network are thus essential, as without a coordinating body members are unlikely to have the capacity to implement and sustain the network's activities. For the SCCRMC, the strength of its governance structure was highlighted in the social network analysis, where members of the management committee tended to be highly central, and in interviews where participants spoke at length about the strength of the management committee. There are also benefits to a network from outside organizations, like the United States Coral

Triangle Initiative (USCTI) Support Program or Coastal Conservation and Education Foundation (CCEF), acting as network coordinators, such as increased fiscal capacity and technical expertise. While outside organizations can serve as a neutral body to coordinate activities and streamline information, sometimes network participants become too dependent on the outside organization and feel that they do not have the capacity to continue activities on their own. This problem was illustrated through the DDBRMC and the dissolution of the network following termination of CCEF funding. Similarly, although CTI-CFF activities are ongoing, it is unclear if the REX network will be able to continue in the same form as it had previously without additional outside funding now that USCTI support has ended. Therefore, when there are opportunities for member-led coordinating bodies, as in the SCCRMC, this creates an opportunity to support local leaders, emphasize participant knowledge, encourage social learning, and sustain network functions.

The REX network, SCCRMC, and DDBRMC each represent one institution within the larger coastal and marine management milieu in their respective areas. Thus, it is important that each of these networks strive to diffuse social capital, lessons learned, and capacity beyond the network to others involved in other coastal and marine management efforts. In the REX network, for instance, there was limited representation of local level managers (e.g., CTI-CFF project site managers). Similarly, in the SCCRMC and DDBRMC participants tended to be municipal coastal managers, with limited attendance at meetings by *barangay* representatives who are active in coastal management. For the REX network, participants stressed the need for increased capacity building and diffusion of knowledge to local level managers. Both SCCMRC and DDBRMC members discussed ways in which *barangays* are informed of network activities, but multiple NGO informants who worked at both the municipal and *barangay* level highlighted a

need to broaden and strengthen these efforts. For the SCCRMC and DDBRMC, the ability to form connections among municipal coastal managers is an important outcome; however, given that local level actions often influence the ultimate success of environmental institutions, increased diffusion of network goals, lessons learned, and capacity to the local level are important considerations that could further achievement of network goals.

## **5.2 Lessons learned and recommendations for other collaborative networks**

The three networks studied in this dissertation have unique contextual issues, but they also share common characteristics with other collaborative ecosystem management networks being implemented throughout the world. In the Mediterranean, for instance, the Mediterranean Marine Protected Area Network (MedPAN) links marine protected area (MPA) managers across Mediterranean countries to build capacity and design coordinated approaches for MPA management (MedPan, 2015). In the United States, numerous National Estuary Partnerships, under the auspices of the Environmental Protection Agency's National Estuary Program, link governments, scientists, and stakeholders to collaborate on estuary protection and management (US EPA, 2015). These are just two examples of the various marine-focused, ecosystem management collaborative networks that exist worldwide, and the lessons learned in this dissertation have many applications for other such networks. While there has been a shift toward larger-scale and more collaborative approaches in the field of marine management, thus far there has been limited empirical examination of the social factors influencing the effectiveness of these efforts and strategies that can be used to strengthen them. In examining social capital in the CTI-CFF REX network, the SCCRMC, and DDBRMC, a few recommendations emerge that should be applied to the design and implementation of other collaborative ecosystem management networks:

1. **Collaborative networks have the ability to create social capital across socio-political boundaries.** Even when participants have not worked together previously and there are socio-political and cultural differences among members, networks can bridge these boundaries and help participants create and maintain relationships, exchange information, engage in social learning, and increase member capacity. Frequent opportunities for participant interaction through meetings and trainings where participants have opportunities to get to know their peers and build strong relationships facilitate the formation of social capital among participants.
2. **Networks nurture the development of local leaders, even when coordinated by outside entities.** Collaborative networks offer opportunities for participants to gain knowledge, expand their expertise and skills, and develop relationships with their peers. These opportunities for increased personal capacity and growth lead to the emergence of local leaders within the network. Particularly in networks coordinated by outside entities (e.g., foreign aid organizations), the emergence of local leaders helps the network emphasize local knowledge and empower participants. Network coordinators should recognize the importance of local leaders, support and encourage their growth, and help them use their leadership role to serve as active brokers both within and beyond the network.
3. **Strong governance mechanisms are instrumental to network success.** A strong governance structure provides a clear means to coordinate network activities, streamline information and actions, and help members collaborate toward shared goals. Although designing a governance structure can be difficult and tedious, this is an instrumental stage in network development. Selecting an appropriate governance structure designed to target

