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Measuring Connective Capacity throughout the Gulf of Mexico Fishery Management Network

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MEASURING CONNECTIVE CAPACITY THROUGHOUT
THE GULF OF MEXICO FISHERY
MANAGEMENT NETWORK

A Thesis

by

ANTHONY ROCHA LIMA

Submitted to the Graduate College of
The University of Texas Rio Grande Valley
In partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2018

Major Subject: Ocean, Coastal, and Earth Science

MEASURING CONNECTIVE CAPACITY THROUGHOUT
THE GULF OF MEXICO FISHERY
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December 2018

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ABSTRACT

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The Gulf of Mexico provides substantial resources along its 1,680-mile coastline, spanning 5 U.S. states and providing millions of pounds of seafood and hundreds of million in revenue annually. Continued success of the fishery relies on the ability of a large, complex, multiagency network to find the best solutions to balance the needs of humans, as well as ensure long term sustainability. Organizations with varying objectives require effective communication when addressing intricate ecosystem-based management topics such as endangered species and regional economies.

To better understand the connectivity within the Gulf fishery management network, an IRB reviewed survey was dispersed to the largest, most influential organizations. The survey anonymously measures perceptions and interactions with other organizations, with a supplemental semi-structured interview to allow for researchers to investigate past the limitations of the survey. Metrics such as four dimensions of trust and three dimensions of influence are used to understand connective capacity.

DEDICATION

The completion of my master studies would not have been possible without and love of family; my mother, grandparents, and my sister. I would like to specifically thank my mother, Rosangela Rocha, who continuously guided my education and provided limitless support.

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CHAPTER I

INTRODUCTION

1.1 Statement of the Problem

Coastal areas are among the most valuable in the world, making up just 4% of the Earth's total area and having roughly 33% of the world's population (Barbier, 2013). These areas are heavily populated due to their valuable natural resources, as well as cultural and recreational value. The Gulf of Mexico (GOM) commercial fishery provides a wealth of marine resources within its waters and coastal ecosystems. Annually, the GOM provides around 1.6 billion pounds of seafood and provides over \$5 billion in income across all five U.S. states: Texas, Louisiana, Mississippi, Alabama, and Florida (NOAA, 2006). A cascade of other industries are directly dependent on the region's fish stocks; such as marine sport fishing, maritime vessel construction, and commercial seafood processing (Adams, Hernandez & Cato, 2004). Additional value exists in the form of the 600,000 square miles of ocean used in merchant shipping, which has grown annually in volume and weight since 1998 (Adams, Hernandez & Cato, 2004). These industries are interdependent, for their reliance upon the same ecosystem, as well as their reliance upon on each other for economical and industrial services.

Despite a universally recognized need for effective management over the region, the GOM still experiences pressure on the fishery. The most controversial collapse within the GOM is the northern red Snapper (*Lutjanus campechanus*). In the 1980s, red snapper biomass was so low that nearly half of the stock's former commercial range could not be fished (Cowan, Grimes,

Patterson, et. al, 2011). The red snapper is slowly showing signs of recovery, but an issue that persists is why the development of a fishery management plan has been so slow to be designed and implemented by the Gulf of Mexico Fishery Management Council (GMFMC, sometimes referred to “the council”. Some analysts believe the council management implemented science that was “faith-based,” and this would delay the implementation of conservation management practices needed to allow for the fishery to recover. This “faith-based” science relied upon debatable success of the artificial reefs, as well as ambiguous efficiency in the implementation of bycatch reduction devices (Cowan, Grimes, Patterson, et. al, 2011). The collapse of the red snapper fishery cannot be solely attributed to a lack of scientific clarity, but perhaps an overconfidence in man’s ability to control and predict natural systems. Stock assessments have been categorized as “data hungry, complex, and uncertain,” which may be attributed to seemingly growing trend of trust in science (Cowan, 2011). Lack of clarity amongst a wicked ecosystem management problem has led to continuous differences in perception among scientific, management, and fisher communities (Cowan, 2011).

Unfortunately, many factors that contribute to the success of the Gulf of Mexico Fishery (GOMF) are outside of the GMFMC’s control. Natural disasters such as intense hurricane seasons, as well as anthropogenic pressures from disasters such as the Deepwater Horizon oil spill has had catastrophic effects on the fishery. Under these external forces, the fishery network expands, engaging outwards to new agencies. Although these occurrences can have “management” in the form of disaster preparedness, the GOMF has experienced some recurring environmental hazards that require stakeholder involvement to effectively address.

One of these complex problems is with hypoxia, or “The Dead Zone” which has occurred for decades. Hypoxia caused by eutrophication of runoff water from the Mississippi River Basin results in massive areas where all species are harmed (Rabalais, Turner, & Wiseman, 2002). Trawling data has shown that demersal species spatial distribution suffers from loss of useable habitat, loss in ecological performance, and often direct mortality (Craig, Crowder, Gray, McDaniel, et. al., 2001). Many of these demersal species are harvested directly (such as shrimp), but their disturbance also negatively impacts species that rely on them as a food source. In the case of hypoxia, the GOM fishery is negatively impacted through water management practices of several states connected to the Mississippi River drainage basin. Neither the National Marine Fishery Service (NMFS), nor any bureau within the National Oceanic and Atmospheric Administration (NOAA), have regulatory authority over water management, and here the network must extend to the Environmental Protection Agency (EPA), United States Department of Agriculture (USDA), and other organizations. It quickly becomes obvious that the GOM fishery network reaches far into organizations that have are not necessarily fishery focused.

In response to the challenge of governing over such vast ecosystems, fishery managers have turned toward a new management style that views the fishery through a much wider lens (see Wondolleck & Yaffee, 2017, for the state of the art of marine EBM). This shift allows for a holistic view in which the fish are merely a component of a larger, much more complex ecosystem. The complexity of the systems also requires communication among the ever-widening series of stakeholders that effect the fishery’s resiliency, diversity, and anthropogenic pressures. The new paradigm, ecosystem-based management (EBM), features three major

elements; land-scape scale focus, collaborative planning, and flexible planning goals (to be discussed further in 2.1). These core elements are absolutely necessary for the fishery to handle additional stresses from anthropogenic sources, and none of them can be implemented without having successful dialogue between integrated government agencies and their relationship with stakeholders. This study analyzes the concepts of EBM throughout the GOM fishery management network, exploring individuals as well as the network in its entirety, and focuses on evaluating the extent and precursor of cooperation and collaboration.

CHAPTER II

REVIEW OF THE LITERATURE

2.1 Ecosystem Based Management

Resource management, especially at the scale of the GOM, cannot function efficiently with top-down, command-and-control style structures. Instead, EBM seeks to integrate adaptive co-management, the ability of multiple organizations to cooperate with a management plan (Armitage, Plummer, Berkes, Arthur et al. 2009). Three feature elements of EBM allow for management of this type; land-scape scale focus, collaborative planning, and flexible planning goals (Layzer, 2008). These three elements require connective capacity, a term often associated with water governance, that deals with an organization's ability to connect with others to handle complex problems (Edelenbos & van Meerkerk, 2015; van Meerkerk & Edelenbos, 2018). Land-scape scale focus is the realization that all things in ecosystems are interconnected. Runoff from the Mississippi basin has caused hypoxic conditions throughout the GOM, despite the water originating hundreds or even thousands of miles away (Raymond, Oh, Turner, & Broussard, 2008). Collaborative planning incorporates cooperation. Collaboration should take place between a range of actors, who all have different personal and institutional needs from the resources. Branching communication between actors in this network provides the sharing of exclusive knowledge, experiences, and perspectives that others do not have. Although many aspects of hard science can be relatively well understood by scientists, no single person or regulatory agency will ever be able to find one solution or management tactic that will completely serve the

fishery in every way. Lastly, flexible planning goals includes the recognition that goals may change as new information becomes available. These three elements focus on stakeholder inclusiveness, connective capacity, and adaptability.

Ultimately, successful implementation of EBM requires a large network of actors engaged in strong communication and cooperation. Trust among these actors is vital to fostering collaboration, with boundary-spanning leaders playing a critical role in facilitating new connections with these actors. Boundary-spanning leaders work to cultivate scenarios with informal communication. Informal communication is simple and comfortable; it is most widely used in scenarios where stakeholders can interact on a personal level without an overwhelming need for strict professionalism, which develops trust in the process (Edelenbos, & van Meerkerk, 2015). Trust is a precursor to connective capacity, organizations that are able to work jointly in good faith with one another can appropriately manage complex systems across ecosystems (Edelenbos, & van Meerkerk, 2015; Temby, Sandall, Cooksey, & Hickey, 2017). Trust and influence within a fishery network allows for fragmented institutions (agencies that deal with only a specific aspect that still effects the fishery), as well as stakeholders, to collectively make decisions that consider all aspects of the ecosystem.

Currently, there is very limited research on the relationships between organizations within the GOM fishery. Understanding how the network and its individual components integrate requires focusing on biological data, public policy theory, economics, and the desires of

stakeholders. A multitude of data exists when examining smaller pieces of the network, but few studies examine the overall functionality of the system.

Biological survey data is available through public sources. Additionally, a range of scholars have discussed varying types of natural resources, including fisheries. A critical component to management is to understand that each ecosystem, although governed at some level by the same principles, is unique. This is true of the flora and fauna, as well as of abiotic conditions, including governance and management structure. Policies and regulations that support sustainable harvests in regional fisheries councils can not necessarily be applied to the GOM. Although the North Pacific, Pacific, and New England regions do interact with Canada and Russia, the relationships (economically, culturally, politically) between these countries are not the same. Additionally, events such as Deepwater Horizon oil spill in 2010 and intense 2004-2005 hurricane seasons are specific to the region.

One study that is specific to the region assess the efforts of the Gulf of Mexico Alliance (GOMA) into bringing EBM style management to the region. GOMA brings together state representatives for the US Gulf States with federal partners to come to conclusions about best management practices for the region (Carollo & Reed, 2010). Five separate points of EBM were examined: multilevel cooperation, stakeholder involvement, sharing of information, bridging science and policy, and consensus-based decision making. This study highlights the efforts in operationalizing the EBM theoretical framework, but focuses specifically on GOMA and does not have a metric for overall network connectivity. In order to map the entirety of the

network, each of the agencies must be analyzed independently as well as interdependently, which has been done with the survey instrument. (For another GOMA-focused overview of EBM in the GOM, see Wondolleck & Yaffee, 2017, chapter 3.)

2.2 Research Questions

This research aims to understand several key characteristics of the GOM fishery management network. The connective capacity of the network is crucial for making large scale decisions, often involving efforts from multiple stakeholders or organizations to be effective. Before any individual or network analysis occurs, it is necessary to understand what organizations are present in the network, including obvious government agencies, as well as extending to international, foreign government, and non-governmental organizations. The GOM fishery management network consists of a wide variety of stakeholders, each that can offer a wide unique experiences and different types of knowledge. It is necessary to understand the type and frequency of communication throughout the network to understand how cooperation and knowledge sharing can be most effective. Additionally, recurring communication is a precursor to interagency trust and influence, two elements that also must be analyzed to understand the intricacies of the fishery management network. Overall, this research is aimed at understanding three key research questions:

- What agencies make up the Gulf of Mexico fishery management network?

- How does communication occur between these organizations? With what method and frequency?
- What is the distribution of trust and influence throughout the network?

