

Community Engagement and Perceptions in  
Marine Conservation in the Caribbean

by

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## ABSTRACT

Stressors to marine environments are predicted to increase and affect the well-being of marine ecosystems and coastal communities. Marine protected areas (MPAs) are one most widely implemented interventions for marine stressors. Despite the implementation of thousands of protected areas worldwide, people are still striving to understand their dynamics as they vary in their efficacy and many MPAs have not met their objectives. Additionally, those that have often fail to protect the ecosystem services and cultural values necessary for human community health. Thus, research has expanded to include analyses of the human and social dimensions that may limit their effectiveness. This dissertation explores the role of community engagement in marine protected areas and perceptions of environmental changes in coastal communities. Currently, existing research on the roles of community engagement in marine conservation interventions is limited, particularly in the island-states of the Caribbean region. This dissertation contains a review of the literature to understand the nuances of community engagement in relation to MPAs. Through the review, it was determined that primary forms of engagement are interviews and surveys, and respondents primarily included businesses, community members, fishers, and resource users. To better understand the perceptions and practices on-the-ground, key informants were interviewed across the Caribbean. There are strong desires to conduct community engagement for innumerable benefits, but there are barriers that some participants have overcome. Sharing information between MPA sites offers an opportunity to effectively engage community members. For the local case study, Charlotteville, Trinidad and Tobago, a small, coastal fishing town in the northeast region of Tobago was selected to understand the role of perceptions of

environmental changes. There were strong ties of environmental and social changes, with an emphasis on the impacts of environmental stressors to human health. The heterogeneity and diversity of responses in this chapter highlight the need to consider who is engaged in community engagement activities.

## DEDICATION

For the grassroots organizers and people outside of the academy  
practicing environmental care and protection.

“Are we ready for a dolphin-informed replacement of the  
patriarchal family with “schools” of unlearning?

What is the relationship between the circular  
collective feeding practices of manta rays  
and the Black diasporic history of cooperatives?

I believe collaboration is natural and can be reclaimed.”

“When I can’t see the shore I’m here  
timing my breathing to yours. Knowing  
collectively we can leap, we can dive,  
we can practice our faith in each other.”

Alexis Pauline Gumbs  
*Undrowned: Black Feminist Lessons from Marine Mammals*

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## **Chapter 1**

### **INTRODUCTION**

Marine ecosystems are increasingly threatened by human activity (Hoegh-Guldberg & Bruno, 2010). Concurrently, many strategies have been designed to alleviate these stressors; they range in scale from local to global and focus from prevention to remediation. These strategies have in common the assumption that people must be meaningfully engaged in decision-making processes. However, information on how to operationalize the inclusion of people in the decision-making and management processes is lacking. In this dissertation, I seek to understand how people are engaged and considered in marine conservation interventions and how they can be better integrated into decision-making going forward. By assessing current efforts and perceptions of community engagement, marine conservation interventions can be more effectively and equitably implemented.

#### **Scope and structure**

Through this dissertation, I aim to understand the role that communities and individuals play in marine conservation. In the first two chapters of this dissertation, I focus specifically on a widely used intervention in marine conservation: marine protected areas (MPAs). MPAs are designated patches of the seascape that vary in size and have some degree of protection or regulation of activities that may or may not be conducted within the areas (Day et al., 2019). In the Caribbean, governments have adopted targets to increase protected area coverage. The Caribbean region comprises over 300 areas that protect marine or coastal ecosystems (Bustamante et al., 2018). However, many areas are not meeting their specified goals and objectives, and there is uneven coverage and

distribution of the protected areas (Appeldoorn & Lindeman, 2003; Guarderas et al., 2008; Knowles et al., 2015). Thus, there is a need to better understand how various factors, community engagement in the case of this dissertation, impact MPA management.

I explore community engagement in Caribbean MPAs in chapters two and three. In this dissertation, I define community engagement as interactions or flows of knowledge between members of a community and the management of MPAs. Community engagement encompasses a broad range of activities and processes in which community members participate, and it has been cited as an essential contributor to MPA success (Giakoumi et al., 2018). However, in the current use of the terminology, community engagement is not inherently beneficial to community members or the operations of MPAs, as it can be extractive or manipulative (Arnstein, 1969). Engagement alone is not sufficient. To be effective, participation must be based on “empowerment, equity, trust and learning” (Reed, 2008, p. 2422). Thus, I seek to understand the current discussions and practices in Caribbean MPAs to determine recommendations and a comprehensive overview of the status quo.

As community engagement concerns interactions between institutions and actors, it is vital to study the knowledge and perceptions of community members with respect to the socio-environmental system and the management processes. In chapter 4, I explore perceptions of environmental changes over time to understand the heterogeneity of perceptions throughout a community and identify how perceptions connect to management. Perceptions are essential to understand and consider because they are tied to human behavior. As a result, researchers and practitioners have been focusing on

human behavior in conservation projects (Cinner, 2018; Cowling, 2014; Nyborg et al., 2016; Reddy et al., 2017). Additionally, a positive outcome of community engagement is the change in behavior within the community (Chawla & Cushing, 2007; Cooper et al., 2007; Story & Forsyth, 2008). Community perceptions represent a source of knowledge that is not commonly considered in conservation and resource management (Bennett, 2016). Below I outline the methods and research questions of the three chapters of this dissertation.

### ***Chapter two***

Through a review of peer-reviewed and grey literature containing information on community engagement in marine protected areas in the Caribbean, I categorize engagement elements within each case study. From the literature, I explore the following questions: 1) What forms of community engagement are implemented? 2) Who in the community is engaged? and 3) How, and with what sentiments, is community engagement discussed?

### ***Chapter three***

I characterize the role community engagement has played throughout the Caribbean region by interviewing managers, officials, and key informants in marine protected areas. For each participant, I ask: 1) What are key barriers to community engagement in Caribbean MPAs? 2) How does community engagement vary across the region? 3) In what ways has community engagement been successfully implemented? 4) How do key informants perceive the importance of the concepts mentioned above in obtaining positive social and ecological outcomes?

## ***Chapter four***

I explore the dynamics of individual perceptions towards environmental changes over time in a case study of Charlotteville, Trinidad and Tobago. I will interview residents within the community to address the following questions: 1) How do residents in a small, coastal fishing community perceive and characterize environmental changes over time? 2) How are their responses different based on social groupings?

### **Positionality**

Before presenting my dissertation, it is essential to consider my positionality in relation to this research process. I came to this work as I entered graduate school wanting to conduct research rooted in the importance of ameliorating marine stressors while supporting the communities that are inextricably tied to the environment. Meaningful engagement is generally thought to lead to better outcomes. I also consider meaningful engagement to be a moral necessity in marine conservation, especially in regions where research and practice is conducted by outsiders. Undoubtedly, this preconception has influenced how I have conducted and written about this research.

My history and experiences shape the methodologies and the ways I perceive responses (e.g., through the coding processes in chapters three and four). Therefore, while reading this dissertation, it is worthwhile to consider how my upbringing, gender, ethnicity, citizenship, and education could have influenced how participants responded to my interview questions. There are inherent differences between the participants and me. I acknowledge the imperial privilege I exercise as a citizen of the United States and how this may be perceived by participants who have helped this research come to fruition (Falcón, 2016).

At the same time, I have been shaped by the experiences of growing up as a Black woman in the United States of Caribbean descent. Though there are commonalities between the experiences of Black people in the United States and the Caribbean, the socio-political-cultural dynamics are different, stemming from the trajectory of the African diaspora (Jackson & Cothran, 2003). In combination with my nationality, I also have a different outlook on how community members and managers interact with top-down forces (Crenshaw, 2017). My education has also influenced my positionality. I have been schooled in Western institutions, shaping the ways I view the world. Specifically, before graduate school, I had no formal exposure to social science methodologies and methods but have learned from experiences and courses in anthropology, ethnography, sustainability, and ethics.

I use quotes, when possible, to not alter the meaning of their words and knowledge since this is ‘outsider research’ (Smith, 2021). I have maintained journals throughout the research process specifically for reflexivity to re-evaluate my role, practices, and affect (Cohen & Crabtree, 2006; Hsiung, 2008; Sultana, 2007). Nevertheless, it is essential to keep these factors in mind while reading this dissertation to understand the process and its findings.

## Chapter 2

### A review of community engagement in marine protected areas

#### Abstract

Marine protected areas have been widely implemented to manage anthropogenic impacts and conserve the cultural heritage of our oceans. Recent research underscores the importance of community engagement in the development and management of protected seascapes. While community engagement is often described as a necessary component of conservation interventions, few studies have examined the well-being and livelihoods of those being engaged. Here I synthesize what is known about community engagement, the forms of engagement, and who is being engaged in current and proposed efforts. I used mixed methods to gather and synthesize this information from peer-reviewed articles (N=43). The most common methods of engagement are interviews and surveys. Respondents were primarily businesses, community members, fishers, and resource users. Through qualitative analyses, I found that a primary motivation for community engagement is improved social and environmental outcomes through behavior change, education, and data collection. A few of the articles described the diversity and heterogeneity of communities and their knowledge systems. Several studies have described the process of engagement and the necessity to address power dynamics within communities. This research serves as a step to understanding nuances of community engagement and the spectrum of how it is currently operationalized.

#### Introduction

Marine ecosystems have provided resources to coastal communities for thousands of years yet currently face seemingly insurmountable threats (Larsen, 2003). Marine



ecosystems such as coral reefs, mangroves, deep seas, and estuaries, provide immeasurable benefits to people. In addition to providing food sources to people globally (Food and Agriculture Organization (FAO), 2018), coastal marine ecosystems are central to mitigating risks associated with flooding and storms. Additionally, many marine ecosystems are culturally essential; these seascapes have long shaped communities' diets, religious, and spiritual practices (Reid, 2015).

Considering the services that marine ecosystems afford coastal communities, governments, researchers, and practitioners manage numerous pressures threatening these essential ecosystems. Globally, threats are increasing in frequency and magnitude. These include climate change, pollution, systematic environmental/ecological shifts (e.g., habitat loss, invasive species, biodiversity loss), social failures (e.g., ineffective governance), growing human demand, and non-anthropogenic natural events (Boonstra et al., 2015; Burke et al., 2011; Hoegh-Guldberg et al., 2018). Locally, threats include point source pollution, habitat degradation, sedimentation, and development. With increasing coastal populations, these threats will not subside without intervention (Aswani, 2019; Neumann et al., 2015).

Marine protected areas (MPAs) have emerged as a widely used strategy in marine conservation. As defined by the International Union for the Conservation of Nature (IUCN), an MPA is "a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values" (Day et al., 2019, p. 2). In practice, MPAs operate at different scales, have different restrictions, and are managed by different governing bodies; the diversity of strategies used in implementation and

operation has allowed their proliferation in various socio-political and ecological contexts. MPAs can address many threats, including fishing, extractive, and recreational activities. Ultimately, they aim to reduce the types and degrees of stress people can place on the seascape. To date, there have been many MPA targets set over the past 20 years by the United Nations General Assembly (UNGA), IUCN, and the Convention on Biological Diversity (Campbell & Gray, 2019); more recently in 2010, the CBD set a target of protection 10% of global oceans by 2020 (CBD, 2010); in 2015, the UNGA also approved a target of 10% by 2020 (United Nations, 2015); and in 2016, the IUCN encouraged members to effectively designate 30 percent of their national waters by 2030 (IUCN, 2016).

Since their emergence, many people have researched the ecological impacts of MPAs (Ban et al., 2017; Gallacher et al., 2016; Smallhorn-West et al., 2020). MPAs may result in positive ecological outputs – such as increased biomass (Halpern, 2003; Lester et al., 2009), increased biodiversity (Hastings & Botsford, 2003; Sciberras & Jenkins, 2013), and habitat protection (Gell & Roberts, 2003) – both within and outside of reserves (Lubchenco et al., 2003). However, many MPAs have not met these expectations for ecological conservation and those that have often fail to protect the ecosystem services and cultural values necessary for community health. There has been a shift from thinking of MPAs as a form of "fortress conservation" where humans are entirely excluded from areas to ones with more access and participation (Pugh & Potter, 2003). Thus, research has expanded to include analyses of the human and social dimensions that may limit MPA efficacy (Álvarez-Fernández et al., 2020; Barreto et al., 2020; Picone et al., 2021; Voorberg & Van der Veer, 2020). Researchers have cited human-centric

determinants such as budget and staff capacity (Gill et al., 2017), stakeholder engagement (Giakoumi et al., 2018), population size, crisis perceptions of fish populations, livelihood alternatives, community participation, long-term guidance from external and government organizations (Pollnac et al., 2001), and effective enforcement (Edgar et al., 2014) as predictive factors. Concurrently, there has been a shift in conservation towards social embeddedness and community-based approaches.

Communities are comprised of independent actors with varying interests (Brown, 2003) and networks (Bodin & Crona, 2009), deviating from the common belief of communities as a region or social structure with shared norms (Agrawal & Gibson, 1999). The notion of a community as a homogenous unit of people who are the stewards of the environment breaks down further when studying marine resources. Historically, much of the literature concerning communities and conservation has been around terrestrial resources (e.g., forest, pastures), which often have more explicit boundaries that are often based to some degree on ownership (e.g., Carr et al., 2003). However, marine resources are outside of the geographical boundaries where people live, and individuals who reside elsewhere can often access the resources. Additionally, the lack of biophysical markers makes the boundaries unclear, and the movement of resources across jurisdictions makes them hard to monitor (Folke et al., 2007). This mismatch between resources and communities complicates the notion that conservation and management are tightly coupled through overlapping space and institutions.

While researchers and practitioners acknowledge the importance of community and stakeholder engagement in conservation interventions, the current discourse maintains that the roles of communities are essential for conservation interventions. In a

meta-analysis of protected areas, Andrade and Rhodes found community participation in the decision-making process to be the only variable significantly correlated with compliance (2012). Others have called for equitable and inclusive decision-making through adaptive management (e.g., Brown, 2003) while providing guidance on best practices for participation (Reed, 2008). Community subgroups, and ties between these subgroups, encourage cohesion that promotes conflict resolution (Ostrom, 1990); additionally, they provide pathways for information exchanges. Though there is overwhelming support for the inclusion of communities at all stages of conservation projects, there is little guidance on engaging communities.

Given that communities are not homogenous units, it is essential to understand who is and is not included in the engagement process to capture diverse perspectives. I seek to learn about the role of community engagement in marine protected areas from previous studies by conducting a scoping review using systematic approaches. Previous reviews of engagement in the literature highlight aspects of engagement necessary for success (Reed, 2008; Sterling et al., 2017) and its relation to specific context attributes such as governance and tenure (Raschke et al., 2019). Reed et al. emphasize that the quality of decisions made from stakeholders' engagement relies on the process that led up to the decision. Here I build upon these studies to better understand the discourse, or how community engagement is referenced, in the MPA literature as MPAs are a significant and growing conservation intervention. I also seek to understand the diversity of stakeholders and community members involved and the methods of involvement.

I define a community as a homogenous or heterogeneous group of people that is a constantly evolving, multidimensional, cross-scale network that may also be defined by

spatial or cultural bounds (Berkes, 2004; Carlsson, 2000). I consider community engagement varying from unidirectional flows of information (e.g., educational pamphlets, social media campaigns) to more bidirectional flows (e.g., meetings between managers and the public). In the broadest sense, I deem community engagement as any interactions or flows of knowledge between members of a community and the management of MPAs, which can itself include community members. This study aims to describe the range of community engagement types currently implemented in marine protected area management and illustrate how the literature positions community engagement within the intervention context. Specifically, I ask: 1) What methods of community engagement are implemented?; 2) Who in the community is engaging with MPAs and MPA research?; and 3) How, why, and with what sentiments, is community engagement discussed? By understanding the complexities of community engagement in MPAs from existing evidence, I aim to inform future research and management.

## **Methods**

### ***Study Area***

I reviewed published research on MPAs around islands across the Caribbean, a region with a mosaic of cultures, ethnicities, ecosystems, political regimes, and economies. The region's marine and terrestrial ecosystems rank as some of the most biodiverse areas of the world (Burke et al., 2011). However, ecosystems and species are at risk to devastating regional threats: coastal development, watershed-based pollution, marine-based pollution, overfishing, destructive fishing, diseases, and changing ocean chemistry (Burke et al., 2011).

In this paper, I focus on the insular Caribbean, which includes 13 independent states (Antigua and Barbuda, The Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago) and 17 territories or lands of another status (Anguilla, Aruba, Bonaire, British Virgin Islands, Cayman Islands, Curaçao, Guadeloupe, Martinique, Montserrat, Puerto Rico, Saba, Saint Barthélemy, Saint Martin, Sint Eustatius, Sint Maarten, Turks and Caicos Islands, United States Virgin Islands).

As we know them today, these islands stem from the imperial hands of Great Britain, Spain, Holland, and France. In a region built on the control and domination of people, we must have a greater understanding of how conservation engagement occurs—the socio-political and historical contexts throughout the Caribbean influence how communities co-exist with the environment and institutions. Though most threats to MPAs in the Caribbean may not be unique to the region, the present and historical socio-political and ecological contexts affect how MPAs are managed and how community members interact with the protected areas. Since the 1950s, MPAs have been established throughout the Caribbean. There are over 300 MPAs in the region, ranging in size and classification (UNEP-WCMC, 2019). The context in which MPAs have emerged throughout the region influences the ways that they operate. Since MPAs are intertwined with socio-environmental realms, it is crucial to understand engagement better.

### ***Evidence Synthesis***

Systematic evidence synthesis methods offer opportunities to learn from existing bodies of knowledge. These methods are used to provide rigor, objectivity, and transparency in synthesis conclusions that can better inform decisions (Collaboration for

Environmental Evidence, 2013). As opposed to traditional literature reviews, synthesis methods ensure processes that are transparent, reliable, and reduce bias (Haddaway et al., 2015). There have been increasing calls for using these types of evidence synthesis approaches as a critical tool to pursue ‘evidence-based conservation’ (Pullin et al., 2020; Segan et al., 2011; Sutherland et al., 2004; Sutherland & Wordley, 2017). Reviews can serve as a link between primary research, policy, and practice (Woodcock et al., 2017). Indeed, scholars have created protocols for developing rigorous reviews for conservation that ensure consistency and applicability (Pullin & Stewart, 2006). To understand the role of community engagement in marine protected areas in the Caribbean, I employed methods in evidence synthesis to examine the published literature. I used a population, intervention, and outcome approach (Khan et al., 2003) and identified specific terms after reviewing articles across disciplines on marine protected areas. For *Web of Science Core Collection* articles from 1900 through 2020, I searched using the search string outlined in Table 2.1.