the network's goals – whether participant-governed, led by an outside organization, or a combination of these models – early on will help ensure members are clear on how the network will function and their responsibilities.

4. **Contextual issues like political will and funding can be difficult to overcome, even when social capital develops among participants.** Even when a network has a strong governance structure and fosters social capital among participants, sometimes underlying contextual issues like politics and funding will undermine a network's success. In some instances, social capital can be harnessed to overcome these issues by helping participants work collectively to form solutions, like increasing member contributions, seeking additional outside funding, or working with an outside organization to mediate member conflicts. However, prior to entering into collaborative network efforts, partners should think carefully about whether contextual issues can be overcome and what specific strategies can be used to do so.
5. **Knowledge gained and social capital built through collaborative networks should be diffused to other levels of management.** Collaborative networks do not exist in a vacuum; they are generally part of a larger ecosystem governance landscape involving many other individuals and organizations who are working toward similar goals. Thus, networks must think strategically about how to ensure diffusion of network lessons to other levels of management so that the tangible social capital and capacity outcomes formed within the network can have wider-reaching impacts.

Collaborative networks are not a panacea to resolve environmental problems. For marine ecosystems, addressing the complex socio-ecological threats they are facing – such as potential decreases in fish stocks due to climate change and illegal fishing, increased thermal stress on

coral reefs and other sensitive marine vegetation, and increasing levels of pollution – requires a multitude of innovative management approaches. However, collaborative networks that build member social capital represent one tool that can be applied toward environmental management and conservation problems. Social capital in collaborative networks helps the networks achieve social and management goals that eventually may result in improved socio-ecological outcomes and resilience. The CTI-CFF, SCCRMC, and DDBRMC demonstrate some of the tangible social capital benefits that can be gained through collaborative networks and underscore the value of and need to invest in collaborative ecosystem management networks.

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## Appendix A: Southeast Cebu Coastal Resource Management Council Social Network Survey

Cebuano translations are included in italics. This survey was distributed in-person to respondents.

### Section 1: General Information

1. **Where do you live currently?** *Please write-in below. [Palihog suwat sa blanko kung asa ka gapuyo karon]*

\_\_\_\_\_ municipality (munisipyo)

\_\_\_\_\_ barangay

2. **Please write-in the LGU or other organization that you work for and your job position.** *[Palihog suwat kung asa ka nga LGU nag trabaho o kung asa ka nanarbaho ug kung unsa imong posisyon sa trabaho]*

\_\_\_\_\_ LGU or organization (organisasyon)

\_\_\_\_\_ job position (posisyon sa trabaho)

3. **How many years have you been participating in SCCRMC events?** *Please provide the approximate numbers of years that you've participated in SCCRMC events. [Pila naka ka tuig nagaapil sa mga kalihukan sa SCCRMC? Palihug ug butang kung pipila na ka tuig nagaapil sa mga kalihukan sa SCCRMC.]*

\_\_\_\_\_ years (tuig) (e.g., 10 years) (e.g., 10 ka tuig)

4. **Thinking about the past 12 months, on a scale of 1 (this is my first meeting) to 10 (I always attend), how frequently do you attend SCCRMC meetings?** *Please circle one: [Sa sulod sa ni-aging 12 ka buwan, isuwat ang numero 1 (bag-o pa nagsugod ug apil) hangtod 10 (kanunay ko nag-apil), ka pila ka naka apil sa mga miting sa SCCRMC. Palihog lingini ang numero.*