CHAPTER III

METHODOLOGY

The research methodology consisted of a survey instrument and semi-structured interviews with key informants. The survey codebook (including all survey questions and choices) and interview questions are listed in the appendix.

3.1 Survey Design - Target Organizations and Demographics

In the survey, respondents were asked a series of biographical questions, presented with an organized list of agencies and asked which ones they communicate with in their work, and then asked follow-up questions about those organizations. In developing the list of organizations, five categories were created, U.S. Federal, U.S. State, Trilateral, Mexican Government, and NGO. Lists of organizations were drafted by asking scientists and fishery managers who they work with. This list was designed to be inclusive as possible, as survey data would later show which organizations have a large impact throughout the network. Many organizations interact with each other in complex networks and, in some organizations, individuals may have significant influence despite bureaucratically not having significant authority with a position or title. Considering only which organizations have legal authority would be an oversimplified model of the reality of the network. Although an agency may enact a regulation, the driving force may come from outside of the organization. For these reasons, a wide range of stakeholders must be interviewed to understand the inner-workings of fishery politics.

The first and most obvious agencies to include in this study are large actors in the fishery, federal and interstate organizations. Organizations such as the Gulf of Mexico Fishery Management Council, Gulf States Fishery Commission, and the National Marine Fishery Service. Other federal agencies such as the U.S. Fish & Wildlife Service, Environmental Protection Agency, and the U.S Department of Agriculture are also listed, who indirectly have a serious impact on the health and longevity of the region's fishery. All five U.S. states also had relevant agencies (With Mississippi having two; Mississippi Department of Wildlife, Fisheries & Parks, and the Mississippi Department of Marine Resources).

Sharing borders (on land and in the sea) with other countries calls for a need for international organizations. Understanding how Mexican agencies communicate with American counterparts is necessary for healthy ecosystems and productive fisheries. Three international organizations are used for the study, the Trilateral Committee for Wildlife and Ecosystem Conservation and Management (TCWECM), International Boundary and Water Commission (IBWC), and the North American Development Bank (NADB). These three organizations work together to stabilize and maintain natural resources that are shared in North America, normally dealing with issues such as water use and pollution control. While the IBWC and NADB are bilateral organizations that facilitate cooperation between the United States and Mexico, the TCWECM is a trilateral organization, working with Canada, the United States, and Mexico. A single entity cannot manage or control a free-flowing common. Four Mexican agencies are added, including the SEMARNAT, CONAPESCA, and INAPESCA. Few scholars have

examined U.S.-Mexican relations when dealing solely with fisheries, and it is unknown what type of communication they have with American organizations.

The last category is NGOs, including organizations that have global environmental influence such as the PEW Charitable Trust, the Environmental Defense Fund, and the National Wildlife Federation. Some organizations in this category target solely marine resources (e.g., Ocean Conservancy, Oceana) and organizations such as GOMA target the region specifically. Although not government agencies, these groups have influence through public outreach and, in some cases, large amounts of staff, volunteers, donations, and support. The overall goal of almost all of the NGOs is preservation and sustainability of marine resources, with less emphasis on revenue. Fewer NGOs, such as the Recreational Fishing Alliance (RFA) are committed more toward fighting for the individual right of noncommercial fisherman and what some would consider excessive or intrusive regulatory restrictions.

The IRB-reviewed survey was distributed through the Qualtrics survey software to members of 27 of the 34 listed organizations. Seven organizations (five federal organizations, and two NGOs) did not have publicly available information. The e-mails were all taken from publicly available sources online, such as contact lists and other directories. In total, 3,370 e-mails were collected and received an invitation to participate. Of these e-mail addresses, 1,749 were associated from the U.S. Federal government, 257 belonged to state employees, 968 belonged to members of Mexican organizations, 112 e-mail addresses belong to trilateral organizations, and 284 addresses were found from NGOs. A survey link generated through

Qualtrics was able to be shared among those who were not e-mailed directly. Multiple reminder e-mails were sent at different time intervals, and the survey was available in English and Spanish. The survey was designed to maximize data while asking as few questions as reasonably possible, as longer surveys are likely to be incomplete. The survey was started 392 times, with 285 responses recorded. The completion rate is 31%, resulting in 124 completed surveys, while 161 respondents provided partial information.

Limited demographic data was collected, focused on determining the individual's career length, career category, working locations, and species specialization. Respondents with shorter career lengths are expected to work more closely with field work than with management, which would theoretically prescribe less networking. In addition to understanding a few key components about an individual's career, working location data was also gathered. This geographic data is meaningful to constructing the fishery management network because locations may result in some bias among the opinions of stakeholders (i.e. siding with one state over another, despite being in a federal position).

The survey also asked which species classes of fish the respondent's work is related to. The categorization was adapted from the one used by the Gulf of Mexico Fishery Council (2018). Some species in the gulf are more contentious and widely recognizable, but several species contribute to the region's economies. Requesting that respondents provide this information makes the respondents code-able by species category and, most importantly, enables

the construction of species category-specific networks. It also enhanced the internal validity of the data by ensuring that all respondents explicitly claim to work on Gulf fishery governance.

No personally identifiable data was gathered. The objective was to increase honest feedback without the fear of backlash from their organization, other organizations, or anyone throughout the UTRGV. The purpose of these type of demographic information is to better understand network characteristics. The perceptions and communication skill of a lifelong civil servant is expected to be different than a newly hired technician. Additionally, due to the size of these agencies, some of the individuals will not be involved with multiagency communication. Having a basic demographic profile of the participant can be used to determine trends within certain categories of involvement.

3.2 Survey Design – Measuring Connective Capacity

Connective capacity is loosely defined, but often underlines the ability to exchange communication, knowledge, or resources from organization to organization. Connective capacity can have different definitions dependent on the circumstance. In the Gulf of Mexico fishery management network, connective capacity will be measured through communication type, influence level, and trust amongst the fragmented governmental and pseudo-governmental entities that make decisions or are involved in the decision-making process. Due to the complexity of connective capacity, measurements cannot reasonably be made directly.

Section II of the survey measures communication variables, first by asking respondents what organizations they communicate with. A 3-point Likert scale measures the frequency of

both formal (committee meetings, memos, written business communication) and informal (chance conversations, spontaneous meetings, casual emails and phone calls). Both types of communication are important in different ways, and a hypothesis can be formed to see either as beneficial. Higher levels of formal communication may convey perceptions of a technocratic, top-down style of management where decisions are made mostly within higher ranks and are distributed to smaller agencies after. Higher level of informal communication may allow respondents to feel comfortable enough to have honest and free-flowing communication to all levels of management, possibly offering insight and relevant knowledge that can aid decision makers.

Multiple scales of trust are used within EBM as a model of how to define, measure, and understand the types of trust. For this study, four different dimensions of trust used are Stern and Coleman's (2015) typology: dispositional, rational, affinitive, and procedural. Existing survey question operationalizations of affinitive trust and procedural trust have been developed and employed in Temby et. al., 2017 and Song et. al., 2017, as three questions per trust type. Song et. al., 2019 expanded this to operationalizes of all four of Stern and Coleman's trust types, adding three questions each to measure dispositional trust and rational trust. This present study reuses the Song et.al., 2019 operationalizations, with one exception. Namely, one of the procedural trust questions, "In our experiences with this organization, we have never had the feeling of being misled," has been replaced with the following. "In working with this organization, it is expected that any unfair dealings will be avoided or rectified by existing regulatory, legal, or reputational measures." This was done due to potential overlap between rational trust and procedural trust in

Song et. al., 2019. For these questions, participants are asked how much they agree with a statement, answering with a 1-5 rating. Participants are asked which organization they belong to, which organizations they interact with, as well as the frequency and type of communication.

The survey questions are generated to understand specific details of how these organizations connect with one another. The questions are formatted so that the respondent is providing data based on their history and experiences working with another organization. Understanding interorganizational trust and influence is different than probing respondents about opinions; as opinions are not always acted upon. Dimensions of trust can also be compared to the type and frequency of communication between stakeholders. The table below is a small representation of the type of questions and its corresponding trust type.

Type	Definition	Survey Example
Dispositional	The general tendency or predisposition of an individual to trust or distrust another entity in a particular context.	People are almost always interested only in their own welfare
Rational	Trust in an entity based primarily on a calculation of the perceived utility of the expected outcome of placing one's trust in another entity.	This organization can be relied upon to perform its objectives.
Affinitive	Trust in an entity based primarily on the emotions and associated judgments resulting from either cognitive or subconscious assessments of the qualities of the potential trustee.	Because we have been working with this organization for so long, all kinds of procedures have become self-evident.
Procedural	Trust in procedures or other systems that decrease vulnerability of the potential	In this relation, both sides are expected not to make demands that

	trustor, enabling action in the absence of other forms of trust.	can seriously damage the interests of the other.
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Table 1: Four Dimensions of Trust

Influence has the capability of swaying opinions or bolstering support for a proposition within fishery governance. Even though an organization may have regulatory authority, other stakeholders are commonly engaged with decision making. Furthermore, influence is an important component of what Robert Agranoff (2006, 59-60) refers to as “mutual learning and adaptation.” Communication, trust, and influence are different yet all critical in measuring connective capacity within the GOM fishery management network.

Three degrees of influence were measured, operationalizing to Sikina Jinnah’s (2014) tripartite distinction introduced in *Post-Treaty Politics*. Respondents are asked about the frequency of information exchange (weak level of influence), changes in professional choices (moderate level of influence) and fundamental shifts in management paradigm (strong level of influence), according to a three-point Likert scale.

Questions were crafted in a way to isolate which specific type of influence is present, as seen below in Table 2. Differentiating between them is critical, as some sort of influence will always be present. Translation between theories of influence into measurable questions requires finesse and careful word choice when creating questions. The survey does merely ask if influence is present, but seeks to understand what the intensity of the influence is and how it will affect other parties.

A sensible estimation is that weaker levels of influence should be more predominant throughout the network, with stronger influence occurring less frequently. Additionally, organizations that are well-staffed, and have more access to funds, or have systematic jurisdiction are expected to be highly influential. In the case of generalist organizations such as trilateral agencies that deal with multiple uses such as water management and endangered species, little is known about what impact, if any, they have on the transnational fishery.

Degree of Influence	Survey Example
Weak	How often has your communications with people from this organization, or documentation from it, enhanced your knowledge of fishery science or management?
Moderate	How often has communicating with people in the following organization led you to make professional choices or decisions that you would not have otherwise made?
Strong	To what extent have your communications with people at this organization led you to rethink your approach the management of fisheries and/or harvesting and conservation practices?

Table 2: Influence

3.3 Semi-structured Interviews

The final component of acquiring data is the semi-structured interview. This data was taken primarily through conducting face to face interviews with the participants, with phone interviews a secondary but less desirable option. The 60-minute interview will allow for detailed, critical responses that are not possible using only the Qualtrics survey software. The researchers

here have the ability to intimately explore subtle differences of interagency influence. The interview were recorded, removing the possibility of misinterpretation that would alter analysis. The semi-structured interviews provided valuable context to the survey data.