**Table 2.1**

*Search string*

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Population terms	<p>(“caribbean” OR “greater antilles” OR “lesser antilles” OR “west indi*” OR “anguilla” OR “antigua and barbuda” OR “aruba” OR “barbados” OR “bonaire” OR “british virgin islands” OR “cayman islands” OR “cuba” OR “curacao” OR “dominica” OR “dominican republic” OR “grenada” OR “guadeloupe” OR “haiti” OR “jamaica” OR “martinique” OR “montserrat” OR “puerto rico” OR “saba” OR “st. barthelemy” OR “saint barthelemy” OR “st. kitts and nevis” OR “saint kitts and nevis” OR “st. martin” OR “saint martin” OR “st. maarten” OR “saint maarten” OR “sint maarten” OR “st. lucia” OR “saint lucia” OR “st. vincent and the grenadines” OR “saint vincent and the grenadines” OR “st. eustatius” OR “sint eustatius” OR “the bahamas” OR “trinidad and tobago” OR “turks and caicos” OR “us virgin islands”) AND</p>
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Intervention terms	("marine protected area*" OR "marine reserve*" OR "marine refugia" OR "marine refuge*" OR "marine park*" OR "marine santuar*" OR "partial closure*" OR "no-take zone*" OR "no trawling" OR "marine conservation zone*") AND
Intervention adjacent terms	("engag*" OR "participat*" OR "stakeholder*" OR "resident" OR "survey*" OR "public meeting*" OR "town meeting*" OR "town hall*" OR "focus group*" OR "interview*" OR "community based*" OR "community based conservation*" OR "community based resource management*" OR "education*" OR "integrated conservation" OR "development project*" OR "local ecological knowledge*" OR "adaptive co-management*" "collaborative management" OR "co-management" OR "participatory model*" OR "payments for ecosystem services" OR "citizen science" OR "forum*") AND
Outcome terms	("success*" OR "effect*" OR "fail*" OR "benefit*" OR "indicat*" OR "outcome*" OR "impact*" OR "result*")

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*Note.* The search string used in the query of the *Web of Science* database

I developed a set of inclusion and exclusion criteria to evaluate the relevance of articles. I designed these search terms to find articles about MPAs in the Caribbean where some form of community engagement is present and an evaluation, or outcome, aspect. For inclusion into the final dataset, articles must meet all inclusion criteria while not meeting any exclusion criteria (see Appendix A.1).

I recovered and downloaded metadata (including title, abstract, and author(s)) and uploaded data into RStudio (v1.2.1335) as a text file. I used the ‘metagear’ (v0.2; Lajeunesse, 2016) and ‘bibliometrix’ (v2.2.1; Aria & Cuccurullo, 2017) packages to load the data into R and manually screened titles and abstracts. One author reviewed all articles and used the abstract screener function to go through the articles more efficiently. They classified them as 'yes,' 'no,' or 'maybe.' I downloaded articles remaining (those classified as ‘yes’ or ‘maybe’) in the title and abstract screening from the internet and



reviewed the full text. I included any articles with doubt over inclusion in the title and abstract stage in the full-text screening (see Appendix A.2 for the list of articles reviewed and included).

I extracted quantitative and qualitative data from these articles to gather details of community engagement and how it is incorporated into MPA planning, design, implementation, monitoring, and evaluation. Data include the location of the research study, who was involved in engagement, the types of engagement, and when engagement occurred. Using MAXQDA, I performed content analysis to explore the sentiments and reasonings for why community engagement was or should be utilized from the authors' or participants' standpoint. I also collected summary information on the main findings of each paper.

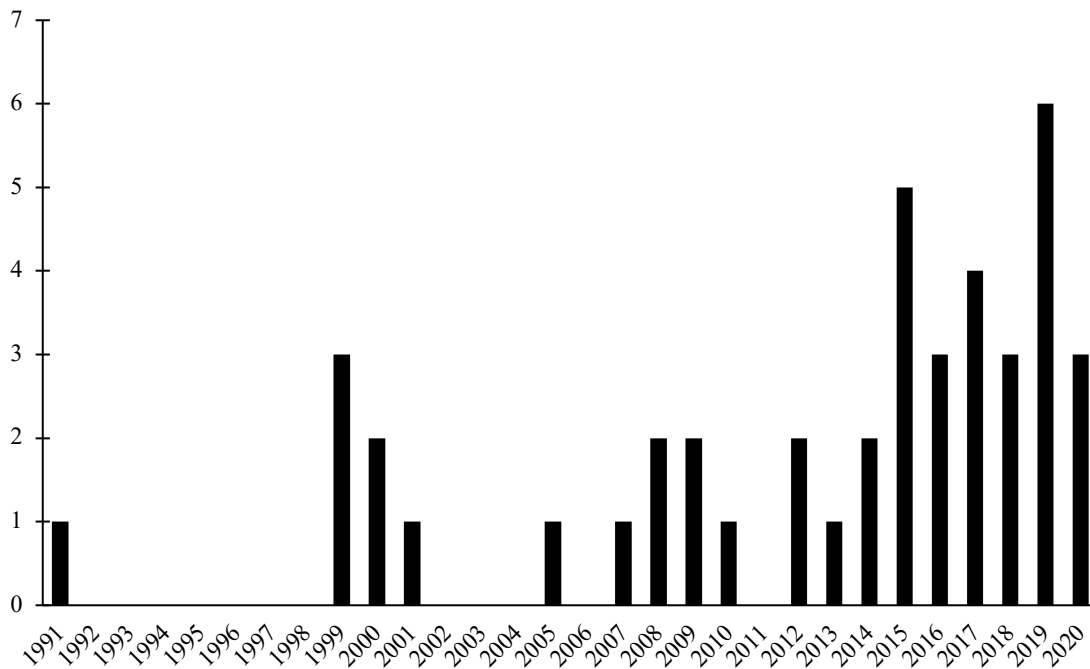
To determine the disciplines of each article, I used the *Web of Science* metadata on research areas and categorized them as a natural or social science (see Appendix A.3). I recognize that using these research areas is only a proxy for the types and amount of training researchers are most likely to be exposed to throughout their careers. I included the following as natural science disciplines: Biodiversity & Conservation, Environmental Sciences & Ecology, Fisheries, Life Sciences & Biomedicine, Marine & Freshwater Biology, Oceanography, Science & Technology, and Water Resources. The following seven disciplines are those I designated as social science disciplines: Anthropology, Business & Economics, Education & Educational Research, Geography, International Relations, Social Sciences, and Sociology.

## Results

The *Web of Science* query returned 216 records (see Appendix A.4 for a diagram on exclusion at the different review stages). After reviewing the titles and abstracts of these records, I excluded 61 articles. From the remaining 155 articles, I reviewed their full text and removed an additional 112 articles. Ultimately, through this systematic search, I identified 43 papers of relevance that I used in the analyses. The 43 articles I reviewed span from 1991 to 2020, with the number of articles generally increasing over time (Figure 2.1).

**Figure 2.1**

*Articles published over time*

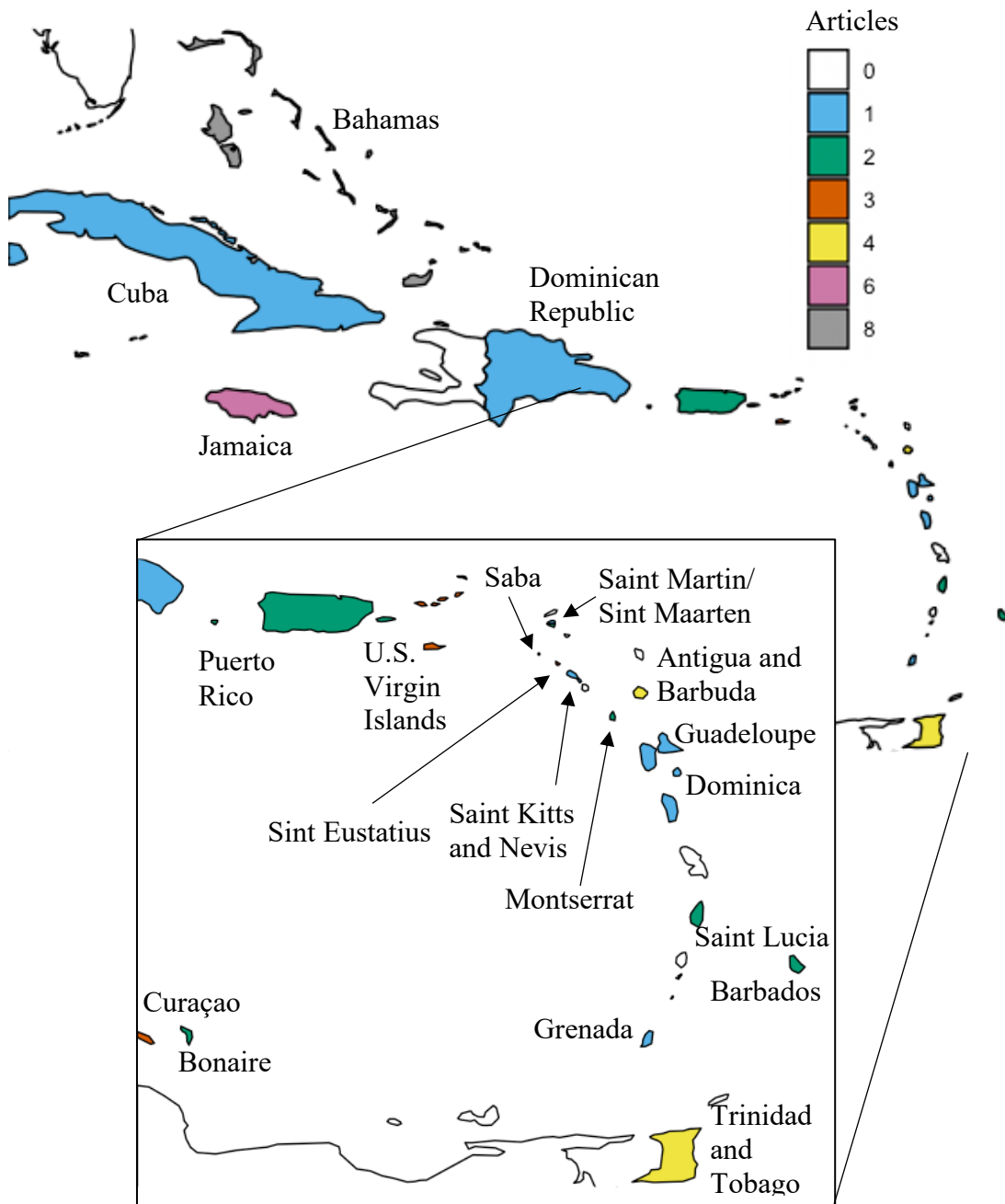


*Note.* The number of articles published annually through 2020 that satisfied the inclusion/exclusion criteria.

Articles studied MPAs from across the insular Caribbean, including 11 independent states and ten territories/other statuses (Figure 2.2). Most of the articles were single country/territory studies (N=30), while five were conducted at the regional, Caribbean level. The remainder of the articles were of studies conducted in two or more states or territories.

**Figure 2.2**

*Locations of articles*



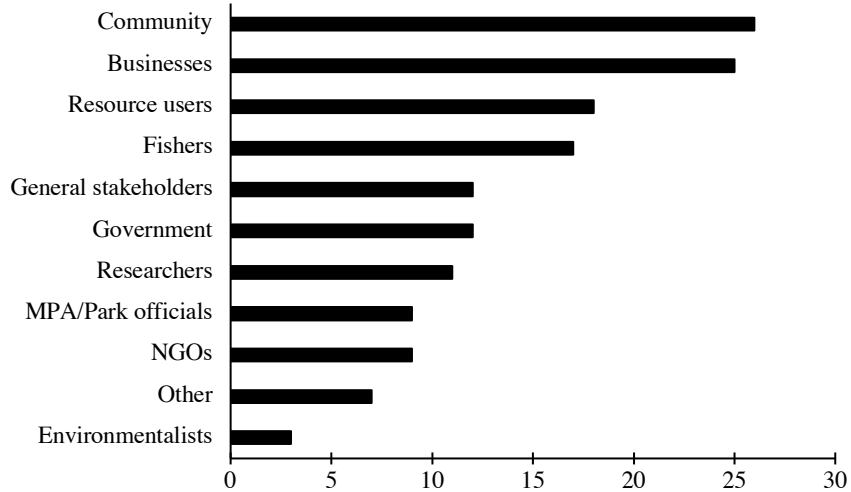
*Note.* This figure shows the countries, territories, and regions studied in the articles that satisfied the inclusion/exclusion criteria; some articles conducted studies in multiple

countries. There were also five articles that were regional, or Caribbean-wide. Cuba, Dominica, Grenada, Guadeloupe, Saint Martin, Saint Kitts and Nevis, and the Dominican Republic occurred once; Barbados, Bonaire, Puerto Rico, Saint Lucia, Sint Martin, and Montserrat occurred twice; Curaçao, Sint Eustatius, and the U.S. Virgin Islands occurred three times; Antigua and Barbuda, Saba, and Trinidad and Tobago occurred four times; Jamaica six times; and the Bahamas eight times.

Most articles described instances where those who were engaged and participating were quite narrow scope (e.g., Alexander & Campbell, 2018; Camacho & Steneck, 2017). From the descriptions of who was engaged, I developed the following categories: businesses, community, resource users, fishers, general stakeholders, government, researchers, MPA/park officials, NGOs, other, and environmentalists (see Appendix A.5 for the classifications of these from the denotations in the text in articles). Figure 2.3 shows the distribution of groups of people described as being engaged across studies. The four most prevalent categories are community members, businesses, resource users, and fishers.

**Figure 2.3**

*Participants in articles*

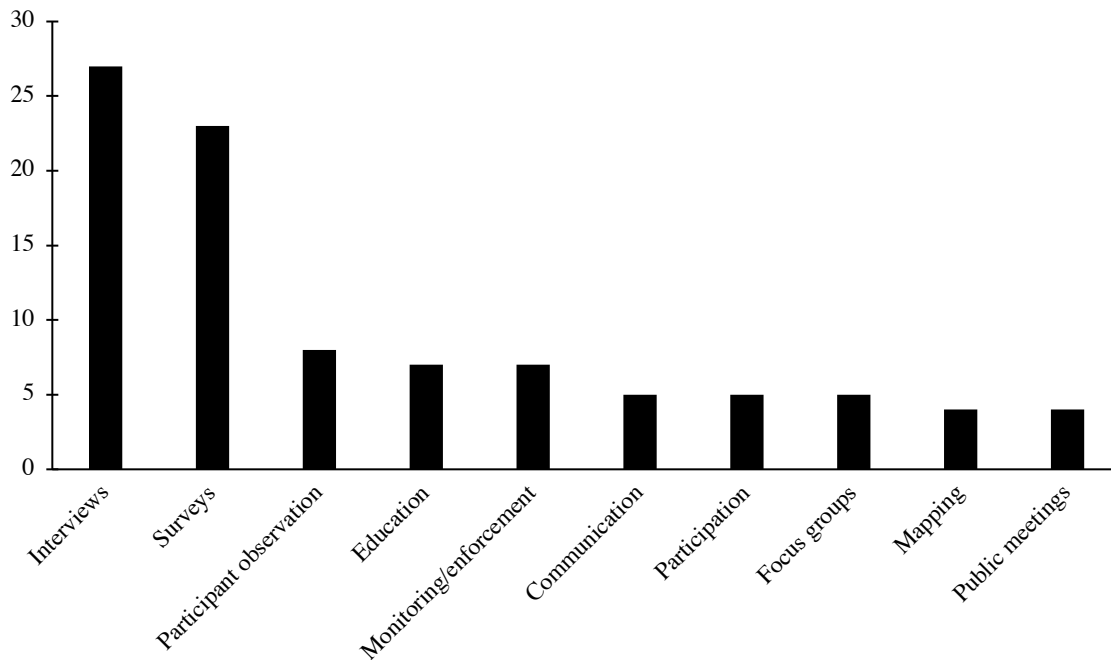


*Note.* This figure shows the distribution of individuals, grouped into the broad categories, participating in community engagement.

I identified 31 categories of community engagement with 122 listed methods. The most common methods of engagement mentioned (those accounting for 75% of total mentions) are, in descending order, as follows: interviews, surveys, participant observation, education, monitoring and enforcement, communication, participation, focus groups, mapping exercises, and public meetings (Figure 2.4). The remaining methods of engagement only occur three or fewer times across the articles (see Appendix A.6 for a table of the counts for all types of community engagement mentioned). The top three methods of engagement are interviews, surveys, and participant observation.

**Figure 2.4**

*Methods of engagement in articles*



*Note:* This figure shows the number of articles that cited the various methods of engagement.

The articles are written from disciplines predominantly in the natural sciences; eight of the 43 articles have a research area in the social sciences. I did not find differences in the data between articles in the natural and social science research areas.

To answer the third question of this chapter – how, why, and with what sentiments, is community engagement discussed? – I thematically coded articles using the text surrounding engagement. From this process, I identified ten broad emergent themes: *behavior, education, efficiency, flows of information, heterogeneity, necessity and desire, power, process, social networks, and ways of knowing*; these ten themes are further broken down into subthemes (Table 2.2).