<b>This is my first meeting</b>				<b>I always attend</b>
1	2	3	4	10

## Section 2: Information Sharing in the SCCRMC

*Instructions: For all questions, you will be asked to list up to five individuals. You will receive specific prompts with each question to instruct you. [Matag pangutana nga mo sunod, palihog lista ug abot pulo ka mga tawo basi sa unsa ang pangutana]*

1. **Thinking about the past 12 months, who have you interacted with most frequently about issues related to the SCCRMC?** *Please list up to 10 individuals, the frequency of communication, and their municipality, and title. Interactions include exchanging ideas and advice, collaborating on projects, serving on committees together, and interacting in a social setting. Next to each person, please estimate the frequency (e.g., once a month, once a week, as needed) of your interactions with this person. .[Sa sulod sa 12 ka buwan, kinsa man and tawo nga imong na sigehan ug istorya kabahin sa SCCRMC ug mga butang kabahin sa SCCRMC?][ Palihug lista abot pulo ka tawo, kung kapila mo nag-istorya, taga-asa na munisipalidad, ug ilahang posisyon sa trabaho. Iapil sab ang inyong nahisgutan kabahin sa ilang mga tambag, mga proyekto, ilahang mga nasakopan, ug ang inyong mga na istoryahan. Sa blanko sunod sa ngalan, palihog ug bana-bana kung ka pila kamo mag ka istorya (sama sa ka usa sa usa ka buwa, o ka usa sa usa ka semana o kung kanus-a kinahanglan).]*

<b>Name (pangalan)</b>	<b>Frequency (ka-pila)</b>	<b>Municipality (munisipalidad)</b>	<b>Title (posisyon sa trabaho)</b>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____


2. **For the individuals you listed above, what type of information do you discuss when you interact with them?** *Please check all that apply or write-in an additional response. .[Kada sa usa ka tawo nga imong gi lista, unsa man nga klase sa impormasyon ang inyong mga nahisgutan?]*Palihog ug check sa tanan kung mao kini imong gi pakig isturyahan.

- Marine protected area management
- Coastal law enforcement
- Illegal fishing
- Share documents related to the SCCRMC *[pakig ambit ug mga dokumento kabahin sa SCCRMC]*
- 
- Discuss projects relating to the SCCRMC *[pakig isturya kabahin sa SCCRMC]*
- Discuss personal issues *[pakig isturya ug mga butang personal]*
- 
- Other: *[kung ubang mga butang, palihog suwat ]*  
\_\_\_\_\_

3. **For the individuals listed above, what are the main modes of communication that you use to interact with them (e.g., text message, telephone, in-person conversation, email)?** *Please write at least two modes below. [Sa mga tawo nga na-lista, unsa ang gamit kaayo ninyo nga klase sa komunikasyon kung ang hisgutan kabahin sa SCRRMC (sama sa text, telepono o personal nga)? pag-isturya. Palihog sulat ug duha ka klase sa blanko.]*

---

4. **Which members of the SCCRMC do you look to for or have exposed you to new or innovative ideas and information?** *Please list the names of up to 10 individuals, their municipality, and title. .[Kinsa na miyembro sa SCCRMC ang imong gi-pangita o ang nag*

*hatag ka nimo ug mga bag-o na ideya ug impormasyon?]Palihog lista ug 10 ka tawo, , taga-asa na munisipalidad, ug ilahang posisyon sa trabaho.*

<b>Name</b>	<b>Municipality</b>	<b>Title</b>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

5. **Who do you turn to for trustworthy information about the SCCRMC or related issues (e.g., marine sanctuaries, fisheries enforcement).** *Please list the names of up to 10 individuals, their municipality, and title. .[Kinsa ang imong masaligan ug ma adto-an kabahin sa mga sensitibo nga mga butang kabahin sa SCCRMC, sama sa marine sanctuary, sa pag patuman sa mga balaud kabahin sa fisheries. Palihog lista abot 10 ka tawo, taga-asa na munisipalidad, ug ilahang posisyon sa trabaho.]*

<b>Name</b>	<b>Municipality</b>	<b>Title</b>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

---

**Thank you for taking the time to complete this survey! We appreciate your responses.**  
*Daghang salamat sa pag hatag og oras ani nga survey! Nalipay ako opg dako sa inyong sa  
inyong pag pakig-ambit ug pag-kumpleto ani nga survey!]*

## Appendix B. Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security Social Network Survey

This survey was distributed through the online survey tool, Survey Monkey, to individuals who had participated in Regional Exchanges (REXs) on marine protected areas, climate change planning, and fisheries management.