The GSMFC was chosen as the organization on which to focus for the semi-structured interviews. This decision was made because it is a uniquely fishery-oriented management entity that is housed from a single office. Larger groups such as the National Marine Fishery Service and U.S. Fish and Wildlife Service have several offices located in each of the Gulf states. Many of these offices function as regional headquarters, meeting rooms, logistical and administrative functions, and field stations. Interviews at only one of these locations would not allow for a comprehensive view of the entire organization's perception and functional roles. An important note is also that the GSMFC uniquely resides somewhere between a federal and state organization, but not exactly either as well. Furthermore, the GSMFC's smaller organization size makes it easier to coordinate with, interview, and engage with.

CHAPTER IV

FINDINGS

4.1 Target Organizations and Demographics

Section 1 of the survey collected data to understand critical demographic data about the respondents. The questions attained data regarding the main organization that the respondent worked, how long the position was held, a categorical career role, area code of place of work, specific species focus, and whether the respondent held a secondary position within fisheries.

The five highest respondent rates are shown in the table below. This represents an accurate spread of the overall tendencies of the respondent demographics. There are a high number of federal and state respondents, and lesser amounts of NGO respondents. It is important to note the size of the organization when comparing this data, as the organizations such as the Gulf States Marine Fishery Commission have a smaller number of staff yet may have a larger impact than some of the larger, generalist (and wealthier) organizations. Trilateral and Mexican organizations have extremely low respondent rates. There was a single response from three trilateral organizations, and only single response from four Mexican natural resource agencies.

#	Agency	Category	Percent of Respondents
1	U.S. Fish & Wildlife Service	Federal	18.40%
2	National Marine Fishery Service	Federal	11.66%
3	U.S. Geological Survey	Federal	10.43%
4	Mississippi Department of Marine Resources	State	7.36%
5	Coastal Conservation Association	NGO	7.36%

Table 3: Highest Respondent Rates

Time working within an organization represents the amount of turnover within some positions in the management network. Higher turnover rates may result in less connective capacity, as there is less time to cultivate meaningful professional partnerships with other organizations. Nearly half of the respondents (40.88%) have spent over 15 years working within their organization.

Time Working Within Organization

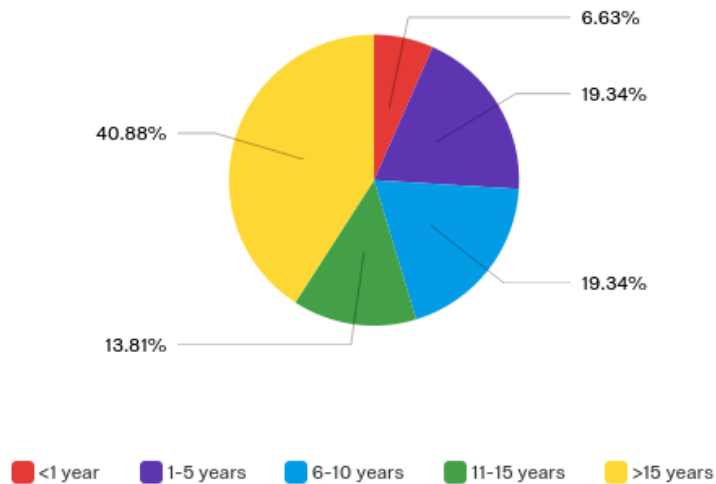


Figure 1: Career Length

Asking respondents to select a career category offers insight into how respondents view themselves. Many respondents may work in multiple categories, specifically as they move up into positions that require increased personnel management, interagency communication, and overall responsibility. “Education,” “Policy Advocacy/Legal,” and “Volunteer” are among the most popular responses for selecting the open-ended “Other (Indicate below)” category.

Career Category

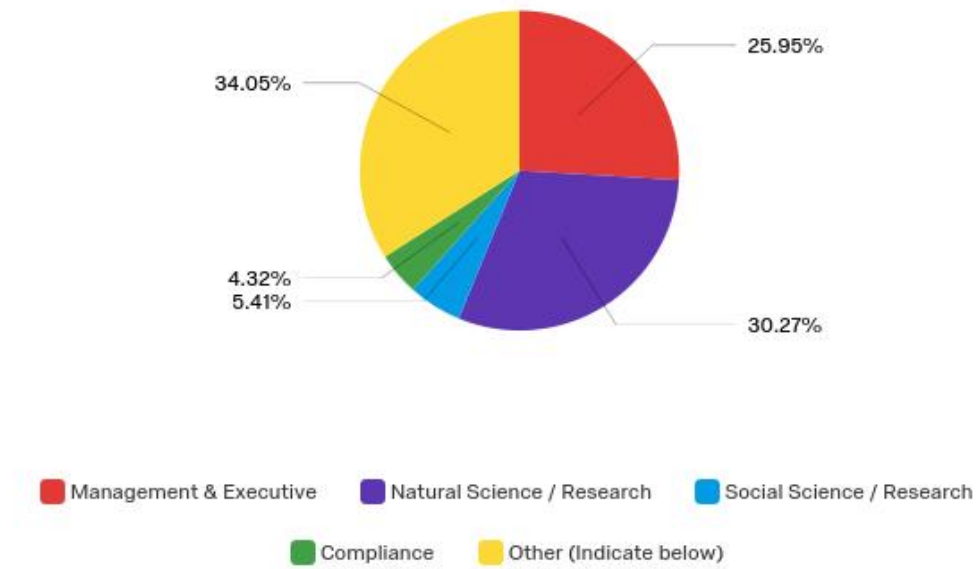


Figure 2: Career Category

Respondent's work address area codes are demonstrated in the map below, which uses color coding to determine response density. As expected, greater number of respondents live within closer proximity to the Gulf of Mexico coast line, with Mississippi and Florida having the majority. Some organizations, such as the Gulf States Marine Fishery Commission, do not have satellite offices, but only have a single address. The GSMFMC is located in Gulfport, MS. In conjunction with this, the Mississippi Department of Marine Resources also contributes to the density within the area.

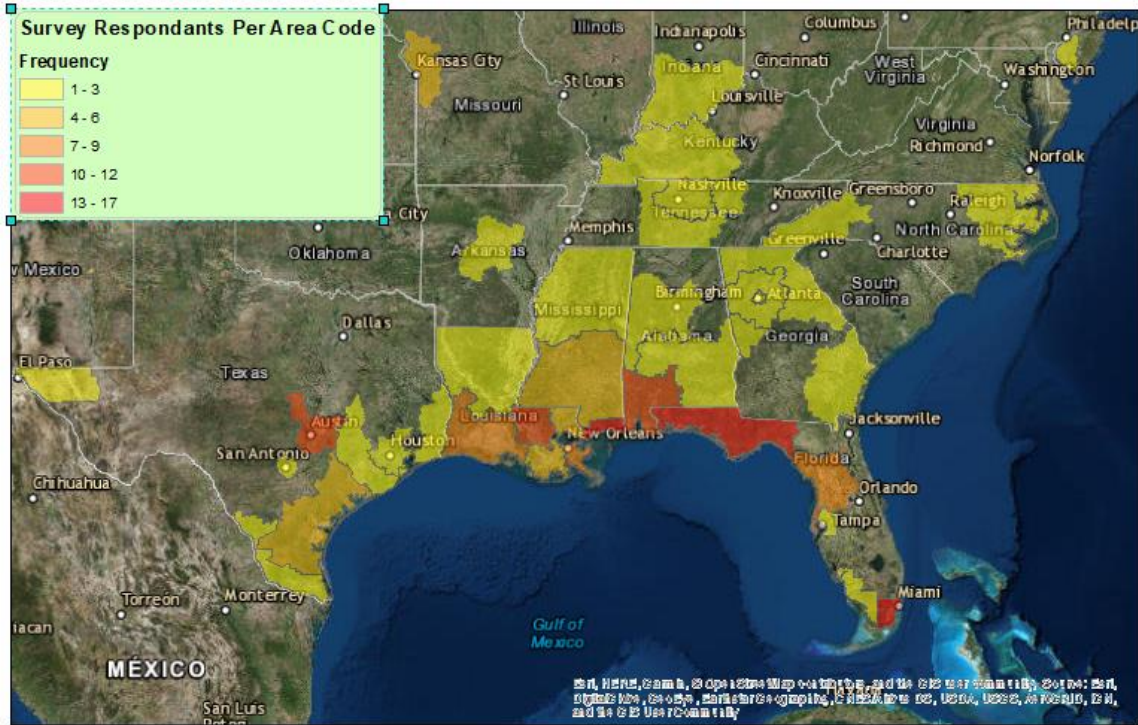


Figure 3: Respondent Working Locations

A relatively even distribution of different types of fisheries were selected. Reef fish, including the economically important red snapper, was the highest selected options. Groupers and other reef fish also remain very high amongst respondents. In the “Other (Indicate below)” options, the most frequently entered answers are oysters and endangered and threatened species.

Specific Fisheries Managed

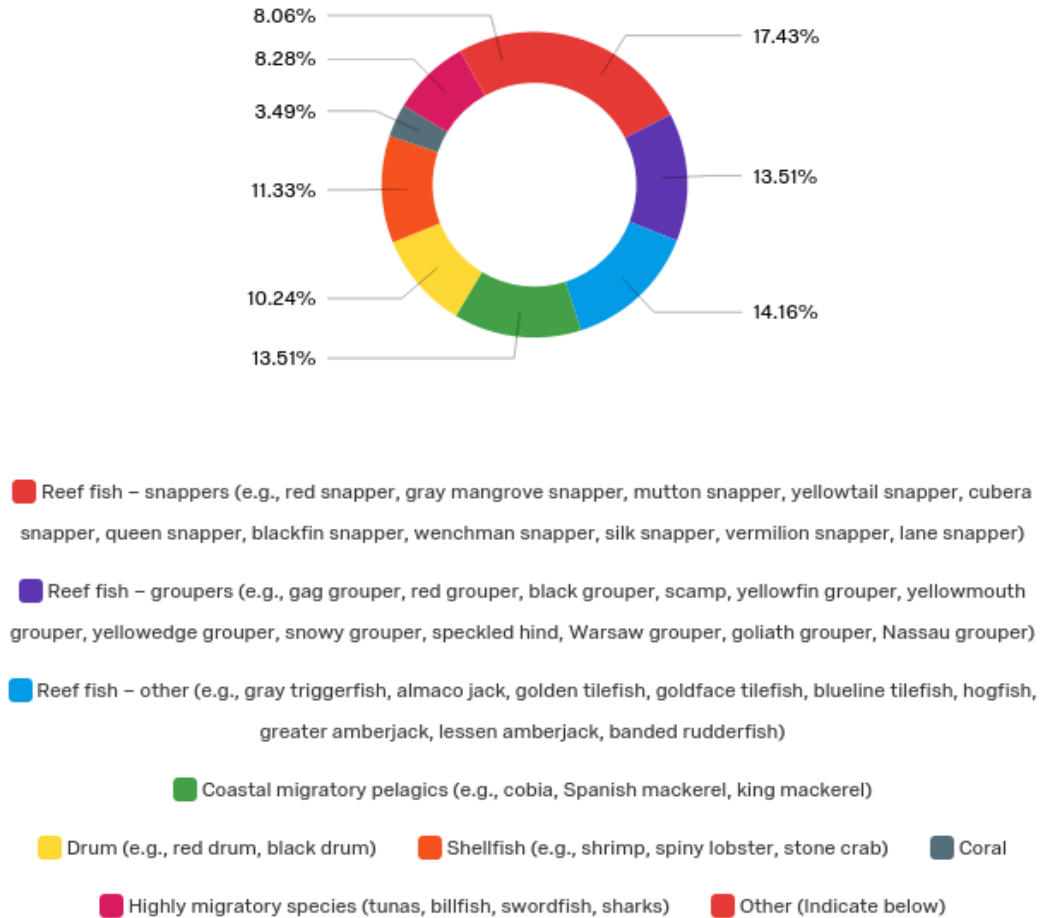


Figure 4: Species Managed

Lastly, 16.76% of the respondents indicated that they were part of a second group related to fisheries. This can involve sitting on an advisory board or panel to offer scientific advice and experience. This type of interaction seems relatively common within fisheries, but its effect on the overall network is poorly understood. It may result in more positive and open

communication, when a member of an organization is able to interact while focusing on a similar goal. This may lead to boundary spanning, an overall positive impact within the fishery. An unintended consequence may be that a single individual has too much of an impact on decision making, in his or her primary organization, and then swaying the opinions of others in a separate organization.