**Table 2.2***Emergent themes and examples*

Broad theme	Subtheme	Example
Behavior	Community-based management counters individual tendencies	“community-based management helps to counter individualistic tendencies at the expense of collective benefits” (Smith & Berkes, 1991)
	Cooperation	“Cooperative research could be used to educate fishermen, resource managers and policymakers alike, reduce uncertainty and provide the basis for revising fishery management plans” (Karras & Agar, 2009)
	Rule obedience	Formal consultation and monitoring by community play some role in compliance of reserve rules (Pollnac et al., 2010)
Education	Education of resource users	Education of users (divers) plays a significant role (Davis & Tisdell, 1996)
	Stakeholders valuing education	“A marine park with a greater education and communication component was deemed by all stakeholders to be more valuable in achieving the desired objectives than the park as it was at the time” (Fernandes et al., 1999)
Efficiency	Data collection opportunity	“This case study presents the types of data that trained students and volunteers can obtain during research conservation visits from interviews to determination of underwater light levels and quantitative measurements on coral reefs.” (Crabbe et al., 2004)
	Engagement as a research tool	Papers on MPAs that use some form of community engagement to collect data but do not necessarily evaluate community engagement in the region (Ward-Paige et al., 2011)
	Monitoring opportunity	“Levels of compliance with reserve rules were, however, related to complex social dynamics, rather than simply enforcement” (Pollnac et al., 2010)



Broad theme	Subtheme	Example
Flows of information	Communication between managers, scientists, and community members:	“This analysis argues for the utility of studying risk communication as a process occurring between two communities: scientists and local people.” (Stoffle & Minnis, 2008)
	Stakeholders valuing communication	“Managers will have to alter how they interact with fisherfolk and other stakeholders, with mechanisms devised to allow more direct involvement of these groups.” (Appeldoorn, 2008)
Heterogeneity	Communities are complex	“complexity and diversity of factors that can explain perspectives and can lead to local community members’ acceptance or rejection of management efforts” (Broad & Sanchirico, 2008)
	Heterogeneity of stakeholders	“While co-management necessitates the participation of stakeholders, it does not mean all stakeholders are participating in management, or that comanagement represents the views and interests of all stakeholders.” (Smith, 2012)
Necessity and desire	Community engagement leading to success	“community involvement played an important role in the establishment and early success at CLPNR” (Schärer-Umpierre et al., 2014)
	Intrinsic motivation	“To ensure enduring engagement in community-based programs for conservation, participation that is intrinsically motivated, rather than experienced as a personal risk or burden, must be pursued.” (Carballo-Cárdenas & Tobi, 2016)
	Stakeholders wanting to engage	“all stakeholders surveyed expressed a willingness to participate and were keen for a more inclusive, holistic management approach” (Ramsey et al., 2015)
Power	Age and gender biases	“participation was limited, and highly stratified by race, class and gender” (Wise, 2014)
	Decentralization of power	“when major players make noteworthy sacrifices such as ceding power that they solely possess to a more inclusive, heterogeneous group, all patrons begin to develop trust and a compulsion towards reciprocity.” (Hassanali, 2013)

Broad theme	Subtheme	Example
Power	Full and equal participation	“if they [participatory processes] are not done in a way that promotes fairness or transparency or allows participants to provide input, influence decisions, or exchange information, then they could likely facilitate negative views about the social and ecological performance of MPAs” (Dalton et al., 2012)
Process	Co-creation	“with appropriate data, popular support for MPAs can be combined with knowledge of how local communities are structured and connected to the sea to design a participatory process that will produce successful cases of siting and managing MPAs” (Stoffle & Minnis, 2007)
	Engagement from the start	“many respondents strongly supported an approach that involved all stakeholders from inception” (Ramsey et al., 2015)
	Involvement fades over time	“failure to follow-up with the planned co-management structure ultimately led to its collapse” (Schärer-Umpierre et al., 2014)
	Iterative process	“ongoing process that demands commitment, flexibility, and patience on the part of all stakeholders” (Sandersen & Koester, 2000)
	Need for involvement	“A successful approach needs to be government-led but with willing and committed participation of stakeholders.” (Ramsey et al., 2015)
	Quality involvement	“Our findings indicate that it is not simply involvement in MPA planning and management, but the quality of that involvement, that is associated with positive perceptions of MPA performance in the wider Caribbean.” (Dalton et al., 2012)
	Social networks	Connections between users
Informal interactions between residents and researchers		“Overall, many of the research organizations in the Bahamian islands are not fully integrated into the communities and are considered by many Bahamians to represent yet another foreign interest” (Wise, 2014)

Broad theme	Subtheme	Example
	Social capital	“When major players make noteworthy sacrifices such as ceding power that they solely possess to a more inclusive, heterogeneous group, all patrons begin to develop trust and a compulsion towards reciprocity.” (Hassanali, 2013)
Ways of knowing	Community knowledge	“In time, however, local knowledge and societal values have intermingled with scientific data, sometimes challenging scientific discourses, and contributing to a richer understanding of the invasion as a social-ecological phenomenon.” (Carballo-Cárdenas, 2015)
	Traditional ecological knowledge	“They are uniquely changed by such projects, but stand to serve in special ways as providers of traditional ecological knowledge, definers of environmental ethics, and as co-managers of these marine resources” (Stoffle & Stoffle, 2007)

The broad theme of *behavior* pertains to instances where community engagement is linked to impacting the ways individuals in the community change habits or behavior. *Education* refers to both education being an essential tool to initiating change in behavior and individuals valuing education as a tool for conservation. *Efficiency* is a broad theme to denote instances where authors or participants in the research of the article highlight instances of community engagement that cut down costs or rely on voluntary labor. Examples include citizen science and unpaid monitoring and enforcement conducted by local fishers. Many of the articles cite the importance of communication. I use the broad theme *flows of information* to code instances where communications are a method of community engagement or where individuals value communication. I used *heterogeneity* when authors highlight that individuals or stakeholders in a community have various experiences, histories, perceptions, and knowledge. Thus, those implementing or

managing conservation actions and community engagement should acknowledge this heterogeneity.

I split the broad theme of *necessity and desire* into three subthemes: *community engagement leading to success*, *intrinsic motivation*, and *stakeholders wanting to engage*. I used the broad theme to represent instances where community engagement is viewed as essential. It can be from either a practical viewpoint where the MPA will only be successful with community engagement or an intrinsic stance. For example, “community-based management helps to counter individualistic tendencies at the expense of collective benefits” (Smith & Berkes, 1991). There are also calls for intrinsically motivated engagement: “To ensure enduring engagement in community-based programs for conservation, participation that is intrinsically motivated, rather than experienced as a personal risk or burden, must be pursued” (Carballo-Cárdenas & Tobi, 2016). *Necessity and desire* also includes cases where there is a desire from individuals wanting to engage; hence why it is not simply categorized as a necessity.

*Power* is the broad theme to characterize power dynamics that emerge from positions and influence in the community and management and dynamics that emerge from an individual's race, class, or gender. I split the broad theme of *process* into subthemes that characterize aspects of community engagement deemed necessary in the articles: *co-creation*, *engagement from the start*, *involvement fades over time*, *iterative process*, *need for involvement*, and *quality involvement*. *Social networks* refers to relations, both formal and informal, between actors and institutions that are necessary to consider or build for effective community engagement. The last broad theme, *ways of*

*knowing*, is used when there are references to traditional, local, and indigenous sources of knowledge.

Engagement is not a binary operation; its success and impacts are dependent on a variety of factors that are not well known. “It is not just about the number of horizontal and vertical ties. The quality, depth, and strength of those linkages is critical as well” (Alexander et al., 2015). Further, it must be sustained: “community involvement played an important role in the establishment and early success at CLPNR [Canal Luis Peña Natural Reserve], but failure to follow-up with the planned co-management structure ultimately led to its collapse” (Schärer-Umpierre et al., 2014).

## **Discussion**

In this literature review, the concept of community engagement is often used in reference to a tool used by the authors to collect data. For example, many authors use interviews and surveys to understand the perceptions and uses of MPAs better. This pattern, combined with the increasing number of articles over time, supports the trend of greater incorporation of social sciences in marine conservation.

In this study, I found that the primary methods of engagement in articles studying MPAs are interviews and surveys. Those described as engaging in the articles were primarily from the community, businesses, resource users, and fishers. From descriptions of community engagement in the articles, I found that a primary motivation for community engagement is improved socio-environmental outcomes through behavior change, education, and data collection. Here I briefly highlight implications of key findings and important future directions.

### ***Methods of engagement***

With *interviews*, *surveys*, and *participation* as the top three forms of community engagement, most of the engagement is unidirectional in the literature. Researchers recommend multidirectional methods of engagement where individuals who are engaged are actively engaging (Barmuta et al., 2011; Shackleton, Adriaens, et al., 2019); unidirectional methods of engagement include questionnaires where those conducting the activity are seeking information (e.g., knowledge of a resource, perceptions). I found that the primary forms of engagement in the literature were unidirectional. With unidirectional forms of engagement, there may be less of a guarantee that the engagement will impact the process of management or decision-making elements. When there is less power in the process, those engaged may feel that their voices, opinions, and knowledge are ignored (Arnstein, 1969). Consequently, this may create or worsen distrust. However, from the articles in this study, none of which explicitly explore the role of power, it is difficult to assess if, and to what extent, certain methods of engagement redistribute power.

Some articles discuss education programs and enforcement efforts, yet they are a smaller subset. However, what is difficult to assess given the data in the articles, is the context in which engagement activities occur. Thus, the method of engagement may not be as important a factor in the quality of the outcomes as the context and way the method is carried out. Further, the social and power dynamics involving individuals and institutions facilitating engagement affect the ways engagement occurs and its outcomes.

### ***Engagement with whom?***

Though the category *community* was the most cited group of engaged people, few articles define who comprises the community members described. For MPAs, community members with power, such as the town council leaders, tend to be more involved than those who have fewer ties or financial stakes in the issue at hand (Jentoft et al., 2011). *Fishers* were also commonly cited in the articles, which is unsurprising as they are often the primary resource users in coastal communities near MPAs. More often than not, stakeholders are considered to be individuals with a direct financial link to MPAs. To consider the well-being of the community and the marine environments, a more inclusive approach considers everyone as a stakeholder as all community members are in some way connected to the environment. For example, one study in the sample states that “all Barbuda residents can be considered stakeholders” (Johnson et al., 2020).

In conducting community engagement, we must acknowledge the heterogeneity throughout a community: “in many cases, those stakeholders who are involved in co-managing a resource may not represent the views of the community at large, or even the majority of stakeholders” (Smith, 2012). Specifically, some studies note that women are lacking, and there must be substantial efforts for their inclusion (Johnson et al., 2020; Sandersen & Koester, 2000; Wise, 2014); however, most of the studies did not explore or disaggregate between gender. Given that the research articles have not reported the outcomes of community engagement, the direction and magnitude of that engagement is not possible to effectively assess. However, I anticipate that engagement in which individuals have substantial power in the processes would have correlated with MPAs with more positive social and ecological outcomes (Arnstein, 1969). Power dynamics and

structures exist in all facets of society. They are critical to consider when engaging communities: "when major players make noteworthy sacrifices such as ceding power that they solely possess to a more inclusive, heterogeneous group, all patrons begin to develop trust and a compulsion towards reciprocity" (Hassanali, 2013). Engaging with a diverse group of participants (e.g., concerning knowledge, ties to the environment, socioeconomic backgrounds) is important in coastal communities since everyone has ties to the environment, whether directly or indirectly; similarly, interventions and management processes are relevant to everyone. These factors surrounding power dynamics and engagement can impact conservation decisions' perceived validity and effectiveness (Reed et al., 2018).

### ***References to engagement***

When looking specifically at the way the authors reference the role of community engagement, much of the commentary surrounding community engagement and MPAs did so in a superficial manner, offering support but no clear guidelines on how, when, and in what ways it should be implemented. None of the authors or participants in the studies were critical of community engagement, which supports the idea that many people view community engagement as an inherently good phenomenon. The terms community and engagement are portrayed as positive elements in conservation interventions. However, in many instances, community engagement is conducted in extractive or performative ways. Those being engaged are not benefiting from the engagement and have little to no power in the engagement outcomes. The positive depictions and sentiments surrounding community engagement ignore the fraught history of problems that have arisen when institutions with power assert control over individuals.



Even though there is evidence that people support community engagement in the management of MPAs, engagement strategies are limited and their evaluation even less. I believe that this may be due to the capacity and funding required to implement engagement strategies. Many forms of engagement take many people hours to complete; hence they are costly. Given that the management of MPAs requires a lot of responsibilities – such as monitoring, enforcement, budgeting, and data collection – it is reasonable that community engagement is not more prevalent in the literature. Thus, what is needed may include more funding from governments, NGOs, and funders designated for community engagement. Additionally, there may be benefits from more training in engagement activities and evaluations.

### ***Limitations***

I recognize the limitations of focusing primarily on peer-reviewed literature. There are many different forms of evidence, and systematic reviews of peer-reviewed literature portray a limited subset of the existing knowledge (Adams & Sandbrook, 2013). However, these articles provide insight into the research being conducted and put into the academic world; they interact with the grey literature and what is happening and implemented in practice.

### ***Going forward***

With the recognition of the importance of internally driven interventions, there is value in having evidence and information on the outcomes of engagement. Understanding the impacts of how stakeholders are engaged and the best practices for engagement can promote positive outcomes in MPAs, which reduce social conflict, enhance environmental outcomes, and bridge the divides between managers, community

members, and scientists. By knowing how interventions have been designed and implemented and their effectiveness in various contexts, MPAs can operate in a more equitable way across stakeholders. However, in this review, I have found a dearth of information within peer-reviewed literature on forms of community engagement in the insular Caribbean. Even fewer articles explicitly study the implication and impacts of community engagement in regions surrounding Caribbean MPAs. Part of this may be due, in part, to a disconnect in the language surrounding community engagement between how community engagement is written about in the literature and how it is conducted in practice. For instance, stakeholder is a common term in the literature, yet this can be considered jargon on-the-ground and therefore less commonly used in practice. Nevertheless, further research is needed to understand the precise effects of various pathways of community engagement on MPA outcomes. In conducting this research, there must also be more information on the context and how the outcomes of the engagement are used by managers. From this, we can start to better document the power distributions with relation to community engagement.

The lack of including voices perpetuates social and systematic balances of power. By understanding the role of engaging with community members, MPA management can be strengthened by the better inclusion of more voices. Our oceans and seascapes will change inevitably, but the degree to and pace at which they change and how will largely depend on community engagement in conservation efforts.

## **Conclusion**

From this review, I conclude that there is a need for more research conducted on the impacts, to both communities and the environment, of various forms of community

engagement across the Caribbean. There is little evidence of how acts of engagement alter the efficacy of MPAs, yet there is a consensus that it is crucial. It is essential to consider who is involved in engagement and how the process of engagement is one in which community members have power. In conducting more research on the roles of different kinds and implementations of community engagement, marine conservation and conservation in general can operate in a more just, equitable, and inclusive way.

## Chapter 3

### Characteristics of community engagement in Caribbean marine protected areas

#### Introduction

This chapter focuses on on-the-ground community engagement sentiments and practices. There is information in the literature on community engagement (Chapter 2), but that is a snapshot of what may be practiced by managers and stakeholders on-site. In this study, I interviewed marine protected area (MPA) managers and key informants to better understand how community engagement is practiced throughout Caribbean MPAs. In this introduction I provide an overview of MPAs, community engagement, and the research questions of this chapter.

MPAs are widely acknowledged as an effective tool to conserve ecological and cultural sustainability (Halpern, 2003; Halpern et al., 2009; Lubchenco & Grorud-Colvert, 2015; Roberts et al., 2017; Sala & Giakoumi, 2018). However, a wealth of research and practitioner knowledge show that simply declaring a region protected is not adequate to achieve stated goals (Bennett & Dearden, 2014; Chaigneau & Brown, 2016). A variety of factors are necessary for MPAs to achieve stated goals. These factors range from ecological prerequisites, such as coverage of ecologically sufficient sizes and regions, to social conditions, including monitoring and enforcement, participatory processes, appropriate staff, and adequate funding (Edgar et al., 2014; Fox et al., 2012; Gill et al., 2017; Mills et al., 2020). Overwhelmingly, reasons MPAs are not “successful” are due to social factors, as opposed to ecological issues (Christie et al., 2017; Kaplan et al., 2015; Mills et al., 2020; Mizrahi et al., 2019; Picone et al., 2021).

I chose to focus this study on community engagement because of the established needs and desires to improve community engagement processes in MPA management concurrent with the paucity of information on the topic. I define community engagement as any interactions or flows of knowledge between members of a community and the management of a MPA(s). Though there have been papers exploring some human dimensions and governance of MPAs, few studies have focused explicitly on the community engagement aspects in coastal communities (for example, see McIntosh et al., 2014). Giakoumi et al. found that stakeholder engagement was the most critical factor affecting MPA success and failure (2018). Additionally, a recent longitudinal assessment found that community engagement is an important challenge for managers ([https://www.gcfi.org/pdf/MPAConnect/MPAManagementCapacity%20Assessment\\_2011\\_en.pdf](https://www.gcfi.org/pdf/MPAConnect/MPAManagementCapacity%20Assessment_2011_en.pdf)). Whether the goals of MPAs are to conserve ecological, social, or cultural aspects of a region, community engagement is often posed as a prerequisite for effectiveness.

Participatory approaches to engage community members take place across disciplines and socio-environmental systems. Some of the most impactful approaches include public health and health promotion, activist participation, agroecosystem analysis, applied anthropology, field research on farming systems, and rapid rural appraisal (Macaulay, 2017; Pretty et al., 1995). Community engagement can be conceptualized in a lot of different ways, contributing to the confusion and ambiguity that exists when it is simply referenced as a recommendation to achieve positive socio-environmental outcomes. Community engagement encompasses a broad range of activities and processes in which community members participate. Though community

engagement is often portrayed as a positive action, this is not inherently true. In her often-cited article, “A Ladder of Citizen Participation,” Arnstein asserts that “citizen power” should be an outcome of engagement (Arnstein, 1969). Arnstein’s ladder highlights the levels of empowerment from “manipulation” on the lower rung to “citizen control” at the top (1969); the lower rungs are less empowering for those being engaged. There have been numerous adaptations of the ladder, highlighting other important aspects besides empowerment. For example, Pretty emphasizes that ‘participation’ is too broad a term and creates a typology to categorize participation: “passive participation,” “participation in information giving,” “participation by consultation,” “participation for material incentives,” “functional participation,” “interactive participation,” and “self-mobilization” (1994). In line with Arnstein’s perceptions, Pretty states that functional participation is the minimum type of participation for sustainable development. Lawrence builds on these typologies to create four classifications (“consultative,” “functional,” “collaborative,” “transformative”) that differ based on aspects of process, outcomes, power, and knowledge. Other framings consider the communication flows of the engagement (Rowe & Frewer, 2000), impacts to the decision-making process (Beierle, 2002; Thomas, 1993), and the objectives of the participation (Lynam et al., 2007).