### Information Sharing and the Coral Triangle Initiative's (CTI) Regional Exchanges

#### Section 1: General Information

This section asks you to report general information about yourself and your participation in Coral Triangle Initiative (CTI) Regional Exchanges.

**1. What is your primary nationality? Mark one.**

- Indonesia
- Malaysia
- Papua New Guinea
- Philippines
- Solomon Islands
- Timor Leste
- Other (write in) \_\_\_\_\_

**2. What is your gender? Mark one.**

- Male
- Female

**3. Please write-in the current organization that you work for.**

\_\_\_\_\_ organization

**4. What is your current job title within this organization?**

\_\_\_\_\_ job title

**5. In what year did you first participate in CTI events?** Please provide the approximate year you recall first participating in a CTI event – e.g., 2009. Events include activities such as regional exchanges, trainings, technical working group meetings, national coordinating committee meetings, and other events related to CTI.

\_\_\_\_\_ year (YYYY)

**6. Thinking about the past 5 years, please indicate which topical Regional Exchanges (REX) you have attended.** Please check all that apply or write-in an additional response.

- Marine protected areas (MPAs)
- Climate change adaptation (CCA)
- Ecosystem approach to fisheries management (EAFM)
- I did not participate in any Regional Exchanges
- Other(s) (write-in): \_\_\_\_\_

**7. What types of CTI-related activities do you participate in?** Please check all that apply or write in additional responses.

- Topical regional exchanges (e.g., MPAs, CCA, EAFM)
- Topical technical working groups
- CTI-related trainings
- National Coordinating Committee (NCC) meetings
- National Coordinating Committee technical working groups
- Other CTI related events (write-in): \_\_\_\_\_

**8. Thinking about the past 12 months, on average how frequently have you participated in CTI meetings involving others on CTI-related work (e.g., technical working group meeting, NCC meeting, REX)?** Please check one.

- Approximately once per week
- Approximately once per month
- Approximately every other month
- Approximately every six months
- Approximately once per year
- I have not participated in any CTI activities in the past year

**9. On a scale of 1 to 10 (with 1 signifying no value and 10 signifying high value), how valuable were Regional Exchanges in linking people from the six Coral Triangle countries.** Please circle your response.

1      2      3      4      5      6      7      8      9      10

**10. Has what you learned at a Regional Exchange ever influenced you to take action in your country?** Please check one.

- Yes
- No
- Don't know

**11. On a scale of 1 to 10 (with 1 signifying no increase and 10 signifying significant increase) to what extent have Regional Exchanges increased capacity to be able to implement new policies in your country? Please circle your response.**

1      2      3      4      5      6      7      8      9      10

## Section 2: Relationships Formed Through Regional Exchange Participation

This section asks you to think about individuals that you work with on CTI-related issues like MPAs, fisheries management, and climate change planning. Specifically, you will be asked to name up to five individuals within your country and five individuals in other countries that you work with on these issues. After naming each individual, you will be asked to answer a few brief follow-up questions about each individual.

**Within your country, if you have questions about CTI-related issues (e.g., MPAs, climate change planning, fisheries management) who do go to?** Please list up to five individuals within your country below. For each individual, please answer the questions included below. A person's affiliation is very important for this analysis, but if you do not know a person's position or organization, please still nominate them and leave blank the 'organization' and 'position'.

### Individual 1:

**Name:**

**Position:**

**Organization:**

**1. Did you work with this person prior to the start of CTI?** Please check "yes" or "no." If YES, please proceed to Question 3.

- Yes
- No

**2. If you did not know this person prior to the start of CTI, how did you first meet this person?** Please check all that apply.