4.2 Measuring Connecting Capacity

For the purposes of analysis, six categories of respondent and target organization (U.S. Federal, Non-Governmental Organizations, Gulf of Mexico Fishery Management Council, Gulf States Marine Fishery Commission, State Government, and National Marine Fisheries Service) were chosen due to jurisdictional boundaries, unique positions of authority, as well as having enough respondents to be statistically valid. Some of the groupings used are in fact components of one another (such as National Marine Fisheries Service being a part of the federal government), and have been removed due to their central role in connecting various aspects of the fishery. Categories such as Mexican agencies or international organizations are not present because of low respondent rates, as well as other respondents rarely indicating that these groups are communicated with.

In Figure 5, each line represents percent communicating (PC), formal communication intensity (FCI), as well as informal communication intensity (ICI), generated as an average across the network. PC was calculated as ratio containing the number of respondents who

selected another organization over the total number of respondents from that organization. FCI and ICI were calculated averaging responses of a Likert scale, where respondents who selected never using that particular form of communication as 0, occasional communication as .5, and regular communication as 1. Although some relationships are higher in formal vs informal intensity, overall total FCI was 23.39, while ICI was slightly lower at 20.87. Mexican and trilateral organizations were not included due to only a single respondent per category, as well as low levels of communication toward them reported by others.

The Gulf of Mexico Fishery Council and the National Marine Fisheries Service are two agencies that are communicated with most frequently. Both agencies are involved with setting catch limits, with the GMFC's scientific and statistical committees overseeing biological stock data attained through surveys conducted by the NMFS. Most respondents reported higher levels of both formal and informal interactions with the NMFS, while less were reported with the GOMFMC.

The lowest level of communication was reported within the federal government (excluding NMFS), where a disconnect in connective capacity may occur between those who manage fisheries, and those who manage aspects that influence fisheries' health (such as the EPA regulating pollution, or the USACOE affecting coastal construction projects). Also, extremely low communication occurred with NGOs, largely bringing their effectiveness into question. Some NGOs may be more focused on education and outreach of the public, and less

involved with rallying for management decisions. Additionally, NGOs who criticize or devalue the roles or decisions of government agencies may be antagonistic.

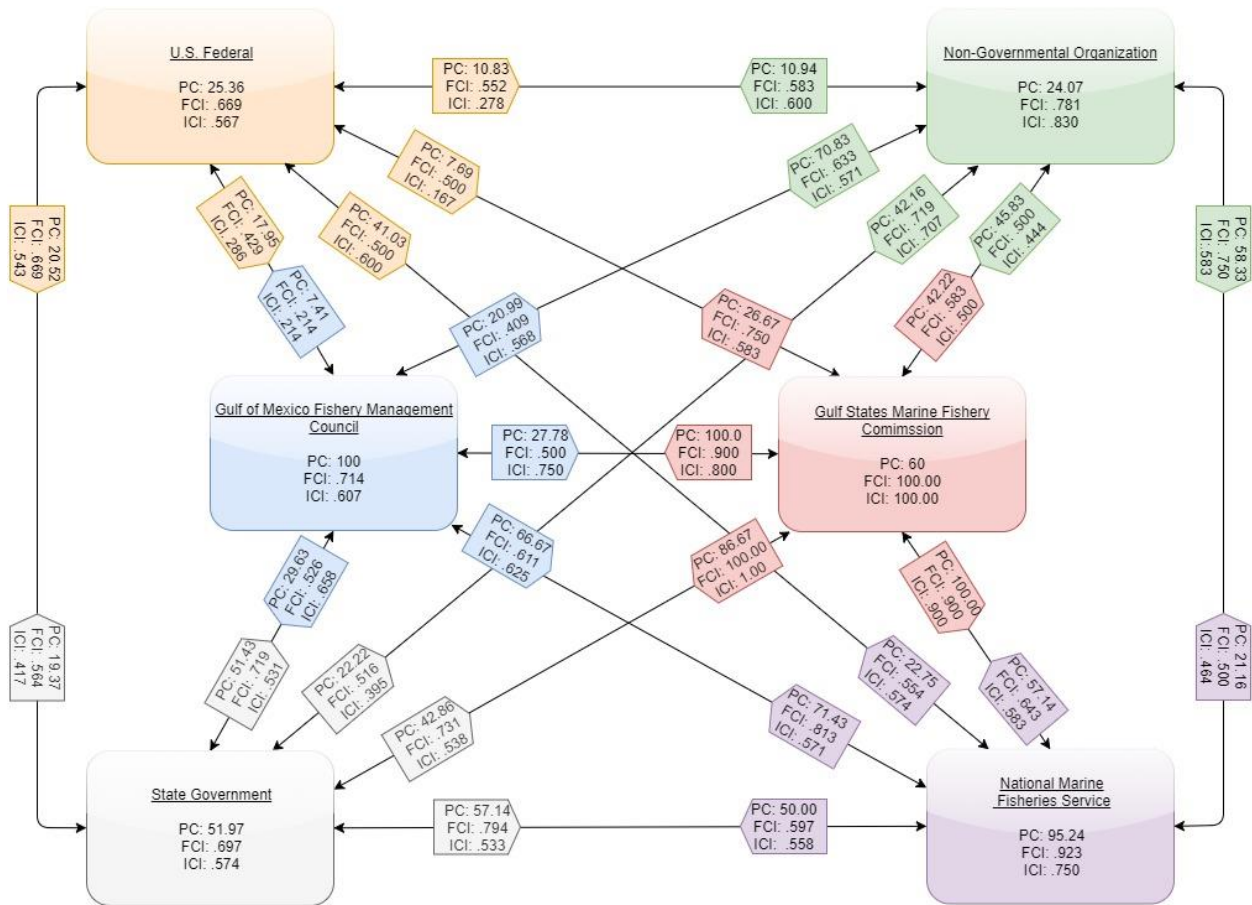


Figure 5: Communication Type and Intensity Diagram

The same organizations that maintain high levels of communication also maintain influence throughout the network. Among federal and interstate organizations, the GMFMC, GSMFC, and NMFS display more influence in all categories. Additionally, both the USFWS and the USDA also have high levels of influence for non-fisheries specific federal agencies. The six

natural resource agencies of the five gulf states display similar influence metrics. Agencies within the Mexican government may appear to have influence, but communication levels are among the lowest across the entire network, as well as IOs. Without adequate communication, there cannot be effective influence. A substantial amount of the Gulf is within Mexican waters, and it appears that a transnational fishery is operational without transnational governance. No communication occurs between two halves of a substantial fishery, and it is not known if this is due to economic tensions between the countries, a language barrier, or differences in affluence.

A complete version of the table below can be found in Appendix C. This table contains organizations with a communication score (COM) as well as three degrees of influence and their prevalence. COM is calculated by how many respondents selected that they communicated with that organization. For each of the three degrees of influence, two columns show the prevalence of that influence. R corresponds to that degree of influence being present regularly, and O+R meaning the amount of times that occasionally or regularly were selected. All COM scores of .49 or lower were removed from this list. No Mexican, international, or NGOs featured a COM score above .49.

Type	Org	COM	Weak Influence				Moderate Influence				Strong Influence			
			O + R		R		O + R		R		O + R		R	
Federal & Interstate	GMFMC	0.71	0.83	(0.04)	0.52	(0.05)	0.64	(0.05)	0.16	(0.04)	0.72	(0.05)	0.30	(0.05)
	NMFS	0.75	0.80	(0.04)	0.52	(0.05)	0.48	(0.05)	0.12	(0.03)	0.70	(0.05)	0.26	(0.04)
	USFWS	0.59	0.78	(0.05)	0.33	(0.05)	0.60	(0.06)	0.15	(0.04)	0.63	(0.05)	0.18	(0.04)
US States	LDWF	0.56	0.80	(0.05)	0.41	(0.06)	0.73	(0.05)	0.18	(0.04)	0.68	(0.05)	0.25	(0.05)
	FFWCC	0.62	0.77	(0.05)	0.35	(0.05)	0.63	(0.05)	0.16	(0.04)	0.66	(0.05)	0.25	(0.05)

Note: Standard errors in parentheses.

Table 4: The Effects of Communication: Gulf of Mexico Data

Three types of trust are measured toward target jurisdiction below. As in Song et. al., 2019, rational trust remains highest. Affinitive and procedural continuously shift between the second and third position, averaging the same level overall among the survey responses. Trust among members of the GSMFC remains the highest between non-state organizations. The GSMFC’s primary role is promote better utilizations of marine resources throughout the Gulf of Mexico through a joint program. The GSMFC is able to maintain trust through its transparent operations, as well as decisions being made by 15 commissions, three from each of the five coastal states. The GSMFC is able to function as a conduit and keep free flowing information with little bias.