Scholars and practitioners (Sayce et al., 2013) have provided a spectrum of types of community engagement, in which some forms are not recommended in specific contexts, underscoring the need for understanding what works and why in particular contexts in order to inform lessons and recommendations for engagement can be made. There is a difference between facilitating community engagement and the success of those actions (Arnstein, 1969). Others have noted that when community engagement is

unidirectional and extractive, it can exacerbate distrust between community members and MPA staff by highlighting differences (Day, 1997).

As community engagement continues to be promoted by funders and researchers, we must understand how it is currently conducted and the perceptions of its validity. There have been studies that explore engagement in the literature to understand what works in other conservation contexts (Reed et al., 2018; Shackleton, Adriaens, et al., 2019), but given the role of MPAs in marine conservation and the influence of managers and key stakeholders, it is essential to understand community engagement surrounding MPAs. There is a range of experience and practice out there, and we need to disentangle the approaches that have been most effective if, in practical terms, MPAs are to achieve the conservation goals for which they were established.

In this chapter, I address the following questions: 1) What are characteristics of community engagement across the Caribbean? 2) What are important factors to consider for successful community engagement? 3) What are key barriers to community engagement in Caribbean MPAs? 4) How do key informants perceive the importance of community engagement in MPA management?

## **Methods**

### ***Study region***

The Caribbean represents an ideal case study to explore stakeholder engagement across MPAs because there are a variety of contexts in which MPAs exist and MPAs have existed in the region for decades so there is a wealth of experiential knowledge. The Caribbean region is a culturally, ecologically, and socially diverse area (Higman, 2010). This chapter focuses specifically on the Bahamian, the Greater Antilles, and the Eastern

Caribbean ecoregions which correspond with the Lucayan Archipelago, the Greater Antilles, and the Lesser Antilles (Heileman, 2007; Knowles et al., 2015). This region is also known as the insular Caribbean. Threats to these Caribbean marine ecosystems include pollution, overfishing, climate change, disease, and coastal development (Burke et al., 2004; Guarderas et al., 2008; Mora, 2008). These threats negatively impact food security, livelihoods, and the well-being of people who live in the region (Cinner et al., 2012; Depledge et al., 2017). For these reasons, islands across the Caribbean have implemented MPAs and marine-managed areas (MMAs).

The Caribbean has been a global leader in proactive initiatives to protect marine resources. In 1958, Exuma Cays Land and Sea Park was the first land and sea park in the world (<http://www.mpatlas.org/region/country/BHS/>), and in 1986 it became the first “no-take” reserve in the wider Caribbean. In the Caribbean, the calls for MPAs were primarily driven by large-scale, regional programs such as the Caribbean Environment Program Action Plan of the United Nations Environmental Program and the Protocol on Specially Protected Areas and Wildlife (SPAW) of the Wider Caribbean Region under the Cartagena Convention. These programs led to the Caribbean Challenge Initiative. Eleven countries and territories across the Caribbean and 15 companies set a goal to effectively conserve and manage 20% of the marine and coastal environment by 2020 (Bustamante et al., 2018). MPAs across the Caribbean range in size, proximity to communities, restriction levels, goals. In an assessment of 31 MPAs across the Caribbean, researchers found that most MPAs are making some progress towards their stated social and ecological resources (Dalton et al., 2015). However, most of the MPAs



are not making good progress towards their management objectives concerning the management process, conflict, compliance, or enforcement (Dalton et al., 2015).

### ***Interviews***

To gather information on community engagement practices and to understand perceptions of community engagement in Caribbean MPAs, I conducted semi-structured interviews with managers and key informants. I considered key informants to be individuals who have worked alongside MPA staff and have a deep understanding of the operations and history of said MPAs. I conducted semi-structured interviews to capitalize on the “knowledge-producing potential of dialogues” (Brinkmann, 2014, p. 286). I developed an interview guide to elicit information regarding the historical and current uses of community engagement in MPA operations (Appendix B.1). Questions were formulated using expert information from individuals working alongside managers in the area and were approved by the Arizona State University Internal Review Board (Appendix B.2).

Data from the interviews include background information on the respondent; historical and governance of the MPA with which they are most familiar; community engagement in the implementation and management of the MPA. I identified managers and key informants from a database containing contact information of people who have been working throughout the Caribbean on MPAs. I then used snowball (chain-referral) techniques to identify other vital informants or individuals with deep knowledge of community engagement in the region. Snowball methods involve asking respondents to refer other individuals who they believe are relevant to the study; this technique is

valuable in cases where the target population is hard to find or dispersed over a large area (Bernard, 2017).

Interviews were conducted virtually and recorded when feasible and when permission was granted. I noted information on the types of engagement utilized for MPAs and who was involved. Using the interviews and content analysis, I identified emergent themes related to the implementation of and needs for community engagement (Bernard, 2017).

## **Results**

In this section I will provide an overview of the participants and the countries in which they work, followed by data from the interviews broken down by the research questions outlined in the introduction.

I interviewed 14 men and women who work throughout the Caribbean. Participants were from St. Vincent and the Grenadines, Barbados, Dominica, Haiti, Jamaica, The Bahamas, Grenada, St. Kitts and Nevis, Trinidad and Tobago, Antigua and Barbuda, and two who worked throughout the region. Table 3.1 shows the countries in which the participants worked, as well as attributes of the location including the number of MPAs and the population. All participants were from independent countries and represented all the independent countries in the region except for Cuba, the Dominican Republic, and Saint Lucia. Participants were individuals who work for and with MPAs and MMAs throughout the region. Some of the participants work for adjacent institutions, including local, regional, and global environmental NGOs and government departments. They have experience in marine conservation ranging from a few years to a few decades.

**Table 3.1***Caribbean country profiles*

Country	Group <sup>b</sup>	Independence <sup>c</sup>	GDP per capita (USD) <sup>d</sup>	Tourism contribution to GDP (%) <sup>e</sup>	Number of MPAs <sup>f</sup>	Coverage of MPAs (%) <sup>f</sup>	Population (in thousands) <sup>g</sup>	EEZ (km <sup>2</sup> ) <sup>h</sup>
Antigua and Barbuda	LLI	U.K. (1981)	17,113	60.4	14	0.3	98	107,939
Bahamas	Lucayan	U.K. (1973)	34,864	44.8	37	7.92	393	628,026
Barbados	LWI	U.K. (1966)	18,149	39.9	3	0.01	287	183,773
Cuba <sup>a</sup>	Greater	U.S. (1902)	9,296	9.6	88	3.85	11,327	364,511
Dominica	LWI	U.K. (1978)	8,111	34.7	2	0.03	72	28,593
Dominican Republic <sup>a</sup>	Greater	Spain (1865)	8,282	17.3	36	17.96	10,848	269,489
Grenada	LWI	U.K. (1974)	10,818	20.2	23	0.1	113	26,133
Haiti	Greater	France (1804)	715	9.9	7	1.47	11,403	123,525
Jamaica	Greater	U.K. (1962)	5,369	30.3	17	0.75	2,961	263,284

Country	Group <sup>b</sup>	Independence <sup>c</sup>	GDP per capita (USD) <sup>d</sup>	Tourism contribution to GDP (%) <sup>e</sup>	Number of MPAs <sup>f</sup>	Coverage of MPAs (%) <sup>f</sup>	Population (in thousands) <sup>g</sup>	EEZ (km <sup>2</sup> ) <sup>h</sup>
Saint Kitts and Nevis	LLI	U.K. (1983)	19,896	25.1	3	3.98	53	10,209
Saint Lucia <sup>a</sup>	LWI	U.K. (1979)	11,611	39.6	31	0.22	184	15,472
Saint Vincent and the Grenadines	LWI	U.K. (1979)	7,464	22.3	31	0.22	111	36,304
Trinidad and Tobago	LWI	U.K. (1962)	16,637	7.9	2	0.05	1,399	79,798

<sup>a</sup> Caribbean countries that are not represented by participants in this chapter

<sup>b</sup> Archipelago classifications in the Caribbean: Lucayan, Greater Antilles (Greater), Lesser Antilles Leeward Islands (LLI), Lesser Antilles Windward Islands (LWI)

<sup>c</sup> The country from which independence was gained and the year in which it occurred

<sup>d</sup> Gross domestic product (GDP) per capita in United States dollars (USD) data for 2019 from the United Nations Statistics Division (<https://data.un.org/Data.aspx?d=SNAAMA&f=grID%3A101%3BcurrID%3AUDS%3BpcFlag%3A1>)

<sup>e</sup> World Travel and Tourism Council (WTTC) data on tourism's contribution to GDP in USD (<https://wtcc.org/Research/Economic-Impact>)

<sup>f</sup> World Database on Protected Area (WDPA) data on the number of marine or coastal protected areas and the percent of marine and coastal waters protected to some degree (<https://www.protectedplanet.net/en/thematic-areas/wdpa?tab=WDPA>)

<sup>g</sup> Country population data for 2019 from the United Nations Department of Economic and Social Affairs (<https://population.un.org/wpp/DataQuery/>)

<sup>h</sup> Data from Sea Around Us for exclusive economic zone (EEZ) area which typically include waters up to 200 nautical miles from the coast and shelf areas (<http://www.seaaroundus.org/data/#/eez>)

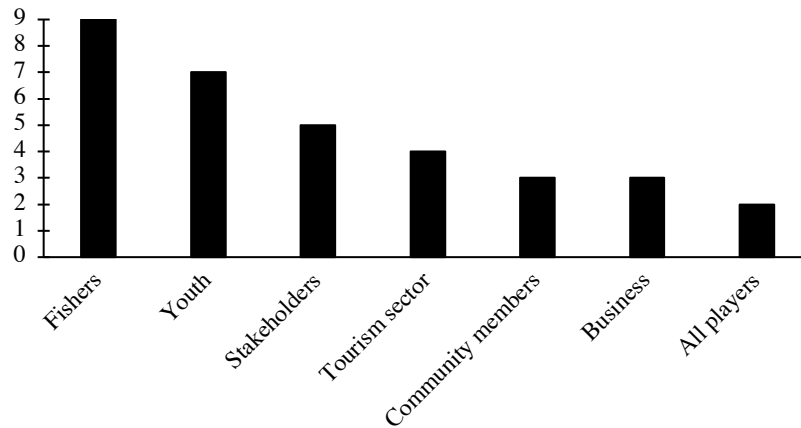
***Research question 1: What are characteristics of community engagement across the Caribbean?***

The first research question is important to answer to understand the landscape of community engagement. Based on the interviews and existing information on aspects of community engagement, the characteristics that I present are who is engaged, the methods of engagement, the backgrounds on the engagers, and the role of collaboration between institutions.

**Who is engaged?** Overall, there was a wide variety of people and stakeholder groups listed as being engaged (Figure 3.1). Fishers were reported to be the primary group of people that participants engaged with. Youth were also frequently cited, followed by different categorizations of stakeholders, community members, the tourism sector, and businesses. All participants emphasized the fact that the community is key because without their input and support, MPA management efforts are futile.

**Figure 3.1**

*Participants listed as being engaged*



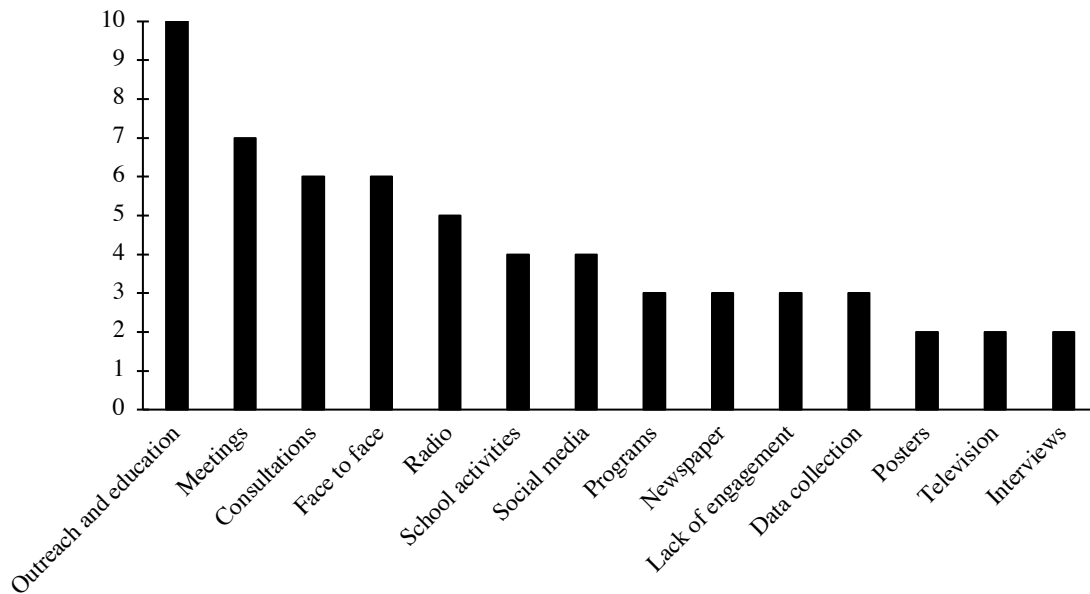
*Note.* The number of participants that cited the various groups of individuals (or stakeholder groups) that are included in community engagement. The categories were derived from the words of the participants; for instance, fishers are a type of stakeholder, but if a participant explicitly said stakeholder and did not elaborate further than I used the category stakeholder. “All players” was a phrase used by two participants to emphasize that everyone with a direct or indirect connection to the MPA was engaged. Engaged groups that were only mentioned by participants once are not included in the figure. These include dive industry, key community members, schools, police, coast guard, government, hotels, village council, hunters, people using MPAs, volunteers, water taxi operators, tourists, and older community members. One participant stated that participants vary by the site location and the objectives of the engagement.

**Methods of engagement.** I identified 20 categories of engagement from the data (Figure 3.2). The most commonly cited form of engagement was outreach and education, followed by meetings, consultations, and specific emphasis on face-to-face methods of

engagement. Participants also described the role of media (radio, television, social media, and newspaper) as a form of community engagement. The methods of engagement are related to the objectives of the engagement. As the following participant describes, the form of the engagement is also related to who they are trying to engage: “We’ve done radio PSAs. And that is our way of also being able to reach government or senior government officials... we’ve even done interviews, one-on-one interviews, with government officials because we obviously know that we won’t want to engage them in a public forum.” In addition to considering what the goals are and who is being engaged, there was a lot of thoughts and information on who is facilitating the engagement, which I explore in the next section.

**Figure 3.2**

*Methods of engagement cited by participants*



*Note.* This figure shows the number of participants that cited the various types of community engagement. The following methods of engagement were only cited once and

are not included in the figure: timeline creation, fundraising, volunteering, summer camps, and cleanups.

**Backgrounds of engagers.** In this section I present data regarding the backgrounds of people who conduct engagement. It is important to understand the training and backgrounds of people facilitating engagement as there are power dynamics within communities and between the people conducting engagement activities, such as MPA staff, and participants. The two aspects of engagers' backgrounds that emerged were 1) where they were from and 2) their training and educational background.

At some locations, the staff is local, while in others, they are from nearby communities. A few participants, as noted in the following excerpt, stated that they prefer someone from the community but recognize that that is not always feasible. "We always want someone that's connected to the community, invested. It just makes the most the sense. Where we are unable to source someone skilled enough to fill those positions then yes, we will have to consider someone not from that community." From this participant's perspective, being from the community helps create trust. However, this was not true in all contexts:

"I've had a case where, okay, so what I haven't said to you is I actually grew up in this community. Right. Um, and when I say I grew up, I was raised fishing, that kind of thing. So, I've been, you know, taught and trained by some of these guys. And I've had a case where I went back to interview some of them initially, this is actually right after I finished a bachelor's before I went to masters, I was doing another small project. Um, I went to a guy who I knew fished. I knew his methods of fishing. I knew normally where he'd go. And when I said to him, yeah, I'm



here on behalf of this management authority. And he's like, I'm not going to answer any of your questions because anytime they do something, it affects us [fishers].”

Historically, and in the experiences of the fisher in the above example, the trust between fishers and the management at the location had been degraded. Consequently, even though the fisher knew the manager and may have trusted them on a personal level, their capacity as a manager was enough to not confide in them.

Most of the engagement activities are undertaken by MPA staff who have marine, biological, or natural resource management backgrounds. However, some individuals are retired schoolteachers and have expertise in education, while some have a business, government, or management background. Having people with marine and biological backgrounds is important for many of the duties conducted through MPA management, but for some objectives, such as community engagement, a more educationally and experientially diverse staff is beneficial. For example, one participant noted that they could better do things if they are fortunate to have a community liaison but that this would require funding and the right individual. Further, another noted that “it is rare that you have communication specialists working in MPAs. And it is perhaps something we need more of. And some of the places that I work with are actively trying to get interns or looking for staff who can sort of fill that gap.” Repeatedly, participants emphasized the desire and importance of having staff of various backgrounds. One individual said they had had groups with no scientific or environmental staff, leading to tremendous improvements.