- At a topical regional exchange
- At a CTI technical working group meeting
- At a National Coordinating Committee meeting
- Working together at a CTI-implementation site
- Other (write-in): \_\_\_\_\_
- Other (write-in): \_\_\_\_\_

**3. What motivates you to communicate with this person?** Please check all that apply.

- This person has access to technical knowledge that I would not have otherwise.
- This person works on an issue that I don't work on but complements my work and discipline.
- This person has exposed me to new and innovative ideas and knowledge.
- This person has worked on CTI issues longer than I have.
- This person has connections to other people that are useful for me to work and communicate with.

- I know I can turn to this person for trustworthy information.
- I am friends with this person.
- Other (write-in): \_\_\_\_\_
- Other (write-in): \_\_\_\_\_

**Individual 2:** [insert same set of questions]

**Individual 3:** [insert same set of questions]

**Individual 4:** [insert same set of questions]

**Individual 5:** [insert same set of questions]

**If you have questions about CTI-related issues (e.g., MPAs, climate change planning, fisheries management) who do go to outside your country?** Please list up to five individuals from other countries. For each individual, please answer the questions included below. The people you nominate DO NOT have to be a citizen of a CT6 country. A person’s affiliation is very important for this analysis, but if you do not know a person’s position or organization, please still nominate them and leave blank the ‘organization’ and ‘position’.

**Individual 1:**

**Name:**

**Position:**

**Organization:**

**Country:**

**1. Did you work with this person prior to the start of CTI?** Please check “yes” or “no.” If YES, please proceed to Question 3.

- Yes
- No

**2. If you did not know this person prior to the start of CTI, how did you first meet this person?** Please check one response indicating how you first met this person.

- At a topical regional exchange
- At a CTI technical working group meeting
- At a National Coordinating Committee meeting
- Working together at a CTI-implementation site
- Other (write-in): \_\_\_\_\_

Other (write-in): \_\_\_\_\_

**3. What motivates you to communicate with this person?** Please check all that apply.

- This person has access to technical knowledge that I would not have otherwise.
- This person works on an issue that I don't work on but complements my work and discipline.
- This person has exposed me to new and innovative ideas and knowledge.
- This person has worked on CTI issues longer than I have.
- This person has connections to other people that are useful for me to work and communicate with.
- I know I can turn to this person for trustworthy information.
- I am friends with this person.
- Other (write-in): \_\_\_\_\_
- Other (write-in): \_\_\_\_\_

**Individual 2:** [same set of questions]

**Individual 3:** [same set of questions]

**Individual 4:** [same set of questions]

**Individual 5:** [same set of questions]

**END OF SURVEY.**

Thank you for taking the time to complete this survey! We greatly appreciate your responses. If you have any further questions about the study please contact [CTLP@u.washington.edu](mailto:CTLP@u.washington.edu).

## Appendix C: Key Informant Interview Guide

### Interview Script – Collaborative Networks and Social Capital (used for SCCRMC, DDBRMC, and CTI-CFF participants)

[Introduction: Name, affiliation, purpose of the study and why I am asking them these questions. Explain that the interview will take approximately one hour and that we will discuss a variety of topics related to marine resource management collaborations at the local and regional level. Define collaboration so it will be clear for subsequent questions: working with people from various organizations/regions/communities to address joint problems. All information will be kept confidential and they are free to skip any questions that they are not comfortable answering.]

#### General questions

1. **Can you tell me about any collaborative marine resource management efforts that you have been involved in over the past five years?** (e.g., The Coral Triangle Initiative, Danajon Double Barrier Reef Management Council, the Southeast Cebu Coastal Resource Management Council).
  - a. **In your opinion, could you describe what you personally found to be the most rewarding aspects of participating in these collaborations?** [Note: if interviewing a collaborative organizer, can change “you” to “the participants.”]
  - b. **In your opinion, could you describe what you found to be the most challenging aspects of participating in these collaborations, both for you and the collaboration as a whole?**
  - c. **Have you ever been involved in any collaborative efforts that you feel failed to achieve their major management or ecological goals?** Prompt: Can you explain to me why you think these attempts failed?
  - d. **Could you explain what factors motivate you to participate in a collaboration?**
2. Can you tell me about some the ways that you think collaborations can affect marine environments?