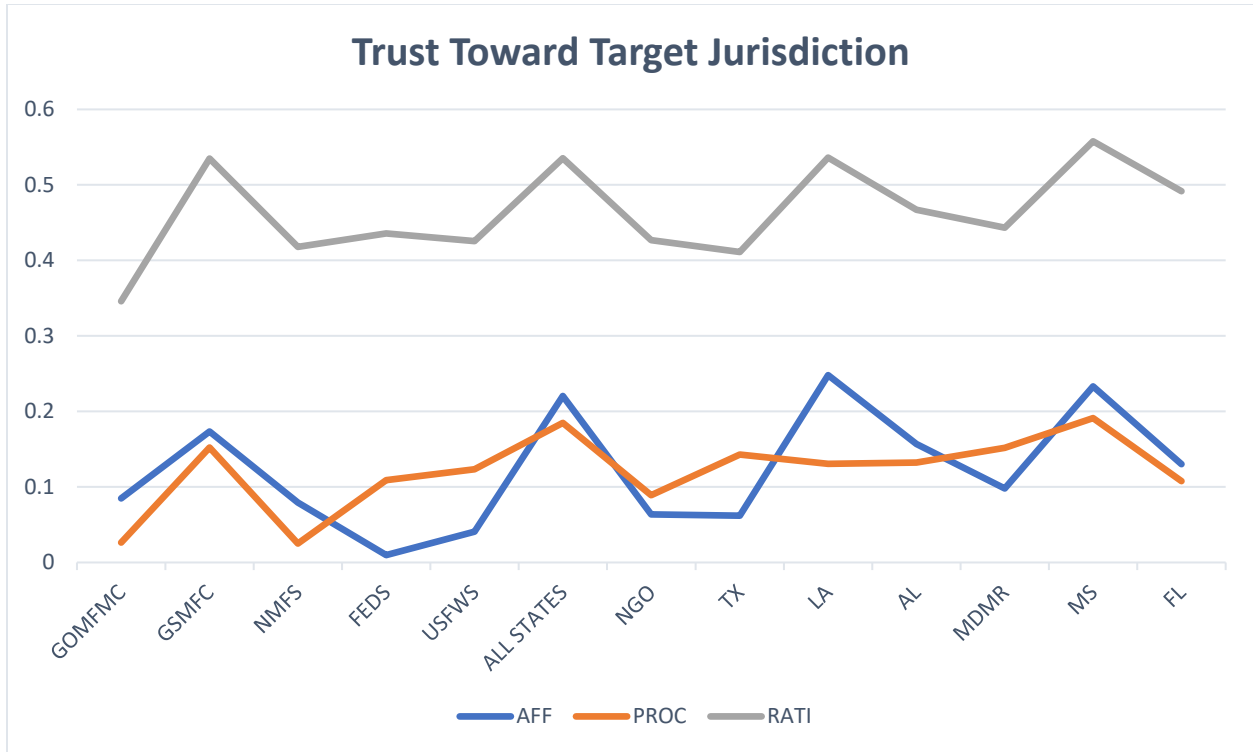


Figure 6: Trust Toward Target Jurisdiction (Gulf of Mexico)

In comparison to findings within the Gulf of Mexico, Song et. al. (2019) provides a useful comparison, using the same types of trust in a similar methodology as this study. Consistent with Song and colleagues' study, rational trust remains highest in all jurisdictions across the Gulf of Mexico, providing validation for both as well as offering insight into interactions in shared resource management. With high rational trust, there appears to be a consensus in which all members recognize the roles of other organizations in some capacity and understand that fishery management is too complex to be managed by a single organization. In contrast to the Great Lakes where procedural trust is always higher than affinitive trust, the Gulf of Mexico is much more variable (Song, et. al., 2019). Doubt in procedures or entities may not

be a purely negative aspect of management, it may require that decision makers be more responsible and clearer about planning and management. A significant hindrance of this type of low trust may be in deciding the use of funds or the limitations in harvesting, where distrust may be a factor in coming to useful consensus on complex issues.

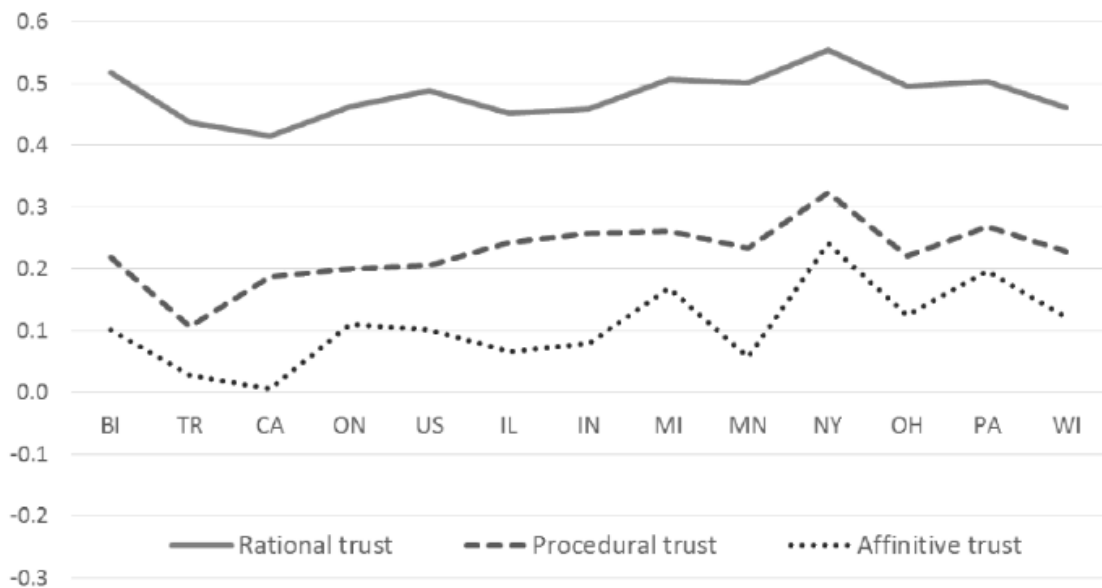


Figure 7: Trust Toward Target Jurisdiction (Source: Song, et. al., 2019)

Interjurisdictional measurements of trust were also compared. Table 5 contains three separate heat maps, showing how each group or individual organization has rated the others (read from rows before columns). The top left corner cell for each heat map identifies which questions were asked, which corresponds to a trust type (3.1-3.3 measures Affinitive, 3.4-3.6 measures Procedural, and 3.7-3.9 measures Rational). Each cell represents an average of all answers taken from the Likert scale, this time featuring five responses. Organizations or groups

were chosen based on having a robust set of respondents. Low numbers of respondents from Mexican and international organizations prevent them from being sensibly used in this analysis.

Within the first heat map showing Affinitive trust throughout organizations, the GSMFC and NMFS have selected higher rates of affinitive trust compared to others, especially within their own organization and matching with states. Procedural trust follows a similar trend to Affinitive trust, with GSMFC and NMFS showing higher values compared to other organizations. Also within Procedural trust, federal organizations show much higher values. Rational trust follows a similar trend as Procedural trust, but this time the GOMFMC can be seen with some greater distribution in values across the row. GOMFMC across all three charts is the organization with the biggest disparity of responses. In an opposite fashion of the GSMFC, NGO trust of other organizations in all three heat maps has the lowest recorded values.

3.1-3.3	GOMFMC	GSMFC	NMFS	FEDS	STATE	NGO
GOMFMC	0.069444	0	0.020833	-0.25	0.01455	-0.03463
GSMFC	0.441667	0.777778	0.258333	0.286616	0.79823	0.066449
NMFS	0.277778	0.277778	0.444444	0	0.183333	0.416667
FEDS	-0.08333	0	-0.0119	0.022944	0.12421	-0.0158
STATE	-0.04167	0.1	-0.05128	-0.07359	0.098876	-0.19823
NGO	-0.15476	-0.11607	-0.18333	0.07265	0.103604	0.146474

3.4-3.6	GOMFMC	GSMFC	NMFS	FEDS	STATE	NGO
GOMFMC	-0.35985	-0.41667	-0.125	0.138889	-0.02941	0.106061
GSMFC	0.416667	0.666667	0.375	0.424242	0.506349	-0.03922
NMFS	0.111111	0.111111	0.277778	-0.04167	0.3	0.333333
FEDS	0.416667	0.583333	0.083333	0.238591	0.174797	0.236111
STATE	-0.125	0.185185	-0.09722	0.039427	0.187283	-0.10619
NGO	-0.30128	-0.21726	-0.36343	-0.14646	-0.0291	0.004608

3.7-3.9	GOMFMC	GSMFC	NMFS	FEDS	STATE	NGO
GOMFMC	0.083333	0.583333	0.282407	0.083333	0.627451	0.433136
GSMFC	0.683333	0.888889	0.65	0.714646	0.748779	0.388832
NMFS	0.5	0.444444	0.642857	0.5625	0.458333	0.5
FEDS	0.638889	0.75	0.511905	0.466146	0.455285	0.481481
STATE	0.138889	0.483333	0.232906	0.348322	0.534488	0.323613
NGO	0.031136	0.060185	0.187037	0.439394	0.386859	0.433725

Table 5: Inter-Organizational Trust Heat Map

4.3 Semi-Structured Interviews

Multiple members of the GSMFC were interviewed, with many staff members heading specific programs that effect which partners they communicate with (federal, state, etc.). When asked to describe overall functions of the commission, the interviewee explained that “The primary role of the commission is to provide a platform for state management and collaboration with our federal partners. Whether it’s enforcement, funding, disaster related things- we are a conduit for information and funding to go to the states.” Another interviewee described themselves as the “Switzerland of fisheries,” avoiding arguments and confrontation and focused more on facilitating discussions.

Every interviewee highlighted the continued importance of cooperation; “We encourage those kinds of networking opportunities to build the individual relationships so when you call someone you can picture who you are talking to, you can picture their office, you can see them sitting and their desk They can essentially give you an honest answer, even if it not an “approved” agency message in either direction. It allows trust and honest communication.” Data from the survey reciprocates this type of mentality, as the commission continually scores higher than average trust ratings, especially considering its modest size. Influence from the commission is moderate but reflects that the commission itself does not have biased management preferences. The GSMFC does not have legal authority, although some commissions such as the Atlantic States Fishery Commission do, and their staff size reflects the increased responsibilities. An association can be made that having high levels of both trust and influence may mean that a

single entity is making too many decisions and is uncontested in management and in science.

The commission appears to be actually functioning exactly where it should be, with only enough influence to host neutral meetings amongst stakeholders.

Despite efforts from all sides to maintain a positive position that allows for, contentious issues do exist and strain those relationships. The vast majority of stakeholders do not appear to have qualms with the management of particular species, but the allocation and management of red snapper has continuously surfaced from these interviews. Animosity regarding snapper has been reported many angles, from every stakeholder. An interviewee mentioned a problem with illegally harvesting red snapper from Mexico and explained that NOAA fisheries has reached out with very little success. A complete lack of any sort of communication with Mexican agencies is clear, both from the single Mexican respondent, as well as American organizations not selecting them as an agency that they have any sort of communication with. Quantifying and understanding how much of a threat illegal fishing is notoriously difficult, and this problem is only exacerbated with a bilateral fishery with no communication between its two largest governing bodies.

Unfortunately, Red snapper is also a highly debated topic among sects of American fisheries. One interviewee noted that two of the biggest dividing issues are the allocation of recreational vs. commercial red snapper, as well as compatible licensing between states. Some states within the Gulf have also chosen to conduct their own fishery stock surveys, which are used in determining how many fish can be caught. Although these stock surveys are normally

conducted by NOAA Fisheries, some stakeholders do not believe that the assessment is a true representation of how many fish are available, and that high value species are worth the investment. These surveys become certified by NOAA fisheries as statistically accurate and valid. States view this as an investment of time and resources, as these more specific surveys often allow for higher accuracy and increase the amount of fish that can be caught. Although interviewees did not say they felt that their expertise was directly questioned, the state's idea to create own survey logistics shows that they believe there are improvements to be made to protocol and procedure.

CHAPTER V

5.1 SUMMARY AND CONCLUSION

All three research questions have been answered throughout the analysis of the survey. Data from communication, trust, and influence quantitatively shows that federal, state, and inter-state agencies make up a large majority of decision making and influence throughout the network. Survey respondent data, as well as interviews, highlight the attention that organizations such as the GSMFC have given toward creating and sustaining long term connective capacity. The GSMFC can be seen as facilitating boundary-spanning behavior, with actions directly intended to coordinate multi-actor projects between state and federal organizations (Ingmar van Meerkerk & Jurian Edelenbos,2018). However, once outside federal, state, and inter-state organizations, the prevalence of trust and influence was detected much less frequently. NGOs displayed a high levels of weak, moderate, and strong influence, but there overall communication was quite low. The most critical finding was the complete lack of any sort of collaborative management effort between the United States and Mexico, through Mexican agencies or any sort of partnership.