In addition to the disciplinary background of the people who are facilitating engagement activities, two participants described the role of gender. “We hired a female warden and trained her in communication and MPA management so that she could be the main one leading a lot of the engagement with the fishers. Fishers are open to talking to women when it comes to something that requires a lot of empathizing, which an MPA does require.” This participant highlighted the need to consider interpersonal dynamics and the reasons why a woman may be better suited than a man to conduct some of the management duties. These perceived differences may be related to the different experiences of men and women in the community, or the gender constructs in the area. Anecdotally, as discussed with another participant, there are a lot of women working in conservation and MPAs throughout the Caribbean because it is considered “care” work, which is work that is associated more with women.

***Research question 2: What are important factors to consider for successful community engagement?***

For the second research question, I sought to understand and document ways that community engagement has been successful and factors that may contribute to its success. Some noted that engagement should be iterative and at the start. For example, they stated that they should give people the option to work on protected areas’ boundaries together. Results of engagement may not be the most environmentally optimal, but that is okay.

Additionally, participants said that community engagement must be included in management plans to help ensure that engagement occurs and is sustainable. Before major projects, staff should create a communication strategy. To do so, one individual

recommended that “keeping it [communications] as simple and as manageable as possible and focused on particular needs leads to well-targeted communications that hopefully can be successful.” During meetings with community members, keeping agendas broad can help highlight components that may otherwise not be acknowledged. There should be other avenues besides town hall meetings when meeting with community members, as not everyone can speak freely. In some instances, this means they should meet with different categories of stakeholder groups separately. To do so, they should target different places to meet with the respective groups. Following is an example of how a community that one participant worked in targeted fishers.

“Boat to boat outreach strategy where the outreach officer, this community liaison manager, will go out with the rangers, and the rangers will go and visit the boats while they’re waiting. They do this especially while the fishermen are waiting for the opening of, say, the conch fishing season, and they’ll go from one boat to the next boat. It’s not really an enforcement visit; it’s really, it’s a social visit. And the outreach manager will – he calls it Coca-Cola diplomacy – he’ll have a cold coke. They go out - this is like five am in the morning while the fishermen are sort of having breakfast. He hands out some cold cokes, and they just chat, and he chats with everybody, and he knows the families. He knows the kids who are working in the junior ranger program in parallel. He’ll talk about somebody’s brother who has developed a hydroponic plant to supplement his fishing income and how it’s going. He’ll just try and build a rapport with the fishermen, which leads to good intelligence sharing. It’ll help build trust between the managers of the site and the local fishermen. It provides an avenue for them to talk about their concerns.

They'll talk about how is the fishing is going. It gives an opportunity for the MPA manager to talk about what they're seeing in terms of coral and fish monitoring and the status of the conch population, or the size of the lobster based on the science program, so they feedback the science results. They chat very much one on one. So, it's helped forge new relationships and its built trust, and it's leading to intelligence gathering, and it's sort of helping to tie together the other programs like education for kids and livelihoods alternatives for fishing families – tie the enforcement and the education and the science programs together a little more.”

One participant stated that their approach has been to empower and support the community. However, given that most MPAs do not have the staff capacity to conduct optimal engagement activities (Gill et al., 2017), some work in collaboration with local and regional environmental nongovernmental organizations (NGOs). In eight of the interviews, participants cited collaborations concerning community engagement. Most of the partnerships mentioned were between the MPA managers and NGOs. Sometimes NGOs provide financial support and support, such as expertise, while others are more involved in the outreach and conduct it themselves. These collaborations can help an MPA build capacity.

Regardless of who or what institution is conducting the engagement, the dynamics of the community itself must be considered. Six participants highlighted the heterogeneity between and within communities. The ways managers conduct community engagement depend on the objectives and goals of the site and the community itself. For instance, one participant added that communities with high tourism levels are different from ones with less tourism. Additionally, there is variation within countries: “Even

within country, there's so much variation. It depends on the culture of the community... If you have a community that's more open to each other and loving and very integrated, then yes, it's very effective." Another participant cited that even within certain types of communities, there are differences; they said that some fishing communities want to be involved while some do not care. Because of the heterogeneity within communities, engagers must take dynamic strategies to target diverse stakeholder groups. However, even with various methods, one participant said that you could not please everyone. Finally, there is also the acknowledgment that there are concerns over if the protected area affects more people than others.

***Research question 3: What are key barriers to community engagement in Caribbean MPAs?***

Though community engagement is prevalent throughout region and there are strong motivations to conduct engagement activities, many participants believe that there is needed improved in the quantity and quality of engagement. In this section I outline some of the barriers that participants cited. The most dominant barriers, unsurprisingly, include funding, capacity, and distrust. On top of monitoring and enforcement duties, MPA managers and staff are often responsible for seeking funding to support their initiatives. Additionally, if an MPA office only has regular, secure financing for a few staff members, the manager needs to prioritize their duties. Often enforcement, data collection, and administrative responsibilities are prioritized. When there are MPA managers, they have endless responsibilities; "they're not just community liaison officers. They're also accountants, and they're policemen, and they're teachers. And they're scientists. Often, sometimes the priority can drop to the bottom. And some sites they're

doing better than others in terms of outreach.” When that same participant reflected on how communities adjacent to MPAs differ, they noted:

“I think it depends on the particular capacity of the team. If they’re fortunate enough to have a community liaison officer or manager, then they’re doing great... in other places that haven’t got the luxury of perhaps having that role where they don’t have enough financing for that sort of staff position, then no it’s something that falls into the lap of the manager or perhaps the field officers who just have to deal with engaging with their stakeholders as they’re going about their business of enforcement or fee collection.”

Funding, the other most frequently cited barrier to community engagement, was acknowledged as a significant barrier to MPA management generally. The funding stream varies from MPA to MPA, yet its sustainability is a concern for most MPAs. One participant, below, summarized their knowledge of the financial side of Caribbean MPAs with which they engaged. Additionally, they acknowledged the vulnerability of their revenue streams, as forecasted from the impacts of the COVID-19 pandemic.

“A sample of 12 MPAs were able to share their financial information... we know that just over half of that subset of MPAs comes from tourism-related sources, be it fee collection, be it taxes associated... It’s a very big topic financing. In the current climate, I am very concerned about impacts of coronavirus on tourism and on, therefore, on MPA financing and, therefore, on staffing levels and on enforcement presence. and on the continuity of programs related to outreach and education... Half is tourism-related, about a third comes from government allocations, we have about 15 percent that is coming in through sort of trust funds,

about eight to ten percent from donors and grants and projects, and a very small amount coming from MPA related enterprises or concessions... In the past, we've always sort of talked about user fees being a sustainable financing tool that generates funding that is unrestricted that the MPAs can apply to whatever they want to apply... What we know is that our MPAs tend to have, on average, five or six different financing streams, which is good that they're diversified to some extent... Some sites are particularly vulnerable now."

Though funding may be a barrier, there is also the acknowledgment that some methods of community engagement, particularly communications, can be done at lower costs.

Infrequent engagement has been a barrier at some locations. Two participants discussed that in their contexts, engagement only occurs when things are not going well or when there is a concrete problem for which managers want community input. Engagement, only when there is a problem, is not considered ideal, but it is a product that their capacity is limited. To prevent this, one participant who works with managers across the region said, "I typically encourage managers just to share information. We try and help them with outreach products. Some easy-to-read summaries of findings from science programs, interesting updates on what's happening with bleaching and disease and sargassum and emerging issues. Don't always go to them [community members] when there are problems to talk about." For most of the MPAs, there is no set process for how communities should be engaged, and the engagement that occurs is not as frequent as it should be. Conversely, in communities where there has been a lot of engagement, the key informants have noticed fatigue in communities such that they are no longer interested in engaging.

Given the legacies of top-down management in many of the countries, it is unsurprising that trust is a common barrier. The effects of distrust come about in different ways. In many cases distrust can emerge from previous experiences. “Once a lot of community stakeholders saw it. Saw what was proposed and what was put before the government. Some persons didn’t buy, but there was some areas where there was a lot of pushback because communities were, felt disrespected that they weren’t consulted, but also were concerned that you made a decision kind of in their backyard without their involvement.” In this case the lack of consultation led to distrust. Alternatively, in some cases, the distrust is not from lack of consultation but lack of meaningful consultation where an individual felt their feedback was used against them.

Single participants mentioned the following as barriers: a general lack of participation, fishers are hard to engage because they may be out at sea for weeks at a time, participation is not sustained and occurs in one-off instances, in explaining protected areas community members have increased expectations for change, conservation is less of a priority when community members are trying to survive, past engagement has occurred in a start-and-stop process, not everyone can speak freely at town hall meetings, people feel like they are being deprived of fishing and access to resources, and there is not enough flexibility in the time and location of most engagement activities. Though these barriers were not repeatedly cited, they are important and likely not isolated to the sites described by participants.



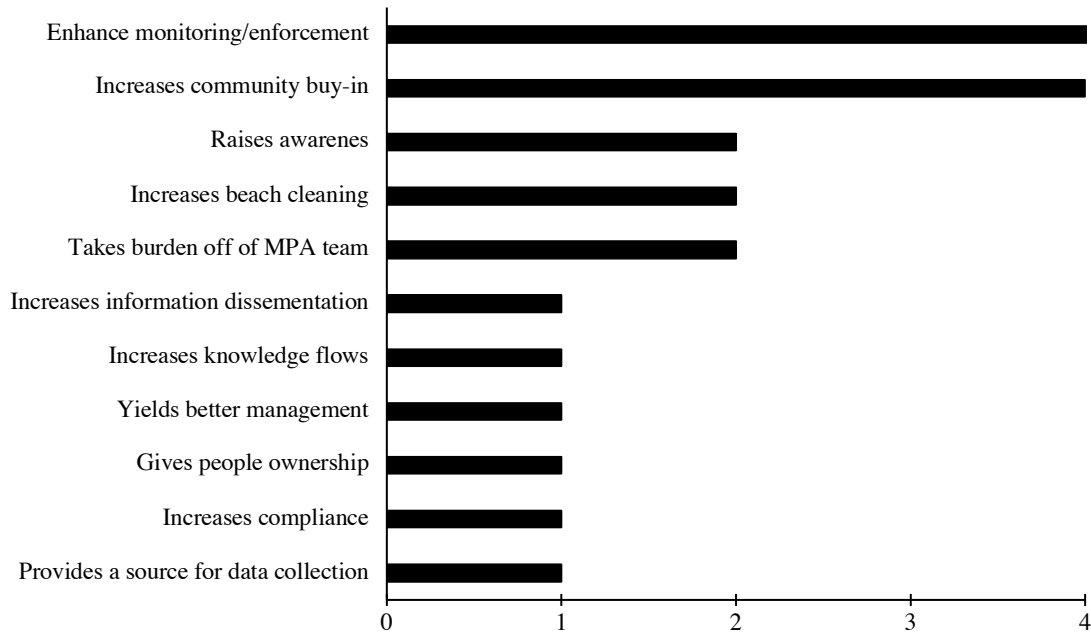
***Research question 4: How do key informants perceive the importance of community engagement in MPA management?***

The previous research questions have detailed the implementation of community engagement and provided details on examples of what has worked as well as barriers. Those are valuable for pieces of information to understand how community engagement can be better facilitated in certain contexts. However, it is also important to understand why, and to what degree, community engagement is a component of MPA management to be able to determine the goals and objectives of engagement activities.

Throughout the interviews, eleven participants discussed community engagement benefits in managing MPAs (Figure 3.3). Four participants generally discussed how engagement increases buy-in, and two mentioned how it raises awareness, while other participants spoke more specifically about how engagement impacts management. Through engagement, five participants discussed how it positively influences monitoring and enforcement; two each added that it takes the burden off of the MPA staff and increases stewardship as seen through beach cleaning. Additionally, interviews suggested engagement increases data collection capacity, improves compliance, gives people ownership, yields better management, increases flows of knowledge, and increases the dissemination of information. One participant mentioned an adverse effect of engagement; they said that in their context, it is easier to create a protected area without community input and to get the community on board and engage them after the fact.

**Figure 3.3**

*Benefits of engagement cited by participants*



*Note.* The number of participants that cited the listed benefits of community engagement.

In addition to the benefits provided by engaging community members, it is clear from the interviews that community engagement in the establishment and management of MPAs is a priority to stakeholders and the key informants. Pragmatically, community engagement is part of the core of MPA success because it cuts across many other management aspects. As one participant phrased it:

“Communications, outreach and education, and stakeholder engagement are kind of crosscutting – they are crosscutting issues. When I talk about financing and when I talk about enforcement and coral monitoring, they’re sort of fundamental elements of management, and communications and stakeholder engagement really

cut across all of those other aspects of management. So, they're critical, and they're crosscutting issues – like climate change.”

For example, one participant noted that though incorporating human factors may significantly increase the management workload, there is no other way to manage the areas and resources.

“My vision of it was kind of like if you want to protect the natural resources and you know the coastal marine resources and to help local communities earn a better livelihood, be safer, climb up the economic ladder, these areas need to be protected and managed... The only way you can protect is if you take the human factors into consideration, the economics and all of that. You protect with the hope of being able to get everyone on board in terms of seeing that they can make you know – that their livelihoods could be increased, their economic situation made better, and things related to that, so you have to take in the human factor absolutely and completely. Because there are no areas where you could put in a marine protected area where there's no habitation. You will find people in every location where a marine protected area – except for one.”

Another interviewee added that community is the most important part of the entire thing, though another noted that they have been missing the [community engagement] ball completely. Further, engagement must exist from the start: “prior to really formally launching the MPA, they have been doing a lot of work on management planning, a lot of work on community consultation in order to try and achieve community buy-in to the site before formally launching.”

In the future, participants stated that there is a need for modern, innovative methods of communication. They should prioritize having communication and stakeholder engagement plans for all the work they do. “All players” must be involved in the process, and they need to think that the reserve will benefit them.

## **Discussion**

This study builds upon calls for community engagement in the establishment and management of MPAs. In this discussion, I synthesize the principles of community engagement in the context of Caribbean MPAs.

### ***Benefits of community engagement***

Throughout the interviews, it was clear that there are numerous benefits of community engagement. In this study, I identified key benefits including enhancing flows of knowledge, improving decision-making and support processes, generating empowerment, and building trust – all of which have been identified as being critical in other studies (Reed, 2008; Sterling et al., 2017; Stringer et al., 2006). In addition to these established benefits, there have been increasing studies to understand the dimensions of engagement that lead to success (de Vente et al., 2016; Reed et al., 2018; Sterling et al., 2017). These studies explore leadership, social and political contexts, power dynamics, temporal and spatial scale. The aforementioned factors were present throughout the interviews, particularly with respect to trust between the various entities. It emerged from the interviews that building trust increases the capacity for people on all sides of management to reach out when they have concerns or questions. Seemingly, the informal methods of engagement are a way to break down barriers, change attitudes, and build trust. In their systematic review, Waylen et al. (2010) found evidence that the inclusion of

outreach and education in an intervention was tied to successfully changing attitudes. They explored more formal means of outreach, while the interviews in this study highlight the value in informal methods. Finally, though there are studies connecting engagement and outcomes, there need to be more studies exploring the pathways of change from engagement activities to specific outcomes and goals. This requires incorporating psychology (for example, see DeCaro & Stokes, 2013), which will likely be highly context-dependent.

### ***Centering community engagement***

In line with the increasing trend of emphasizing community engagement (Arnstein, 1969; Giakoumi et al., 2018; Head, 2007; Kelly et al., 2020), participants consistently expressed that community engagement is essential to the operations of MPAs. This is because we cannot disentangle people and communities from the marine environment; “I could tell you everybody depends on the marine resources. Like 70 percent of people depend on either fishing or water taxi operation, or even one of the MPAs they actually have people who will come and sell in the MPAs. So, arts, crafts, food for the yachties, garbage disposal, and things like that, people using the beaches, etc.” Or, as a participant with a background in business and marketing, put it:

“You realize the importance of the human element – it is all social science... People around the MPAs and stuff are considered consumers, and they’re consumers of the MPA as well... All of these tools that we’re implementing as management products – they’re also to please a customer... Like the MPA is not just there to protect species and the environment, it’s also there to protect people. And it’s for people’s livelihoods and stuff like that.”

Consequently, the main groups mentioned as being engaged were the commonly cited stakeholders for MPAs, such as fishers and businesses; but they also frequently cited youth and community. Youth have historically been involved in MPAs, especially in relation to outreach, but recently, there have been studies exploring best practices to engage them (Chen et al., 2019; Lewis et al., 2017) and outcomes of youth engagement (Lucrezi et al., 2019). With youth being the future users, MPA staff, adult community members, and researchers it is important to engage them in addition to their adult counterparts. Additionally, it is essential to include these groups if the underlying values of the MPAs center the community. Participants emphasized how community engagement should be at the core of management because of its connections to numerous aspects of management operations.

Because there is this understanding of its importance, management and engagement strategies must also center the community. To do this, there should be staff and individuals who have experience and expertise in engagement. Marine areas are being protected, and historically, they have been considered their entity, but they are part of linked socio-environmental systems in which the communities and people cannot be disentangled (Bodin, 2017; López-Angarita et al., 2014). Thus, it is not solely ecologists and biologists who must be considered; there need to be local individuals trained in engagement, outreach, and more human-centered skills. However, this requires funding, which has long been identified as one of the hurdles of successful MPA management (Gill et al., 2017), and this is also true for community engagement specifically (Irvin & Stansbury, 2004).

### *Strategies for conducting community engagement*

In this section I outline current strategies that participants cited, or emerged from conversations, as important to meet their engagement objectives.

**Engaging youth.** Children have more time to engage in activities and relay information and sentiments to their peers and families. Additionally, participants discussed the hurdles of recruiting local people to stay and want to work in MPAs and marine conservation more generally, so engaging younger generations can also act as a long-term recruitment strategy.

**Being flexible.** Those conducting the engagement activities consider the lifestyles of community members. The participants in this study cited examples of adjusting the timing, location, and strategies of engagement activities. For instance, they conducted engagement activities at specific times to not conflict with individuals' work schedules. Concerning location, engagers find success in figuring out convenient locations for community members, whether on the water or at a bar. Strategies for engaging community members in MPA planning and processes should be diverse. Some strategies that are currently under-recognized in the literature, compared to what emerged in interviews, include the use of media (e.g., television, social media). Given that social media campaigns can often be less time-intensive and costly than other methods of engagement, it may be a good strategy in conjunction with other methods of engagement to increase the reach of engagement.