#### Social Capital – Nature of Relationships

3. I would like you to describe the types of relationships that you have formed with other participants in the collaborations you have been part of. **For instance, have you formed new professional or social relationships?**
  - a. **Were there participants in the collaboration who you were friends with prior to the collaboration?** Prompt: If so, could you describe whether this personal relationship influenced your experiences in the collaboration?
  - b. **Can you describe how the relationships you have formed with fellow participants in collaborations have changed throughout the course of the collaboration?** Prompt: Why do you think they have changed? (If they need examples: e.g., have you grown closer with people throughout the collaboration?)
  - c. **Did having the opportunity to work closely with fellow participants in the collaboration affect your relationship with or opinion of them?** Prompt: Could you tell me more about that?

#### Social Capital – Trust

4. I would like to talk about how comfortable you felt with other participants in the collaboration. **Could you describe whether you felt comfortable discussing sensitive topics with them?**
  - a. **Could you explain to me the types of factors that contributed to you feeling comfortable sharing information with other participants in the collaboration?** Prompt: Why did these factors make you feel that way?
  - b. **After meetings, did you feel that other members of the collaboration would follow through on their obligations and tasks?** Prompt: Can you describe what factors contributed to you having confidence that others would follow through on their obligations and tasks?
  - c. **Could you describe actions participants in a collaboration can take to build and strengthen trust?**

#### Social Capital – Communication and Information Exchange

5. I would like to talk about the information sharing with other members of the collaboration, both at meetings and with other participants in between meetings. **Could you describe the major topics and issues you communicated with other members of the collaboration about?** Prompt: Both at meetings and between meetings.
6. Please tell me about me how you communicated with other members of the collaboration(s). **For instance, outside of meetings, how frequently did you communicate with other participants?** Prompt: what were your primary modes of communication (e.g., email, telephone, in-person, etc.)?
  - a. I would like you to tell me more about the individuals you communicated with more frequently between meetings. **Could you explain why you chose to communicate with those individuals more than others?**
7. **Do you feel that by participating in the collaboration you were exposed to new ideas and information?** Prompt: Can you explain to me the types of ideas and information that you were exposed to?
8. **Could you tell me about how information has been disseminated in the collaborations that you have worked in between meetings?** (e.g., email, mailings, telephone) Prompts: Do all members have equal access to information? How do you feel about dissemination of information in these collaborations?
  - a. **If you had questions about the collaboration or topics relating to the collaboration, were some people that you were more likely to talk to than others?** Prompt: Can you explain why you were more likely to come to these individuals with questions?
  - b. **Do you feel that there were individuals who were more likely to provide you with access to new information and knowledge than others?** Prompts: Could you tell me more about the nature of your relationship with these individuals? Can you explain more why you felt that they were more useful sources of information?

Local implementation (for Philippine managers and practitioners)

10. I would like to move on to some broader question regarding marine resource management in the Philippines, in general. **Could you tell me your thoughts current structure more managing marine resources in the Philippines?**

- a. Many of the current collaborations (e.g., Danajon, Southeast Cebu) exist at the municipal level. **But do you feel that community members in neighboring barangays collaborate with each other on issues such as marine protected area or fisheries management?**
  - b. (If yes) **Could you explain how these smaller-level collaborations work?**
- 11.** Currently, there are many new efforts that are trying to encourage people working on marine management to collaborate beyond their communities at the national and regional levels. **What are your thoughts on whether individuals at the community and municipal level in the Philippines are open to this type of higher-level collaboration?**
- a. **Could you describe any possible benefits you see stemming from integrating local and regional activities?**
  - b. **What do you think about any particular challenges or costs from integrating local and regional activities?**
- 13. Do you have anything else you would like to share?**

[Conclusion: Summarize what I have heard, and ask them again if there is anything else they would like to share or add. Tell them the next steps in my research. Give them my contact information and let them know that they are free to contact me if they have any additional information they would like to share or people that they think it would be useful for me to speak with.]