Virtually no communication between the U.S. and Mexico was observed during this study, despite asking both sides of the border about how they interact with each other, and sending the survey in both native languages. This is not to say that some sort of communicative capacity does not exist, but it was not detected within the scope of the survey responses. Additionally, trilateral organizations were also not found to have substantial communication with

either country's fishery management efforts. It appears that trilateral organizations fill an extremely niche role in governance of the region. Perhaps neither side feels the need for teamwork, as each country has hundreds of miles of its own shoreline and waters to monitor.

The three tenants of EBM seem to benefit both countries in theory, but socio-economic factors may prevent either side from engaging with each other. Approaches for coordination and collaboration may be recognized as valuable by stakeholders, but are often difficult to apply in practice (Edelenbos & van Meerkerk, 2015). As described in the survey, some state governments already fund their own stock assessment programs due to lack of faith in how the federal survey is conducted. If regions of the US cannot agree, it seems even more farfetched to have two separate countries who already have a history of opposition to come to conclusion on fishery management. Furthermore, it is extremely difficult, if not impossible, to accurately assess the economic impact of Mexican fishery governance on the United States.

EBM's principles of stakeholder inclusion and fairness all stem around the idea of a "shared" resource, in which two or parties have something to gain. Taking into account that the Gulf of Mexico already has lower affinitive trust than other regions within the United States (in comparison to the Great Lakes), it seems unlikely that either country feels that the Gulf is truly shared. This may also just be to the sheer and complexity, The disparity in economics most likely plays a large role in each country's perception of the other. Currently, it seems unlikely that a partnership between the countries would emerge unless both felt significant pressure to cooperate, such as a fishery collapse that greatly harmed both countries.

The context of fisheries and marine resources is broad within the scope of the survey instrument, and connective capacity between the United States and Mexico may be present through some very specific channels. Although network connectivity in the sense of EBM would seek broad stakeholder cooperation, there may be an importance in highlighting the intricacies of some management focuses, such as highly migratory species (tunas, sharks, swordfish, and billfish). The NMFS consults with a Highly Migratory Species Advisory Panel as well as submits national reports to the International Commission for the Conservation of Atlantic Tuna (ICCAT), based in Madrid, Spain. Integrated performance from these specific organizations will rely heavily on the fewer individuals involved, and boundary spanning leadership will be vital for integrative performance and long-term success (Edelenbos & van Meerkerk, 2015).

This research has shown that the GOM has some important differences from the Great Lakes, despite both studies aimed at measuring trust and inter-organizational policy networks between transboundary fisheries. Song and colleagues' (2019) research on trust within the Great Lakes showed a higher presences of all three types of trust, as well as a more defined order between them (Rational, then Procedural, and lastly Affinitive Trust) compared to the GOM. These findings show the need for improved understanding of shared natural resources, as well as highlight how EBM can help improve relationships and increase economic and ecological sustainability.

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APPENDIX A

APPENDIX A

Survey Codebook

Demographic Variables	
Q1_1. What is the main organization you work for?	Dichotomous (1=Y, 2=N for all agencies)
<u>Federal and Inter-state</u>	
1. GMFMC – Gulf of Mexico Fishery Management Council	
2. GSFC – Gulf States Fishery Commission	
3. NMFS – National Marine Fishery Service (NOAA Fisheries)	
4. NOS – National Ocean Service	
5. NOAA – NOAA (other than NOS and NMFS/NOAA Fisheries)	
6. USFWS - U.S. Fish & Wildlife Service	
7. USGS - U.S. Geological Survey	
8. DOI – Department of the Interior (other than USFWS and USGS)	
9. EPA – Environmental Protection Agency	
10. USACE – U.S. Army Corps of Engineers	
11. USDS – U.S. Department of State	
12. USDA – U.S. Department of Agriculture (all sub-agencies)	
<u>U.S. States</u>	
13. TPW - Texas Parks and Wildlife Department	

14. LDWF - Louisiana Department of Wildlife and Fisheries

15. ADCNR - Alabama Department of Conservation & Natural Resources

16. MWFP - Mississippi Department of Wildlife, Fisheries, & Parks

17. MDMR - Mississippi Department of Marine Resources

18. FFWCC - Florida Fish and Wildlife Conservation Commission

Mexican Government

19. SEMARNAT - Secretariat of Environment, Natural Resources, and Fisheries

20. CONAPESCA - National Commission of Aquaculture and Fisheries; Comisión Nacional de Acuacultura y Pesca

21. SAGARPA - Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food

22. INAPESCA - National Fisheries Institute

International Organizations

23. TCWECM - Trilateral Committee for Wildlife and Ecosystem Conservation and Management

24. IBWC - International Boundary and Water Commission / Comisión Internacional de Límites y Aguas

25. NADB-BECC - North American Development Bank/ Border Environmental Cooperation Commission

<p><u>NGOs</u></p> <p>26. CCA – Coastal Conservation Association</p> <p>27. PEW – PEW Charitable Trust</p> <p>28. ONC – Ocean Conservancy</p> <p>29. ONA – Oceana</p> <p>30. EDF – Environmental Defense Fund</p> <p>31. RFA – Recreational Fishing Alliance</p> <p>32. NWF – National Wildlife Federation</p> <p>33. TNC – The Nature Conservancy</p> <p>34. GOMA – Gulf of Mexico Alliance</p>	
<p>Q1_2. How long have you been working in this organization?</p> <p>YRSEMP</p>	<p>Categorical /scale 1-5</p> <p>1= <1 year</p> <p>2= 1-5 years</p> <p>3= 6-10 years</p> <p>4= 11-15 years</p> <p>5= >15yrs</p>
<p>Q1_3. Please indicate which category best describes your current role?</p> <p>ROLE</p>	<p>ROLE Categorical 1-5</p> <p>1=Management & Executive</p> <p>2= Natural Science/ Research</p> <p>3= Social Science/ Research</p> <p>4= Compliance</p> <p>5= Other (Indicate below)</p>
<p>Q1_4. How long have you held your current position?</p>	<p>Categorical /scale 1-5</p> <p>1= <1 year</p>

YRSROLE	2= 1-5 years 3= 6-10 years 4= 11-15 years 5= >15yrs
Q1_5. What is the area code of your place of work?	Text box

<p>Q1_6. Although this study is concerned with people who are involved directly and indirectly with fisheries, some participants may be more focused on particular fisheries than others. If you work directly with any of these fish species, please select them below. (Select as many as apply).</p> <p>FISH</p>	<p>FISH Categorical 1-9</p> <p>1= Reef fish – snappers (e.g., red snapper, gray mangrove snapper, mutton snapper, yellowtail snapper, cubera snapper, queen snapper, blackfin snapper, wenchman snapper, silk snapper, vermilion snapper, lane snapper)</p> <p>2= Reef fish – groupers (e.g., gag grouper, red grouper, black grouper, scamp, yellowfin grouper, yellowmouth grouper, yellowedge grouper, snowy grouper, speckled hind, Warsaw grouper, goliath grouper, Nassau grouper)</p> <p>3= Reef fish – other (e.g., gray triggerfish, almaco jack, golden tilefish, goldface tilefish, blueline tilefish, hogfish, greater amberjack, lessen amberjack, banded rudderfish)</p>
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	<p>4= Coastal migratory pelagics (e.g., cobia, Spanish mackerel, king mackerel)</p> <p>5= Drum (e.g., red drum, black drum)</p> <p>6= Shellfish (e.g., shrimp, spiny lobster, stone crab)</p> <p>7= Coral</p> <p>8= Highly migratory species (tunas, billfish, swordfish, sharks)</p> <p>9= Other (Indicate Below)</p>
Q1_7. Do you hold a secondary position in another fishery-related organization?	Dichotomous (1=Y, 2=N)

Communication Variables	Measures
<p>Q2_1. Select all the organizations you communicate with about fish and fisheries-related matters - even if you only communicate with them occasionally.</p> <p><u>Federal and Inter-state</u></p> <p>1. GMFMCa</p> <p>2. GSFCa</p>	<p>Dichotomous 1=Y/2=N for 33 agencies</p> <p>NB: filter variable, only those agencies that the respondent communicates with are represented in communication and trust-related questions</p>

<p>3. NMFSa</p> <p>4. NOSa</p> <p>5. NOAAa</p> <p>6. USFWSa</p> <p>7. USGSa</p> <p>8. DOIa</p> <p>9. EPAa</p> <p>10. USACEa</p> <p>11. USDSa</p> <p>12. USDAa</p> <p><u>U.S. States</u></p> <p>13. TPWa</p> <p>14. LDWFa</p> <p>15. ADCNRa</p> <p>16. MWFPa</p> <p>17. MDMRa</p> <p>18. FFWCCa</p> <p><u>Mexican Government</u></p> <p>19. SEMARNAT a</p> <p>20. CONAPESCAa</p> <p>21. SAGARPAa</p> <p>22. INAPESCAa</p> <p><u>International Organizations</u></p>	<p>Help: Please include communication through both formal and informal channels. (e.g. formal channels: committee meetings, memos, official verbal or written business communication) (e.g. Informal channels: chance conversations, spontaneous meetings, personal notes, emails and phone calls, drinks after work).</p>
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<p>23. TCWECMa 24. IBWCa 25. NADB-BECCa</p> <p><u>NGOs</u></p> <p>26. CCAa 27. PEWa 28. ONCa 29. ONAa 30. EDFa 31. RFAa 32. NWFa 33. TNCa 34. GOMAA</p>	
<p>Q2_2. Regarding work-related matters, how often do you communicate with people in the following organizations through <u>formal</u> channels? (e.g., committee meetings, memos, official verbal or written business communication)</p> <p><i>(independent variable, formal communication)</i></p> <p><u>Federal and Inter-state</u></p> <p>1. GMFMCb 2. GSFCb</p>	<p>3-point scale: 1=never 2=occasionally 3=regularly</p>

<p>3. NMFSb</p> <p>4. NOSb</p> <p>5. NOAAb</p> <p>6. USFWSb</p> <p>7. USGSb</p> <p>8. DOIb</p> <p>9. EPAb</p> <p>10. USACEb</p> <p>11. USDSb</p> <p>12. USDAb</p> <p><u>U.S. States</u></p> <p>13. TPWb</p> <p>14. LDWFb</p> <p>15. ADCNRb</p> <p>16. MWFPb</p> <p>17. MDMRb</p> <p>18. FFWCCb</p> <p><u>Mexican Government</u></p> <p>19. SEMARNATb</p> <p>20. CONAPESCAb</p> <p>21. SAGARPAb</p> <p>22. INAPESCAb</p> <p><u>International Organizations</u></p>	
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<p>23. TCWECMb 24. IBWCb 25. NADB-BECCb</p> <p><u>NGOs</u></p> <p>26. CCAb 27. PEWb 28. ONCb 29. ONAb 30. EDFb 31. RFAb 32. NWFb 33. TNCb 34. GOMAb</p>	
<p>2.3 Regarding work-related matters, how often do you communicate with people in the following organizations through informal channels? (e.g., chance conversations, spontaneous meetings, personal notes, emails and phone calls, drinks after work)</p> <p><i>(independent variable, informal communication)</i></p> <p><u>Federal and Inter-state</u></p> <p>1. GMFMCc</p>	<p>3-point scale: 1=never 2=occasionally 3=regularly</p>