**Decreasing fatigue.** Participants perceived that there is engagement fatigue occurring in some communities. This aligns with literature that centers motivation as an essential factor for engagement (Appleton et al., 2008; Clark, 2008). To avoid potential

engagement fatigue, those being engaged need to feel like there is value in engagement outcomes and that they are empowered (Clark, 2008). Flexibility and informal engagement may decrease fatigue by decreasing the burden of participation on the participants.

**Planning.** There are apparent barriers to conducting community engagement: funding and staff capacity, among others. However, there are other procedural ways to emphasize and center community engagement. For those MPAs that have management plans, participants emphasized including specific recommendations and guidelines for community engagement as this can help engagement persist in the regular operations of the MPAs. Management plans may not always be adhered to, but it is a starting point. Community engagement should not be listed as a binary endeavor or as though it was an afterthought. Instead, there should be guidance and requirements on the methods of engagement, who is being engaged, the goals of engagement, and when engagement is occurring. In including these types of information, the hope is that engaging will be easier for the staff because they will have some guidance and promote thinking about how engagement can be more just for those being engaged. Power dynamics must be considered through all stages to avoid elite capture and inequitable social outcomes (Baker & Chapin, 2018; Bennett et al., 2019; Lund & Treue, 2008; Persha & Andersson, 2014; Shackleton, Adriaens, et al., 2019).

The type of engagement is dependent on the objective of the action (Stringer et al., 2006). For example, engagement activities that yield unidirectional information flows, such as awareness campaigns mentioned by the participants, are highly beneficial. The success of these activities depends on the goal; if the purpose or value of a specific



project within the MPA is to educate, they have achieved success. However, if the project aims to get input from communities, that strategy alone is insufficient. There are non-marine-specific toolkits that assist managers and planners in engagement activities, but they can be pretty lengthy to develop and focus on more formal methods of engagement (Aslin & Brown, 2004; National Audubon Society, 2011).

**Sharing information.** Finally, information sharing and syntheses of existing strategies may reduce the effort required when planning engagement activities. For many aspects of MPA management, knowledge has been transmitted the Caribbean Marine Protected Area Management Network and Forum (CaMPAM) network, which was founded in 1997. This network, which spans across MPAs and countries, allows for the exchange of ideas, practices, and collaboration. Specifically, CaMPAM strongly emphasizes communication and outreach, training, and sharing information through its database. Whether evidence is in the form of peer-reviewed literature, lived experiences, or local knowledge (Adams & Sandbrook, 2013; Segan et al., 2011), it is essential to determine best practices better and understanding these complex socio-environmental systems.

## **Conclusion**

Community engagement is important for conservation interventions, but it is difficult to optimally facilitate engagement when there are funding and staff (expertise and capacity) restrictions. These findings are likely relevant not solely to MPAs but conservation and engagement practices more generally. From these interviews, it is important to facilitate a diversity of engagement methods to meet various objectives, which should be clear from the onset of the engagement activity. Some under-recognized

methods of engagement, such as communication, may have a role in enhancing MPA operations but they should not be the only method to engage community members. Finally, informal methods of engagement offer an opportunity to build trust without the resources that are typically demanded by more structured methods of engagement.

## Chapter 4

### Local perceptions of environmental changes in a coastal fishing community

#### Abstract

Efforts to achieve conservation outcomes are more likely to be effective when salience, credibility, and legitimacy are considered in community-based and participatory approaches. For marine systems, there is a plurality of knowledge among diverse community members. This knowledge is relevant to planning, monitoring, and enforcement in the management of marine systems. Community perceptions provide insights into environmental changes and opportunities for future changes and support of conservation interventions. In this study, I explore perceptions of environmental change in the small coastal fishing community of Charlotteville, Trinidad and Tobago, using semi-structured, street-intercept interviews. In describing changes over time, most responses were related to development in the village or changes in the community's social dynamics. Cited environmental changes were largely negative and were mainly associated with biodiversity, weather patterns, pollution, and water flow. Ties between human health and environmental changes emerged as a common theme. Blame was often placed on institutions and groups of people for the negative changes in the community, illustrating the complex social dynamics that contribute to perceptions of the environmental changes. The heterogeneity and diversity of responses in this study underscore the importance of co-production and the need to consider whom we engage when we engage community members. In understanding why and how perceptions differ, interventions and management can better assess the differing needs and wants of the community to co-facilitate more effective social and ecological outcomes.

## **Introduction**

Many coastal regions have experienced rapid environmental and social changes since the middle of the 20<sup>th</sup> century (Bindoff et al., 2019). Stressors, which are predicted to increase in the future (Halpern et al., 2019; Jouffray et al., 2020), will disproportionately impact coastal communities and the ecosystems on which they depend (Béné et al., 2016; L. M. Burke et al., 2017; Donner & Potere, 2007; FAO, 2018; Wolff et al., 2015). While there has been a significant global effort to address these challenges, solving environmental problems in fundamentally dynamic socio-ecological systems requires the inclusion of social values and perceptions (Bennett, 2016; Ives & Kendal, 2014). Conservation initiatives have traditionally used evidence biased towards quantitative data. More recently, the evaluations of conservation initiatives have shifted from ecological indicators to more holistic ones, including governance and socio-economic factors (Agrawal & Gibson, 1999; Berkes, 2004; R. Pollnac et al., 2010). This shift towards a more holistic approach is also due, in part, to the realization that many ecologically well-designed conservation initiatives have not been effective (Ban et al., 2013).

Including cultural knowledge and local values into management can ultimately better the conservation field's efficacy (Bennett, 2016; Nazarea, 2006; Posey, 1992). The transition to emphasizing more equity in sources of knowledge has created subfields of conservation such as community- and evidence-based conservation. Conservation outcomes benefit from the co-production of knowledge between various individuals and institutions (Armitage et al., 2011). There are numerous ways researchers have tried to distinguish different sources of knowledge and explored what counts as evidence

knowledge and how to use these sources jointly (Adams & Sandbrook, 2013; Alexander et al., 2019). We should be cautious when interpreting all types of knowledge, which can be classified not by their source but by their purpose and how it is generated (Agrawal, 1995). Incorporating cultural knowledge and local values into management can ultimately improve the effectiveness of conservation interventions (Bennett, 2016; Nazarea, 2006; Posey, 1992). In Uruguay, local knowledge was used to identify the uses of ecosystems and resources between different communities to develop an appropriate management plan (Mellado et al., 2014). Local knowledge has also been supported because it is cheaper to collect local knowledge than other methods (Anadón et al., 2009). Ultimately, diverse knowledge sources are valuable and essential when managing and exploring complex social-ecological systems (Folke, 2004).

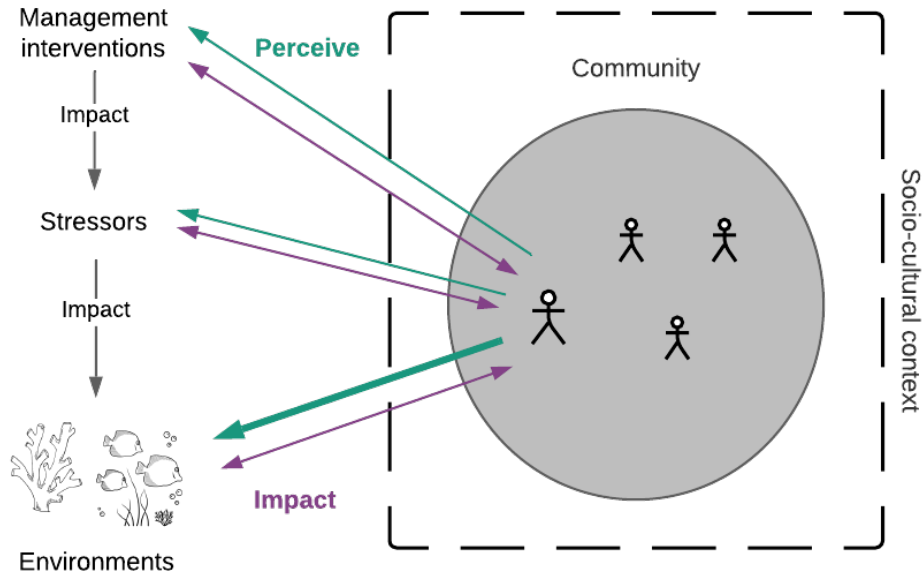
Community perceptions are sources of knowledge that are not commonly considered in conservation and resource management (Bennett, 2016). In this paper, I use Bennett's definition of perceptions based on Munhall (2008) and the Oxford Dictionary: "perceptions refers to the way an individual observes, understands, interprets, and evaluates a referent object, action, experience, individual, policy, or outcome" and can provide insights into the "social impacts of conservation, ecological outcomes of conservation, legitimacy of conservation governance, and acceptability of conservation management" (Bennett, 2016). Perceptions are often viewed as subjective, but for many individuals, these interpretations become their objective truth and influence reasoning and behavior (Munhall, 2008). "Perception is like a set of lenses through which an individual views reality. These lenses evolve from perspectives of location, subjectivity, particularity, history, embodiment, contradiction, and the web of teachings imparted to

the individual” (Munhall, 2008). Everyone (e.g., researchers, community members, politicians) sees the world through some set of “lenses” such that understanding all the different vantages can help clarify how interventions can function in a specific setting.

Despite broad recognition that quantitative and evidence-based approaches to conservation fail to reflect the plurality of perceptions relevant to defining both problems and solutions, there have been relatively few studies of environmental perceptions. They are a significant part of the socio-environmental systems in which conservation interventions operate (Figure 4.1). Individuals in a community have perceptions of management interventions, threats, and their environment. At the same time, community members are interacting with the components above within their socio-cultural context. Consequently, perceptions alter (and are changed by) management interventions and human-environmental relationships as components of this system.

**Figure 4.1**

*Conceptual diagram of environmental perceptions*



*Note.* This figure shows the contributions of environmental perceptions to the socio-environmental dynamics surrounding the management of natural resources in a community (green arrows). Individuals within the community interact with management interventions, stressors, and the environments themselves through their perceptions. Consequently, the individuals in the community impact (purple arrows), and are impacted by, the interventions, stressors, and environments. The bolded green arrow is the specific interaction explored in this study.

Consideration of perceptions is valuable at all stages in conservation management (Bennett, 2016; Beyerl et al., 2016; Gelcich & O’Keeffe, 2016). Understanding residents’ perceptions is a way to develop interventions that are efficient and more likely to persist. Insights from perceptions improve conservation policy and practice by providing

knowledge on “social impacts of conservation, ecological outcomes of conservation, legitimacy of conservation governance, and acceptability of conservation management” (Bennett, 2016). Perceptions are one factor that determines whether or not an individual approves of a conservation intervention (Bennett, 2016). By using perceptions, interventions are more likely to fit the values and cultures in the communities in which they are implemented (Gelcich & O’Keeffe, 2016). Perceptions reflect a source of information that can be utilized in various types of management (e.g., bottom-up, adaptive, collaborative) in different socio-cultural contexts globally (Bennett & Dearden, 2014; Elwell et al., 2018). Ultimately, incorporating perceptions may contribute to longer-lasting projects and positive social and ecological outcomes. With the current trend of declining local and indigenous knowledge (Aswani et al., 2018), we must continue studying and implementing these knowledge sources.

In this study, I explore community perceptions of environmental change to understand variation within a community that is inherently a marine socio-ecological system. Specifically, I ask two key questions: 1) How do residents in a small, coastal fishing community perceive and characterize environmental changes over time? 2) How are their responses different based on social groupings?

## **Methods**

In this study, I conducted semi-structured interviews in Charlotteville, Trinidad and Tobago to answer the outlined research questions. I chose to conduct individual interviews over other methods, such as focus groups or surveys. Based on previous experiences in similar environments, I believed that participants would be more open to speaking than writing responses. Additionally, there was potential for them to feel more



comfortable expressing their minds if no other participants were present. Semi-structured interviews also allowed me to ask probing questions that would elucidate specific responses. In this section, I elaborate on the study site location and methods.

### ***Location***

Trinidad and Tobago comprises a two-island state located in the Lesser Antilles of the Caribbean. The state gained independence in 1962 and is currently a vestige of colonialism, illustrated in the diversity of people and cultures (Deosaran, 1987). The islands comprise both the Caribbean and the North Brazil Shelf Large Marine Ecoregions. This juxtaposition of ecoregions contributes to the islands' unique patchwork of ecosystems and species. The islands' biodiversity is invaluable due to the numerous critically endangered, endemic, migratory, and iconic species.

Tobago is the smaller of the two islands. In North East Tobago, over half of the residents are employed by the government, namely through administration, public service, and unemployment relief. Private employment is equally dominated by fishing and community-based tourism industries. Cultural activities on the island stem from the residents' ancestors and the influence of imperialism on the island. There are strong socio-economic and spiritual relationships between people in the communities and the natural resources. These connections to nature are rooted in the history of conservation on the island; for instance, the island is home to the oldest legally protected tropical forest: the Tobago Main Ridge Forest Reserve. The preservation of this forest has sustained both terrestrial and marine ecological processes. As a result, there are numerous ecosystem services afforded to the communities throughout the island.

Charlotteville is a small fishing village located in North East Tobago. It is home to about 1,000 residents, a couple of local nonprofits, and government support services (e.g., police station, health center, schools). It is located between the forest reserve and a large bay that the village surrounds. The waters surrounding the island's northeast corner are incredibly productive due to upwelling where the Caribbean Sea to the west meets the rough Atlantic Ocean to the east. Charlotteville is the eco and science tourism center within the recently (28 October 2020) declared North East Tobago UNESCO Man and Biosphere Reserve. I selected Charlotteville as the case study location because it is a geographically distinct fishing community with a strong history of environmental education, research, and monitoring programs.

### ***Interviews***

To understand perceptions of environmental changes, I conducted open-ended and semi-structured interviews with residents in July 2018. This study was approved by the Arizona State University Internal Review Board (Appendix C.1-2). Open-ended interviews were employed to obtain descriptive narratives that are harder to capture in other data collection methods. The interview guide (Appendix C.3) was developed iteratively and collaboratively with individuals at the Environmental Research Institute Charlotteville (ERIC). The ERIC is a not-for-profit organization based in Charlotteville, Tobago; its mission is “To value and integrate diverse knowledge and experience to manifest a mutually beneficial relationship between the coastal communities and ecosystems of North East Tobago.”

I developed the interview guide to elicit information on perceptions of environmental change over time using open-ended questions and free-listing. The

questions provide a framework to delve into questions related to their environmental concerns and how each person's (both at the individual and community level) behavior is related to their perceptions of the environment. I interviewed 43 community members in July 2018, consisting of 20 women and 23 men over 18. Participants included fishers, storekeepers, a librarian, and social service workers.

As communities are not a single homogenous entity (Bodin & Crona, 2009; Brown, 2003), I included all residents in the sample pool. Participants were selected using a simple random sampling technique, where I asked every Nth person viewed from the street to participate. Community members were those who self-identified as being a member of the village of Charlottesville. I did not record interviews to enable participants to feel more comfortable while expressing their perceptions. I took notes and immediately typed them after each interview to ensure minimal information was lost.

### ***Data Analysis***

I coded the notes using MAXQDA software. The qualitative data were analyzed both qualitatively and quantitatively. I used a thematic analysis approach to develop codes and gain overarching information from the data collected in the interview field notes. I performed consensus analyses to see whether there was a central, "underlying component of shared knowledge"; I also explored differences between gender groups (Bernard, 2017). Finally, I coded the interviews using emergent themes and inductive techniques.

## Results

### *Free-list – How has Charlotteville changed over your lifetime?*

When I asked participants about changes in the village over their lifetime, I received various responses ranging from none to an array of social and environmental changes. However, most changes identified were not related to the environment. Of the 43 respondents, seven had no response, and of those with responses, they listed between one and 15 changes, with an average of four. The responses fell within the following categories: *tourism, environment, development/growth, social dynamics/culture, infrastructure, nutrition, migration, climate, and modernization*. Table 4.1 shows a brief description of the codes and examples for what I included within each category.

**Table 4.1**

#### *Categories of changes over time*

Category	Description	Main changes perceived
<i>Climate</i>	Changes related to climate or changing weather patterns	Less rain, more dust, more smog
<i>Development/growth</i>	Changes related to the creation or loss of buildings, including the creation of centers that offer services (e.g., library)	Buildings, population changes, more houses, stores, creation of the health center, fish market, more cars
<i>Environment</i>	Changes related to biodiversity and ecosystem health; this category does not include environments managed by people such as agriculture (see <i>Nutrition</i> )	Cleaner beaches, reef expansion, less vegetation, less colorful plants
<i>Infrastructure</i>	Changes related to 1) the condition of infrastructure and 2) services managed or created by the government that require the infrastructure	Water supply, better roads, walls along roads, jetty, loss of boats from Trinidad supplying goods

Category	Description	Main changes perceived
<i>Migration</i>	Changes related to the movement of people into and out of the village and relations; this does not include responses such as “more mixing of people” as that occurs in the village and is more related to <i>Social dynamics/culture</i>	More people leaving and coming back, more outsiders coming in
<i>Modernization</i>	Changes related to technology and the increase in access to goods from other regions which has come about through recent globalization	Internet, loss of cocoa industry, fewer wooden houses, boats are no longer wooden
<i>Nutrition</i>	Changes related to the types of food consumed	More prepared food, people are more health-conscious, less agriculture
<i>Social dynamics/culture</i>	Changes related to interactions between residents and changes in their behavior and sentiments; additionally, characteristic changes in the village as a whole	Less lively, less love, more violence, people do not help each other out, selfish young people
<i>Tourism</i>	Changes related to tourism; there is not a clear link between <i>Tourism</i> and <i>Development/growth</i> , so I decided to keep <i>Tourism</i> separate; similarly, <i>Migration</i> is different in that <i>Tourism</i> occurs at a much shorter timescale, on average	More tourists, fewer tourist attractions

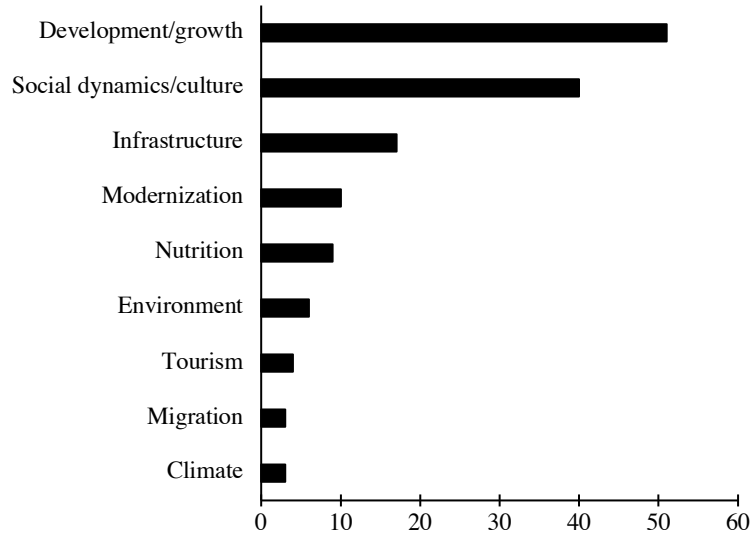
*Note.* This table shows the emergent categories that arose in conversations related to changes in the village over the respondents’ lifetime and examples.