<p>2. GSFCc</p> <p>3. NMFSc</p> <p>4. NOSc</p> <p>5. NOAAc</p> <p>6. USFWSc</p> <p>7. USGSc</p> <p>8. DOIc</p> <p>9. EPAc</p> <p>10. USACEc</p> <p>11. USDSc</p> <p>12. USDAc</p> <p><u>U.S. States</u></p> <p>13. TPWc</p> <p>14. LDWFc</p> <p>15. ADCNRc</p> <p>16. MWFPc</p> <p>17. MDMRc</p> <p>18. FFWCCc</p> <p><u>Mexican Government</u></p> <p>19. SEMARNATc</p> <p>20. CONAPESCAc</p> <p>21. SAGARPAc</p> <p>22. INAPESCAc</p>	
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<p><u>International Organizations</u></p> <p>23. TCWECMc 24. IBWCc 25. NADB-BECCc</p> <p><u>NGOs</u></p> <p>26. CCAc 27. PEWc 28. ONCc 29. ONAc 30. EDFc 31. RFAc 32. NWFc 33. TNCc 34. GOMAc</p>	
<p>Q2_4. How often has your communications with people from this organization, or documentation from it, enhanced your knowledge of fishery science or management?</p> <p><i>(weak influence dependent variable)</i></p> <p><u>Federal and Inter-state</u></p> <p>1. GMFMCd 2. GSFCd</p>	<p>3-point scale: 1=never 2=occasionally 3=regularly</p>

<p>3. NMFSd</p> <p>4. NOSd</p> <p>5. NOAAAd</p> <p>6. USFWSd</p> <p>7. USGSd</p> <p>8. DOIId</p> <p>9. EPAd</p> <p>10. USACEd</p> <p>11. USDSd</p> <p>12. USDAd</p> <p><u>U.S. States</u></p> <p>13. TPWd</p> <p>14. LDWFd</p> <p>15. ADCNRd</p> <p>16. MWFPd</p> <p>17. MDMRd</p> <p>18. FFWCCd</p> <p><u>Mexican Government</u></p> <p>19. SEMARNATd</p> <p>20. CONAPESCAAd</p> <p>21. SAGARPAAd</p> <p>22. INAPESCAAd</p> <p><u>International Organizations</u></p>	
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<p>23. TCWECMd 24. IBWCd 25. NADB-BECCd</p> <p><u>NGOs</u></p> <p>26. CCAd 27. PEWd 28. ONCd 29. ONAd 30. EDFd 31. RFAd 32. NWFd 33. TNCd 34. GOMAd</p>	
<p>Q2_5. How often has communicating with people in the following organization led you to make professional choices or decisions that you would not have otherwise made?</p> <p><i>(moderate influence dependent variable)</i></p> <p><u>Federal and Inter-state</u></p> <p>1. GMFMCe 2. GSFCe 3. NMFSe 4. NOSe</p>	<p>3-point scale: 1=never 2=occasionally 3=regularly</p>

<p>5. NOAAe</p> <p>6. USFWSe</p> <p>7. USGSe</p> <p>8. DOIe</p> <p>9. EPAe</p> <p>10. USACEe</p> <p>11. USDSe</p> <p>12. USDAe</p> <p><u>U.S. States</u></p> <p>13. TPWe</p> <p>14. LDWFe</p> <p>15. ADCNRe</p> <p>16. MWFPe</p> <p>17. MDMRe</p> <p>18. FFWCCe</p> <p><u>Mexican Government</u></p> <p>19. SEMARNATe</p> <p>20. CONAPESCAe</p> <p>21. SAGARPAe</p> <p>22. INAPESCAe</p> <p><u>International Organizations</u></p> <p>23. TCWECMe</p> <p>24. IBWCe</p>	
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<p>25. NADB-BECCe</p> <p><u>NGOs</u></p> <p>26. CCAe</p> <p>27. PEWe</p> <p>28. ONCe</p> <p>29. ONAe</p> <p>30. EDFe</p> <p>31. RFAe</p> <p>32. NWFe</p> <p>33. TNCe</p> <p>34. GOM Ae</p>	
<p>Q2_6. To what extent have your communications with people at this organization led you to rethink your approach to the management of fisheries and/or harvesting and conservation practices?</p> <p><i>(strong influence dependent variable)</i></p> <p><u>Federal and Inter-state</u></p> <p>1. GMFMCf</p> <p>2. GSFCf</p> <p>3. NMFSf</p> <p>4. NOSf</p> <p>5. NOAAf</p>	<p>3-point scale:</p> <p>1=not at all</p> <p>2=a little bit</p> <p>3=a great deal</p>

<p>6. USFWSf</p> <p>7. USGSf</p> <p>8. DOI f</p> <p>9. EPAf</p> <p>10. USACEf</p> <p>11. USDSf</p> <p>12. USDAf</p> <p><u>U.S. States</u></p> <p>13. TPWf</p> <p>14. LDWf</p> <p>15. ADCNRf</p> <p>16. MWFPf</p> <p>17. MDMRf</p> <p>18. FFWCCf</p> <p><u>Mexican Government</u></p> <p>19. SEMARNATf</p> <p>20. CONAPESCAf</p> <p>21. SAGARPAf</p> <p>22. INAPESCAf</p> <p><u>International Organizations</u></p> <p>23. TCWECMf</p> <p>24. IBWCf</p> <p>25. NADB-BECCf</p>	
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<p><u>NGOs</u></p> <p>26. CCAf</p> <p>27. PEWf</p> <p>28. ONCf</p> <p>29. ONAf</p> <p>30. EDFf</p> <p>31. RFAf</p> <p>32. NWFf</p> <p>33. TNCf</p> <p>34. GOMAf</p>	

Trust-related Variables		Measures:
<p>Affinitive trust</p> <p>AFFIA</p> <p>AFFIB</p> <p>AFFIC</p> <p>(independent variables)</p>	<p>Q3_1. Because we have been working with this organization so long, all kinds of procedures have become self-evident.</p> <p>AFFIA1</p> <p>AFFIA2</p> <p>AFFIA3</p> <p>AFFIA4</p> <p>AFFIA5</p> <p>AFFIA6</p> <p>AFFIA7</p> <p>AFFIA8</p>	<p>5-point Likert scale:</p> <p>1=Strongly agree</p> <p>2=agree</p> <p>3=neither agree nor disagree</p> <p>4=disagree</p> <p>5=strongly disagree</p>

AFFIA9	
AFFIA10	
AFFIA11	
AFFIA12	
AFFIA13	
AFFIA14	
AFFIA15	
AFFIA16	
AFFIA17	
AFFIA18	
AFFIA19	
AFFIA20	
AFFIA21	
AFFIA22	
AFFIA23	
AFFIA24	
AFFIA25	
AFFIA26	
AFFIA27	
AFFIA28	
AFFIA29	
AFFIA30	
AFFIA31	
AFFIA32	
AFFIA33	
AFFIA34	

	<p>Q3_2. In this relation, informal agreements have the same significance as formal contracts.</p> <p>AFFIB1</p> <p>AFFIB2</p> <p>AFFIB3</p> <p>AFFIB4</p> <p>AFFIB5</p> <p>AFFIB6</p> <p>AFFIB7</p> <p>AFFIB8</p> <p>AFFIB9</p> <p>AFFIB10</p> <p>AFFIB11</p> <p>AFFIB12</p> <p>AFFIB13</p> <p>AFFIB14</p> <p>AFFIB15</p> <p>AFFIB16</p> <p>AFFIB17</p> <p>AFFIB18</p> <p>AFFIB19</p> <p>AFFIB20</p> <p>AFFIB21</p> <p>AFFIB22</p> <p>AFFIB23</p>	<p>5-point Likert scale:</p> <p>As above</p>

<p>AFFIB24</p> <p>AFFIB25</p> <p>AFFIB26</p> <p>AFFIB27</p> <p>AFFIB28</p> <p>AFFIB29</p> <p>AFFIB30</p> <p>AFFIB31</p> <p>AFFIB32</p> <p>AFFIB33</p> <p>AFFIB34</p>	
<p>Q3_3. Because we have been working with this organization so long, we can understand each other well and quickly.</p> <p>AFFIC1</p> <p>AFFIC2</p> <p>AFFIC3</p> <p>AFFIC4</p> <p>AFFIC5</p> <p>AFFIC6</p> <p>AFFIC7</p> <p>AFFIC8</p> <p>AFFIC9</p> <p>AFFIC10</p> <p>AFFIC11</p> <p>AFFIC12</p>	<p>5-point Likert scale:</p> <p>As above</p>

	<p>AFFIC13</p> <p>AFFIC14</p> <p>AFFIC15</p> <p>AFFIC16</p> <p>AFFIC17</p> <p>AFFIC18</p> <p>AFFIC19</p> <p>AFFIC20</p> <p>AFFIC21</p> <p>AFFIC22</p> <p>AFFIC23</p> <p>AFFIC24</p> <p>AFFIC25</p> <p>AFFIC26</p> <p>AFFIC27</p> <p>AFFIC28</p> <p>AFFIC29</p> <p>AFFIC30</p> <p>AFFIC31</p> <p>AFFIC32</p> <p>AFFIC33</p> <p>AFFIC34</p>	
<p>Procedural trust</p> <p>PROCA</p> <p>PROCB</p>	<p>Q3_4. In our relationship with this organization, the strongest side is expected not to pursue its interest at all costs.</p> <p>PROCA1</p>	<p>5-point Likert scale:</p> <p>As above</p>

PROCC (independent variables)	PROCA2	
	PROCA3	
	PROCA4	
	PROCA5	
	PROCA6	
	PROCA7	
	PROCA8	
	PROCA9	
	PROCA10	
	PROCA11	
	PROCA12	
	PROCA13	
	PROCA14	
	PROCA15	
	PROCA16	
	PROCA17	
	PROCA18	
	PROCA19	
	PROCA20	
	PROCA21	
	PROCA22	
	PROCA23	
	PROCA24	
	PROCA25	
	PROCA26	
	PROCA27	

	PROCA28 PROCA29 PROCA30 PROCA31 PROCA32 PROCA33 PROCA34	
	<p>Q3_5. In working with this organization, it is expected that any unfair dealings will be avoided or rectified by existing regulatory, legal, or reputational measures.</p> PROCB1 PROCB2 PROCB3 PROCB4 PROCB5 PROCB6 PROCB7 PROCB8 PROCB9 PROCB10 PROCB11 PROCB12 PROCB13 PROCB14	5-point likert scale: As above

	PROCB15 PROCB16 PROCB17 PROCB18 PROCB19 PROCB20 PROCB21 PROCB22 PROCB23 PROCB24 PROCB25 PROCB26 PROCB27 PROCB28 PROCB29 PROCB30 PROCB31 PROCB32 PROCB33 PROCB34	
	<p>Q3_6. In this relation, both sides are expected not to make demands that can seriously damage the interests of the other.</p> PROCC1 PROCC2 PROCC3	5-point Likert scale: As above