The most common changes were *Development/growth* (51 responses of changes, including duplicates) and *Social dynamics/culture* (40) (Figure 4.2). *Social*

*dynamics/culture* includes changes in the behavior of younger community members. Participants attributed much of these changes to the influence of technology (e.g., television, the internet) and adults commenting on how children's behavior has changed since their youth. *Development/growth* was often ascribed to the village's most prominent building: a controversial "mini-mall." At the time of the interviews, the building mentioned above was being constructed to house shops, so it was a focus point for many conversations throughout the village. Most of the references to the development of this "white building" were negative. The less cited changes were: *Infrastructure* (17), *Modernization* (10), *Nutrition* (9), *Environment* (6), *Tourism* (4), *Climate* (3), and *Migration* (3). A common change classified as *Infrastructure* was the improvements in the roads. With better infrastructure, access to other communities has become easier, making it less essential that Charlotteville has stores and people who supply goods that people can get elsewhere (e.g., Scarborough – the island's capital). Within the *Tourism* category, there was no unified thought of how tourism has changed; some participants cited more tourism while others stated less. Additionally, participants noted changes in what tourists seek: "less people come to eat the fish, more people come to see it." Changes coded as *Nutrition* were cited by women 78 percent of the time. Eight participants did not respond or said there were no changes, and one participant mentioned there were changes but did not specify in what ways.

**Figure 4.2**

*Changes over time to Charlottetville*



*Note.* The total number of times, across all interviews, that participants cited changes grouped into the emergent categories in response to questions on how Charlottetville has changed over their lifetime.

***Free-list – How has the environment in Charlottetville changed over your lifetime?***

When I asked participants about environmental changes, there was a greater consensus in the types of changes observed than when I asked about general changes. Nine of the 43 participants responded that they had observed no environmental changes over their lifetime, and four additional individuals did not respond to the question. Of the 30 individuals who did respond to the question, 14 of the people replied with changes that were not specific to the natural environment as I deliberately left the question broad. However, eight of the 14 participants also cited changes in the environment in their responses. For the 24 individuals whose responses included natural environment-specific changes, the average number of cited changes was 2.3, ranging from one to six.

I grouped the responses into four categories (Table 4.2): *Biodiversity*, *Weather patterns*, *Pollution*, and *Waterflow*.

**Table 4.2**

*Categories of environmental changes over time*

Category	Description	Main changes perceived
<i>Biodiversity</i>	Changes related to the quantity and diversity of wildlife and plants. These changes can stem from anthropogenic and non-anthropogenic drivers.	Fewer fish, less agriculture, less livestock, fewer sea turtles
<i>Weather patterns</i>	Changes related to weather patterns, including noticeable events and long-term changes (e.g., climate change)	Less rain, global warming, more sun, undifferentiated rainy and dry seasons
<i>Pollution</i>	Changes related to the input of contaminants into the natural environment that could lead to adverse outcomes	Sewage in the sea, littering, detergent runoff, car emissions
<i>Waterflow</i>	Changes related to water availability and flow of water sources, including changes in tides and sea level	Fewer springs, the sea coming in higher, less pipe water

*Note.* This table shows the emergent categories that arose in conversations related to environmental changes in the village over the respondents' lifetime and examples.

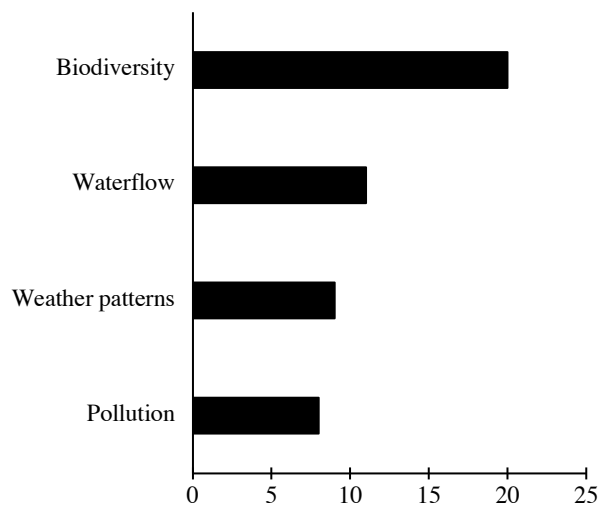
Within these four categories, the most cited environmental changes were related to shifts in plant and animal abundance and diversity, which I grouped into *biodiversity* (42 percent of mentions in this category) (Figure 4.3). Nine of the 20 mentions were related to fishing, including a decline in fish stocks (3), general changes in fish populations (1), increased fishing pressure (4), and loss of fish species (1). Drivers of the decline in fish stocks included increases in seaweed driven by tides and offshore drilling operations. Participants noted that more fishing vessels and the introduction of motorized



vessels increased fishing pressure and overharvesting. Participants also cited changes in the abundance of iguanas and sea turtles. For plants, individuals discussed problematic fungi, improved landscaping in the village, fewer trees resulting from development, and agricultural decline. The *Weather patterns* category accounts for 19 percent of cited changes. Participants mentioned increased humidity, more sun, less rain, shifting weather patterns, and undifferentiated rainy and dry seasons. The *Pollution* category, which I explore in more detail in the following section, accounts for 17 percent of mentions. This category contains the most diversity in responses ranging from littering to the impacts of fires on the ocean to mismanaged sewage. The final category, *Waterflow*, accounts for 23 percent of the cited changes in Charlotteville's environment. The two main groupings within *Waterflow* deal with 1) tides and changes in sea level and 2) changes in water availability. Participants also discussed the cementation of riverbeds and the impacts of high flow events.

**Figure 4.3**

*Environmental changes over time*



*Note.* The total number of times, across all interviews, that participants cited changes grouped into the emergent categories in response to questions on how the environment in Charlotteville has changed over their lifetime.

***Sources of pollution***

A significant way people in the community described changes in the environment was in discussing sources of pollution. However, over a third of the respondents cited, at least at first, that there were no pollution problems in Charlotteville. For example, one participant noted, “we don’t send waste to the sea.” Of the participants who initially cited *No pollution*, four women and two men then discussed sources and problems related to pollution in the village. Noticeably, there were differences between men and women in the types of pollution they cited as occurring (Table 4.3). *Wastewater, Noise, and Village sewage* were sources exclusively cited by women; meanwhile, men were the only participants to cite *Oil* and *General pollution*. Overall, there were more citations of pollution by women (n=39) than men (n=28).

**Table 4.3**

*Sources of pollution*

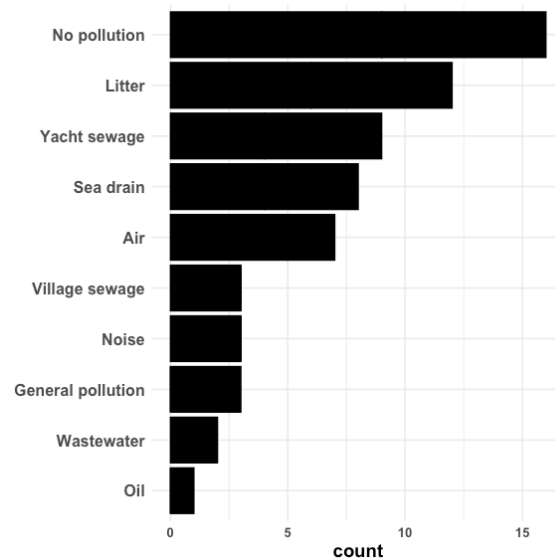
Source	Women	Men
No pollution	9	7
Litter	6	6
Yacht sewage	4	5
Sea drain	4	4
Air	5	2
Village sewage	3	0
Noise	3	0
General pollution	0	3
Wastewater	2	0
Oil	0	1

*Note.* This table shows the counts of sources of pollution cited by men and women.

*Litter, Yacht sewage, Sea drain, and Air* were the most cited sources of pollution (Figure 4.4). *Litter* identified by respondents included improperly disposed items such as plastic bottles, small pieces of trash, and illegally dumped appliances. *Yacht sewage* refers to sewage dumped by tourists on holiday on yachts in the cove that the village surrounds. *Sea drain* includes mentions of rivers and box drains the carry pollution from the village into the ocean. Pollutants under the *Air* source category include those that stem from car emissions, the burning of leaves and tires, and the Sahara dust. I used *General pollution* for cases where participants said there was pollution, but they did not provide many details on the nature of the pollution.

**Figure 4.4**

*Sources of pollution in Charlotteville*



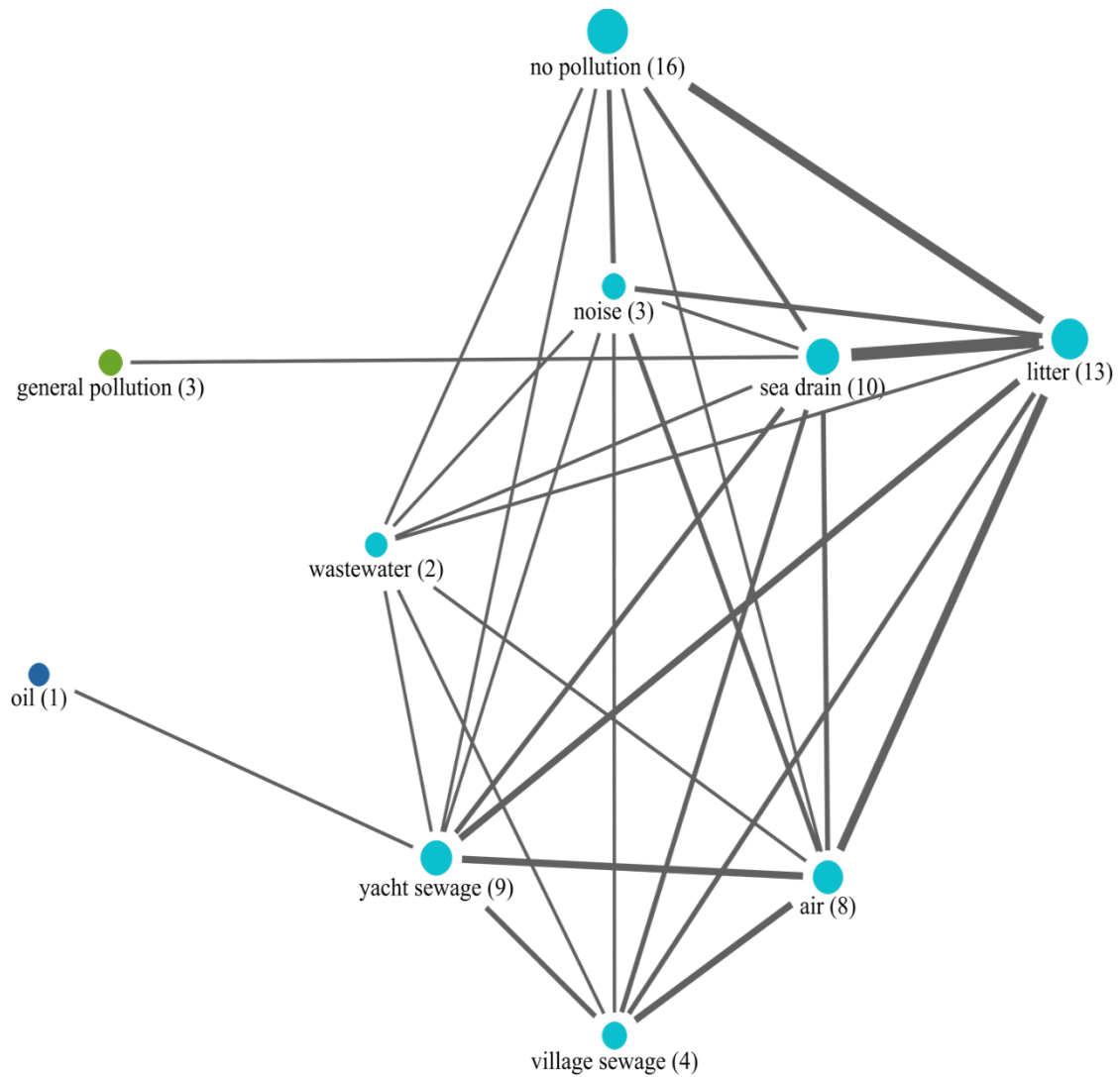
*Note.* This figure shows the counts of the types of pollution identified across all interview participants.

To explore relationships between different sources of pollution cited by individuals who initially stated that there was *No pollution*, I mapped the sources using a

classic multidimensional scaling method (Figure 4.5) (Bernard, 2017). I found that a quarter of the times when individuals cited *No pollution*, they then discussed litter. Apart from *General pollution* and *Oil*, the sources of pollution cited frequently occur with many other sources.

**Figure 4.5**

*Multidimensional scaling map of types of pollution*



*Note.* This figure shows a multidimensional scaling map of the types of pollution identified across all interview participants to explore co-occurrences within participants.

The closer the proximity, the more likely the categories are likely to occur together. The categories are clustered via a hierarchical cluster analysis based on the positions on the map. The thicker the line, the more co-occurrences there are between the two categories. The number in parentheses is the number of times the category occurs across all participants.

### ***Emergent themes***

**Human health.** Ties between human health and environmental changes emerged as a common theme. These ties highlight the connectedness between people in the village with their surrounding environment and the impacts that environmental threats and changes may have on human well-being. These connections primarily arose when participants discussed *Air* and *Yacht sewage* pollution. For *Air*, participants (primarily women) stressed the impacts of breathing in pollutants from car emissions, fires, burning of materials, and the Sahara dust. One participant cited that this form of pollution is particularly awful for individuals with sinus problems and asthma. Another acknowledged that the burning of tires, leaves, and trash might not have large-scale impacts on the environment, but it is important to address because it can affect individual health. *Yacht sewage*, the second most cited environmental change category, was described as "filthy." Some participants said that it prevents people from swimming in the bay as it could cause adverse health impacts. The loss of comfort of people swimming in the bay impacts human well-being and the culture of the community.

**Social capital.** Though Charlotteville is a place where "everybody knows everybody," people have noticed shifts in the community's social dynamics. Participants discussed a past "love" that was intertwined into the community's daily lives, which

previously had “unity” that brought people together. This cohesion, as a few participants noted, affects everything else. One participant stated that the village used to be more active and livelier. When asked about general changes, many participants responded with changes in the social dynamics between community members. Broadly, there is a consensus that there are fewer bonds and less trust between people in the village. This decrease in trust is driven, in part, by modernization. People discussed how televisions and smartphones provide people with entertainment in their homes such that they are less inclined to spend as much time outside. Another modernization that has affected interpersonal dynamics and led to environmental consequences is the introduction of motorized boats. Before motorized boats, it was more common for people to engage in communal fishing activities. This practice, known as "lend-hand," signals a shift from collaborative fishing to more individualized, solitary methods. One participant also noted that this shift is due to young people not caring and being selfish. To enact change, they need to “find people who care about people” and that “unless someone gets serious nothing will happen.”

**Blame.** Throughout the interviews, many individuals (13) placed blame on another party for occurrences of changes. People blamed environmental groups for not doing more, the media for inaccurately portraying the villages, technology, foreign companies for extracting resources without compensating the people, but most frequently the government. Many participants cited the government's "corruption." Participants said that, due to corruption, roads were not maintained, communities could not rebuild after natural disasters, and there was an inequitable distribution of resources. One participant said that there is not enough support from the government and, as a result, “poor people

are paying the price of the government.” Further, if the government does not make changes, then it will become a “war zone.” As a result, “the pocket of everyone just bleeding out.” At the local level, a few participants described discontentment with the Village Council stating that they “keep you down.” Concerning the environment, people thought the onus was on the parties mentioned above to alleviate the negative impacts of general and environmental changes within the community.

**Accessibility.** Though the village is more connected technologically to other places than ever, there has been a shift within village accessibility to goods. This theme came about from a few different types of examples. With increasing access to the internet and television over participants’ lifetimes, there has been increased exposure to other cultures and sources of knowledge. With more access to other cities, Trinidad, and abroad, there is increased access to food (including junk foods, as multiple participants cited). Concurrently, fewer people have gardens and participate in agricultural practices. There used to be more stores in the village where people could buy specific goods (e.g., a hardware store), but with easier access to Scarborough, the capital, there is no longer as great a need for these niche stores. The flow of people, goods, and knowledge transforms interpersonal relationships and how people interact with their natural environment.

## **Discussion**

In this research, I sought to understand the environmental changes of a small coastal fishing community over time. This research builds on increasing interest and calls to study perceptions and knowledge within marine socio-ecological systems (Bennett, 2016). These results show the diversity of perceptions in Charlotteville, Trinidad and Tobago.