	PROCC4	
	PROCC5	
	PROCC6	
	PROCC7	
	PROCC8	
	PROCC9	
	PROCC10	
	PROCC11	
	PROCC12	
	PROCC13	
	PROCC14	
	PROCC15	
	PROCC16	
	PROCC17	
	PROCC18	
	PROCC19	
	PROCC20	
	PROCC21	
	PROCC22	
	PROCC23	
	PROCC24	
	PROCC25	
	PROCC26	
	PROCC27	
	PROCC28	
	PROCC29	

	PROCC30 PROCC31 PROCC32 PROCC33 PROCC34	
Rational trust RATIA RATIB RATIC (independent variables)	Q3_7. This organization can be relied upon to perform its objectives. RATIA1 RATIA2 RATIA3 RATIA4 RATIA5 RATIA6 RATIA7 RATIA8 RATIA9 RATIA10 RATIA11 RATIA12 RATIA13 RATIA14 RATIA15 RATIA16 RATIA17 RATIA18	5-point Likert scale: As above

	RATIA19 RATIA20 RATIA21 RATIA22 RATIA23 RATIA24 RATIA25 RATIA26 RATIA27 RATIA28 RATIA29 RATIA30 RATIA31 RATIA32 RATIA33 RATIA34	
	Q3_8. In our relationship with this organization, both sides treat each other in a consistent and predictable manner. RATIB1 RATIB2 RATIB3 RATIB4 RATIB5 RATIB6 RATIB7	5-point Likert scale: As above

	RATIB8	
	RATIB9	
	RATIB10	
	RATIB11	
	RATIB12	
	RATIB13	
	RATIB14	
	RATIB15	
	RATIB16	
	RATIB17	
	RATIB18	
	RATIB19	
	RATIB20	
	RATIB21	
	RATIB22	
	RATIB23	
	RATIB24	
	RATIB25	
	RATIB26	
	RATIB27	
	RATIB28	
	RATIB29	
	RATIB30	
	RATIB31	
	RATIB32	
	RATIB33	

	RATIB34	
	Q3_9. Working with this organization can contribute to our organization's success. RATIC1 RATIC2 RATIC3 RATIC4 RATIC5 RATIC6 RATIC7 RATIC8 RATIC9 RATIC10 RATIC11 RATIC12 RATIC13 RATIC14 RATIC15 RATIC16 RATIC17 RATIC18 RATIC19 RATIC20 RATIC21 RATIC22	5-point Likert scale: As above

	RATIC23 RATIC24 RATIC25 RATIC26 RATIC27 RATIC28 RATIC29 RATIC30 RATIC31 RATIC32 RATIC33 RATIC34	
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SECTION 4

Q4_1. Generally speaking, to what extent do you agree with the following statements?	
(1) You can't be too careful dealing with people DISPOS1	5-point Likert scale: 1=Strongly Disagree 2=Disagree 3=Neither Agree Nor Disagree 4=Agree 5=Strongly Agree
(2) People are almost always interested only in their own welfare.	5-point Likert scale: 1=Strongly Disagree

DISPOS2	2=Disagree 3=Neither Agree Nor Disagree 4=Agree 5=Strongly Agree
(3) Most people would try to take advantage of you if they got the chance. DISPOS3	5-point Likert scale: 1=Strongly Disagree 2=Disagree 3=Neither Agree Nor Disagree 4=Agree 5=Strongly Agree
Q4_2. Which organizations are the most influential to you, in your professional role, in fishery management (e.g., harvesting, conservation)? In what ways? COMMENTS	Text box
Q4_3. Is there anything that has not been covered in this survey that you would like to add? COMMENTS	Text box

APPENDIX B

APPENDIX B

Semi-Structured Interview Questions

Part I: Background information – your professional role

- Could you describe you/your organization's mandate as it pertains to fisheries in the Gulf of Mexico?
- Can you describe the day-to-day work you/your organization conducts in relation to the fisheries issues in the Gulf of Mexico?

Part II: Inter-agency communication and trust

- What organizations do you frequently communicate with in undertaking your work related to fisheries? Can you describe these interactions? (e.g. regular/impromptu/formal/informal)
- From your perspective, are these communications useful in terms of achieving your tasks? Are they necessary for achieving your organizations' strategic fisheries intents too? Why useful or necessary, or why not?
- Are there organizations that you communicate with infrequently, but wished that more frequent communication is possible? What do you think are the challenges?
- Do you tend to trust the other agencies that you communicate with? Do you think frequent communication helps building trusting relationships? Why or why not?

Part III: Interagency influence

- To what extent does your organization define ideas or concepts related to fishery management for other organizations?
- Does your organization try to promote any ethical values or ways of doing things for other organizations and stakeholders?
- Do other government parties have set preferences on the issues that your organization seeks to address?
- How much pressure to you receive from other governmental bodies?
- Does your organization have access to information that other agencies or organizations do not?

- Are any of your organization's main functions replicated by anybody else?
- Is your organization's expertise ever questioned?
- How do you preserve your organization's appearance of neutrality?

APPENDIX C

APPENDIX C

The Effects of Communication: Gulf of Mexico Data

Type	Org	COM	Weak Influence				Moderate Influence				Strong Influence			
			O + R		R		O + R		R		O + R		R	
Federal & Interstate	GMFMC	0.71	0.83	(0.04)	0.52	(0.05)	0.64	(0.05)	0.16	(0.04)	0.72	(0.05)	0.30	(0.05)
	GSMFC	0.41	0.69	(0.06)	0.38	(0.07)	0.53	(0.07)	0.13	(0.05)	0.62	(0.07)	0.20	(0.05)
	NMFSS	0.75	0.80	(0.04)	0.52	(0.05)	0.48	(0.05)	0.12	(0.03)	0.70	(0.05)	0.26	(0.04)
	NOS	0.17	0.74	(0.09)	0.22	(0.09)	0.46	(0.10)	0.12	(0.07)	0.61	(0.10)	0.17	(0.08)
	NOAA	0.31	0.73	(0.07)	0.41	(0.08)	0.39	(0.08)	0.10	(0.05)	0.51	(0.08)	0.12	(0.05)
	USFWS	0.59	0.78	(0.05)	0.33	(0.05)	0.60	(0.06)	0.15	(0.04)	0.63	(0.05)	0.18	(0.04)
	USGS	0.24	0.69	(0.08)	0.41	(0.09)	0.46	(0.09)	0.11	(0.06)	0.56	(0.09)	0.16	(0.06)
	DOI	0.13	0.71	(0.11)	0.12	(0.08)	0.63	(0.12)	0.16	(0.09)	0.71	(0.11)	0.06	(0.06)
	EPA	0.16	0.71	(0.10)	0.19	(0.09)	0.70	(0.10)	0.17	(0.08)	0.52	(0.11)	0.10	(0.06)
	USACE	0.34	0.62	(0.07)	0.13	(0.05)	0.62	(0.07)	0.16	(0.05)	0.49	(0.07)	0.09	(0.04)
	USDS	0.05	0.50	(0.20)	0.17	(0.15)	0.67	(0.19)	0.17	(0.15)	0.50	(0.20)	0.33	(0.19)
USDA	0.10	0.77	(0.12)	0.08	(0.07)	0.72	(0.12)	0.18	(0.11)	0.77	(0.12)	0.08	(0.07)	
US States	TPW	0.45	0.73	(0.06)	0.35	(0.06)	0.60	(0.06)	0.15	(0.05)	0.60	(0.06)	0.23	(0.05)
	LDWF	0.56	0.80	(0.05)	0.41	(0.06)	0.73	(0.05)	0.18	(0.04)	0.68	(0.05)	0.25	(0.05)
	ADCNR	0.42	0.79	(0.05)	0.36	(0.06)	0.55	(0.07)	0.14	(0.05)	0.59	(0.07)	0.25	(0.06)
	MWFP	0.26	0.76	(0.07)	0.32	(0.08)	0.51	(0.09)	0.13	(0.06)	0.59	(0.08)	0.24	(0.07)
	MDMR	0.45	0.72	(0.06)	0.37	(0.06)	0.64	(0.06)	0.16	(0.05)	0.60	(0.06)	0.23	(0.05)
	FFWCC	0.62	0.77	(0.05)	0.35	(0.05)	0.63	(0.05)	0.16	(0.04)	0.66	(0.05)	0.25	(0.05)
Mexican GOVT	SEMARNA	0.05	0.67	(0.19)	0.33	(0.19)	0.00	(0.00)	0.00	(0.00)	0.50	(0.20)	0.17	(0.15)
	CONAPESCA	0.04	1.00	(0.00)	0.60	(0.22)	0.40	(0.22)	0.10	(0.13)	0.60	(0.22)	0.20	(0.18)
	SAGARPA	0.02	1.00	(0.00)	1.00	(0.00)	0.67	(0.33)	0.17	(0.26)	1.00	(0.00)	0.50	(0.35)
	INAPESCA	0.04	1.00	(0.00)	0.60	(0.22)	0.00	(0.00)	0.00	(0.00)	0.80	(0.18)	0.20	(0.18)
IOs	TCWECM	0.00	-	-	-	-	-	-	-	-	-	-	-	-
	IBWC	0.03	0.50	(0.25)	0.00	(0.00)	0.33	(0.24)	0.08	(0.14)	0.50	(0.25)	0.25	(0.22)
	NADB-BECC	0.01	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
NGOs	CCA	0.43	0.60	(0.06)	0.16	(0.05)	0.51	(0.07)	0.13	(0.04)	0.49	(0.07)	0.12	(0.04)
	PEW	0.20	0.65	(0.09)	0.19	(0.08)	0.62	(0.10)	0.15	(0.07)	0.54	(0.10)	0.04	(0.04)
	ONC	0.28	0.73	(0.07)	0.19	(0.06)	0.68	(0.08)	0.17	(0.06)	0.70	(0.08)	0.19	(0.06)
	ONA	0.14	0.72	(0.11)	0.17	(0.09)	0.74	(0.10)	0.19	(0.09)	0.61	(0.11)	0.00	(0.00)
	EDF	0.21	0.71	(0.09)	0.14	(0.07)	0.67	(0.09)	0.17	(0.07)	0.64	(0.09)	0.04	(0.04)
	RFA	0.10	0.69	(0.13)	0.00	(0.00)	0.72	(0.12)	0.18	(0.11)	0.77	(0.12)	0.00	(0.00)
	NWF	0.19	0.52	(0.10)	0.04	(0.04)	0.53	(0.10)	0.13	(0.07)	0.40	(0.10)	0.00	(0.00)
	TNC	0.35	0.66	(0.07)	0.19	(0.06)	0.51	(0.07)	0.13	(0.05)	0.47	(0.07)	0.06	(0.04)
	GOMA	0.28	0.62	(0.08)	0.16	(0.06)	0.61	(0.08)	0.15	(0.06)	0.57	(0.08)	0.08	(0.04)

BIOGRAPHICAL SKETCH

Anthony Rocha Lima began his career in the sciences at 18, enlisting in the United States Navy. He maintained technical and operational responsibility of anti-air defense radar weapon systems. While enlisted, he completed his B.S. in Environmental Management from the University of Maryland University College. To continue his passion in ecology and fisheries, he entered into the M.S. in Ocean, Coastal, and Earth Science at the University of Texas Rio Grande Valley, and graduated in December 2018. He will continue his education with a PhD in Coastal and Marine System Science from the University of Texas A&M Corpus Christi, where he is focusing on aquaculture and marine resources. His current mailing address is 515 South Sugar Road, apartment 239, Edinburg TX, 78539.