Of the general changes to Charlotteville over participants' lifetimes, *Development/growth* and *Social dynamics/culture* were the most common categories in which responses fell. In conversation, the links between these more socio-economic responses intersected with the environment and signaled changes to the environment that likely occurred given these responses. For example, the increased numbers of houses, people, and roads directly link to the environment and ecosystem services. The connections between humans and nature are likely more apparent in a small coastal village than in a place where residents do not directly utilize the environmental resources. The primary environmental changes were *Biodiversity*, *Weather patterns*, *Pollution*, and *Waterflow*. The responses in this portion of the interview illustrate the ways people think about and interact with their surrounding natural environment. Specifically, there were many connections to human health and well-being, as was seen in the number of responses related to contaminants and water reliability. The implications of the strong coupling between the daily lives of people and the environment highlight the importance of understanding the cultural context, social dynamics, and economics in places such as Charlotteville. The results of this research affirm previous studies that acknowledge that perceptions can be used to inform the design of conservation initiatives (Gelcich & O'Keefe, 2016) and influence the management of said interventions (Shackleton, Richardson, et al., 2019).

### ***Heterogeneity***

I noted differences across the community in responses and the attitudes towards the changes over time. Some of these differences occurred, for the most part, along major demographic lines, while other differences cannot be attributed to a single factor. This



heterogeneity is in line with previous research (Ensor et al., 2018; Frawley et al., 2019). The implications of community heterogeneity are important to understand because even when there are shared perceptions and knowledge, individuals may still respond differently to varying forms of engagement (Jefferson et al., 2015).

Notably, women's responses were more tied to their traditional gender roles than the responses of men. Women were more likely to mention pollution than men. They were also more likely to discuss waste from yachts. The sentiment behind these environmental issues was a fear of the health implications, as they expressed concern and disgust over exposure to various pollutants.

Though there were observable differences between men and women in the community, it is also essential to acknowledge differences throughout the community based on non-demographical information. People's values, beliefs, and perceptions are formed from the context in which they are raised. For instance, an individual's religious upbringing impacts their views on environmental perceptions, as I noted in some of the interviews. In Charlotteville, the Christian legacies from colonization, primarily the Seventh Day Adventist and Methodist belief systems, strongly influence the village. These ties to religion were apparent as we discussed future changes and mitigation measures. There were multiple instances where participants mentioned that certain issues were in "God's hands" or that "some smart man changed the atmosphere." These changes were happening beyond the power of their community, government, and local environmental groups.

## ***Scale***

I believe that perceptions may be a great way to consider the scale of interventions implemented to see what can be done at the individual and community levels. There are studies on the mismatches in the scale of policies and action (Agardy, 2005), yet there is little research on linkages between individual community members and actions (see Lee & Krasny, 2021 for an example). In this case study, I observed differences in the scale of threats and the effort needed for solutions. Most of the changes that respondents cited were local concerns, except for a few participants who cited climate change or global warming. As a result, many mitigation measures for the negative changes can also be performed at the local level. In marine conservation, there are multiple levels of human action: individual, community, national, and international. Different contexts require different scales and methods for incorporating these actions. In regions where management and enforcement are lacking, individual changes may be necessary to enact change. For example, different detergents and disposal methods could reduce the flow of pollutants that go into the sea. There are potential benefits of matching engagement strategies with the scale of the impacts. This matching is essential when we think about the feasibility of solving the problems tied to the scale of individual, local, or global.

## ***Methods***

There are a variety of ways perceptions can be gathered as outlined by Bennett (Bennett, 2016) from interviews (Ezebilo & Mattsson, 2010) to focus groups (Tobey & Torell, 2006). However, there need to be more clear recommendations within these forms of engagement on how to collect perceptions data. In an attempt to fill that need, this

research makes a note of a few methodological points of interest. I intentionally kept the interview questions broad – asking first about changes to the village and then asking about environmental changes. This broadness allowed me to understand the importance of environment-related changes in relation to other types of changes that are typically not seen as being in the scope of environmental studies. There was a significant subgroup of people who stated that there were no environmental issues. Often, after not speaking when they said this, people would then go on to list issues. This observation is important to note as perhaps a written survey would not capture the responses beyond their initial response. At the same time, written surveys may make participants feel as if they have greater anonymity and freedom to respond without judgment. I recommend that researchers carefully weigh the pros and cons of various data collection strategies within the local context in which they would be implemented. For example, it is known that some residents of Charlottesville have some reservations about research conducted and some research participation fatigue. Another important note on methods from this research is that the interviewer, the first author, noticed a trend between the location of the interviews and the participants' responses; for example, participants interviewed on the beach were more likely to comment on fish stocks compared to those interviewed further from the water. The impacts of this suggested trend on the results of this study should be minimal given the street intercept recruitment strategy. Going forward, I would like to repeat this research with different interviewers, ones from the village and ones of different genders, to see the differences in the results.

### *Going forward*

As natural scientists and practitioners begin to incorporate more methods and data analyses from social science disciplines, they must understand other disciplines' theoretical underpinnings and assumptions (Moon & Blackman, 2014). Currently, the training to work in conservation and environmental fields is grounded in ecological theory and quantitative data analysis. Expanding this training to include methods more common in the social sciences can illuminate more information. Additionally, there is a general consensus that perceptions are important, yet we must figure out ways to better operationalize their incorporation (Kittinger et al., 2013).

It is important to note that often we talk about community knowledge as a source for data in conservation. In this sense, community versus "scientific" knowledge is often at odds. This disconnect is not a bad thing. For example, yacht sewage was a highly referenced threat, even though local NGOs say it is not a problem. How residents and NGOs perceive the problem influences their respective behavior. There are numerous threats such as yacht sewage that, whether or not they are significant in their environmental impacts, impact the cultures and livelihoods of the residents.

These results highlight how whom we talk to about environmental issues will influence results. Though there are many recurring themes and responses, it is clear from the interviews that different individuals within the community have different priorities, beliefs, values, and knowledge. There is no universal voice of the community. For these reasons, discussions surrounding equity and the needs of communities must acknowledge the heterogeneity within the community. "Those who are seen to possess knowledge, must also possess the right to decide on how to save their knowledge, how to use it, and

who shall use it” (Agrawal, 1995). It is not just the knowledge but how we use this knowledge in practice. Additionally, information on perceptions should be gathered by specially trained local perception experts (Beyerl et al., 2016). Understanding where, with whom, and why perceptions differ has solid implications for marine conservation; I hope interventions will yield better social and ecological outcomes with this knowledge.

### **Conclusion**

There was a diverse array of responses when we talked to residents in a small coastal fishing village about environmental changes over time. Many of the changes related to growth and social trends are driven by globalization. This case study shows that who and how we talk to residents in a community make a difference. Applying studies and research such as this to practice is essential to ensuring the management and implementation of marine interventions that address the needs and values of all people within a community.

## Chapter 5

### Synthesis and conclusion

To sustain the well-being of human communities and ecosystems, conservation management must meaningfully involve community members. Community engagement is relevant across sectors of society and socio-environmental systems. Additionally, community engagement is important to study because there is ample evidence that action without meaningful participation can create fewer effective outcomes or instances where the public does not feel their voices are heard. For my dissertation, I pursued systematic lines of investigation to understand how community engagement and perceptions can be better implemented and utilized.

In chapters two and three, I used systematic approaches to conduct a literature review and interviewed key informants to better understand the context in which community engagement has been implemented and how it has performed across Caribbean MPAs. Though these sources cited that community members are engaged, there is a lack of true representation of community members of the community. Oftentimes, those with power are the individuals consulted. Comparing the articles to the interviews I conducted, there are differences in the methods of engagement. For example, key informants cited informative practices where they are conveying information to the public. However, the articles cite more consultative methods of engagement that depending on how they are conducted can be extractive. Thus, it is not just did they engage or not, but how it is done. To best understand the impacts of engagement, there must be more information on the context and how the outcomes of engagement were used by decisionmakers.

In Chapter 4, I examined community perceptions in a coastal community to understand the heterogeneity within a community and how unrepresentative community engagement can lead to inequity. If individuals within a community are not engaged, descriptions of community engagement are not reflective of the diversity perceptions within a community. This is problematic because perceptions, knowledge, and behavior vary within and across communities. In this study, I found a diversity of perceptions. These perceptions can be useful to determine the scale and types of management interventions that would be most successful. Further, I hypothesize the methods in eliciting this information from structured surveys and interviews may skew responses. Skewed samples can result in a misrepresentation of knowledge and perceptions, which is important to recognize considering that they were the most common methods of engagement in the literature review in chapter two. It is also important to consider that interventions that require buy-in from community members might not be considered successful if there is a temporal mismatch between effort and response. Ultimately, in communities such as the one in this case study, where there can be intimate relationships between the environment and individuals, there is a lot that can be learned from perceptions.

To protect environments and all their attributes that people depend upon, past inequities and modes of community engagement must be realized. This requires collaboration between community members and applicable institutions that emphasizes just practices and methodologies. In this dissertation, I provided an overview of community engagement and perceptions highlighting promising pathways to achieve more just conservation strategies.

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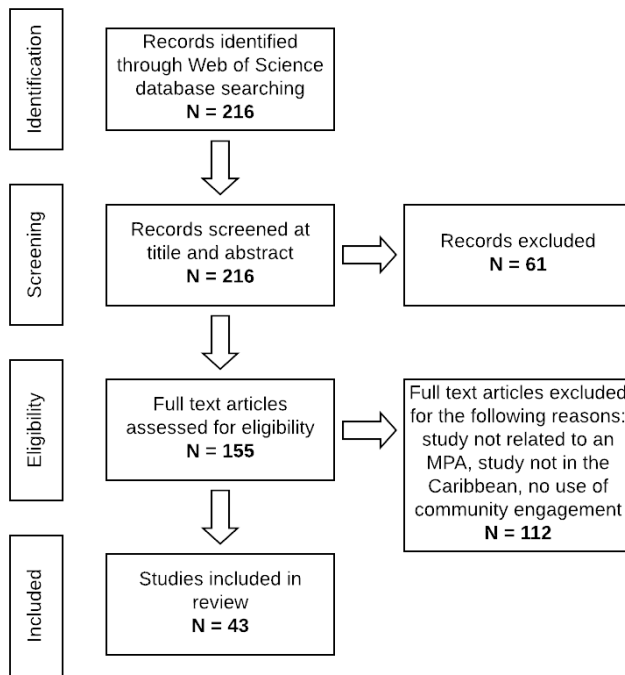
APPENDIX A

SUPPLEMENTARY MATERIALS FOR CHAPTER 2



## A.1

### *Review workflow chart*



## A.2

### *List of review articles*

	Title/ abstract review	Full text review	Title	Year	DOI
	MAYBE	YES	RELATIONSHIPS BETWEEN FISHING PRESSURE AND STOCK STRUCTURE IN QUEEN CONCH (LOBATUS GIGAS) POPULATIONS: SYNTHESIS OF LONG-TERM SURVEYS AND EVIDENCE FOR OVERFISHING IN THE BAHAMAS	2019	10.1080/23308249.2018.1480008
	YES	YES	BIOPHYSICAL CONNECTIVITY OF SNAPPER SPAWNING AGGREGATIONS AND MARINE PROTECTED AREA MANAGEMENT ALTERNATIVES IN CUBA	2019	10.1111/FOG.12384
112	YES	YES	PARTICIPATION IN PLANNING AND SOCIAL NETWORKS INCREASE SOCIAL MONITORING IN COMMUNITY-BASED CONSERVATION	2018	10.1111/CONL.12562
	MAYBE	YES	SOCIAL FIT OF CORAL REEF GOVERNANCE VARIES AMONG INDIVIDUALS	2018	10.1111/CONL.12422
	YES	YES	EVIDENCE OF ECONOMIC BENEFITS FOR PUBLIC INVESTMENT IN MPAS	2018	10.1016/J.ECOSER.2017.10.017
	YES	YES	EXAMINING HORIZONTAL AND VERTICAL SOCIAL TIES TO ACHIEVE SOCIAL-ECOLOGICAL FIT IN AN EMERGING MARINE RESERVE NETWORK	2017	10.1002/AQC.2775
	YES	YES	REDRAWING THE BOUNDARIES: PLANNING AND GOVERNANCE OF A MARINE PROTECTED AREA-THE CASE OF THE EXUMA CAYS LAND AND SEA PARK	2017	10.1007/S11852-017-0498-4

	Title/ abstract review	Full text review	Title	Year	DOI
	YES	YES	THE CONTEMPORARY ECONOMIC VALUE OF ELASMOBRANCHS IN THE BAHAMAS: REAPING THE REWARDS OF 25 YEARS OF STEWARDSHIP AND CONSERVATION	2017	10.1016/J.BIOC ON.2017.01.007
	YES	YES	CREATING A TURF FROM THE BOTTOM-UP: ANTIGUA'S COMMUNITY-BASED CORAL REEF NO-TAKE RESERVE	2017	10.5343/BMS.20 15.1096
	YES	YES	CITIZEN SCIENCE REGARDING INVASIVE LIONFISH IN DUTCH CARIBBEAN MPAS: DRIVERS AND BARRIERS TO PARTICIPATION	2016	10.1016/J.OCEC OAMAN.2016.0 9.014
	MAYBE	YES	USING THE IUCN GREEN LIST OF PROTECTED AND CONSERVED AREAS TO PROMOTE CONSERVATION IMPACT THROUGH MARINE PROTECTED AREAS	2016	10.1002/AQC.26 79
113	YES	YES	TESTING FISHER-DEVELOPED ALTERNATIVES TO FISHERY MANAGEMENT TOOLS FOR COMMUNITY SUPPORT AND REGULATORY EFFECTIVENESS	2016	10.1016/J.MARP OL.2016.01.027
	YES	YES	INTEGRATED COASTAL ZONE MANAGEMENT AND ITS POTENTIAL APPLICATION TO ANTIGUA AND BARBUDA	2015	10.1016/J.OCEC OAMAN.2015.0 4.017
	YES	YES	SOCIAL NETWORKS AND TRANSITIONS TO CO-MANAGEMENT IN JAMAICAN MARINE RESERVES AND SMALL-SCALE FISHERIES	2015	10.1016/J.GLOE NVCHA.2015.09 .001
	YES	YES	ARE CARIBBEAN MPAS MAKING PROGRESS TOWARD THEIR GOALS AND OBJECTIVES?	2015	10.1016/J.MARP OL.2014.12.009
	MAYBE	YES	CONTROVERSIES AND CONSENSUS ON THE LIONFISH INVASION IN THE WESTERN ATLANTIC OCEAN	2015	10.5751/ES- 07726-200324

	Title/ abstract review	Full text review	Title	Year	DOI
	YES	YES	INVESTIGATING CAUSAL PATHWAYS LINKING SITE-LEVEL CHARACTERISTICS, COMPLIANCE, AND ECOLOGICAL PERFORMANCE IN CARIBBEAN MPAS	2015	10.1080/08920753.2015.1030332
	YES	YES	LEARNING THROUGH EXPERIENCE: NON-IMPLEMENTATION AND THE CHALLENGES OF PROTECTED AREA CONSERVATION IN THE BAHAMAS	2014	10.1016/J.MARPOL.2014.01.010
	YES	YES	MARINE MANAGED AREAS AND ASSOCIATED FISHERIES IN THE US CARIBBEAN	2014	10.1016/B978-0-12-800214-8.00004-9
	YES	YES	TOWARDS SUSTAINABLE TOURISM: THE NEED TO INTEGRATE CONSERVATION AND DEVELOPMENT USING THE BUCCOO REEF MARINE PARK, TOBAGO, WEST INDIES	2013	10.1111/1477-8947.12004
114	YES	YES	PARTICIPATION, PROCESS QUALITY, AND PERFORMANCE OF MARINE PROTECTED AREAS IN THE WIDER CARIBBEAN	2012	10.1007/S00267-012-9855-0
	YES	YES	TOWARD INCLUSIVE CO-MANAGEMENT: FACTORS INFLUENCING STAKEHOLDER PARTICIPATION	2012	10.1080/08920753.2012.677642
	YES	YES	MARINE RESERVES AS LINKED SOCIAL-ECOLOGICAL SYSTEMS	2010	10.1073/PNAS.0908266107
	MAYBE	YES	CRUZAN FISHERS' PERSPECTIVES ON THE PERFORMANCE OF THE BUCK ISLAND REEF NATIONAL MONUMENT AND THE RED HIND SEASONAL CLOSURE	2009	10.1016/J.OCEC OAMAN.2009.08.011
	YES	YES	FINANCING MARINE PROTECTED AREAS IN JAMAICA: AN EXPLORATORY STUDY	2009	10.1016/J.MARPOL.2008.05.004
	YES	YES	RESILIENCE AT RISK: EPISTEMOLOGICAL AND SOCIAL CONSTRUCTION BARRIERS TO RISK COMMUNICATION	2008	10.1080/13669870701521479

Title/ abstract review	Full text review	Title	Year	DOI
YES	YES	LOCAL PERSPECTIVES ON MARINE RESERVE CREATION IN THE BAHAMAS	2008	10.1016/J.OCEC OAMAN.2008.0 7.006
YES	YES	MARINE PROTECTED AREAS AND THE CORAL REEFS OF TRADITIONAL SETTLEMENTS IN THE EXUMAS, BAHAMAS	2007	10.1007/S00338- 007-0264-4
MAYBE	YES	THE POLITICAL ECONOMY OF CROSS-SCALE NETWORKS IN RESOURCE CO-MANAGEMENT	2005	NA
YES	YES	TRADE-OFF ANALYSIS FOR MARINE PROTECTED AREA MANAGEMENT	2001	10.1016/S0921- 8009(00)00293-7
YES	YES	USER PERCEPTIONS ON COASTAL RESOURCE STATE AND MANAGEMENT OPTIONS IN CURACAO	2000	NA
YES	YES	CO-MANAGEMENT OF TROPICAL COASTAL ZONES: THE CASE OF THE SOUFRIERE MARINE MANAGEMENT AREA, ST. LUCIA, WI	2000	NA
YES	YES	THE HUMAN SIDE OF REEF MANAGEMENT: A CASE STUDY ANALYSIS OF THE SOCIOECONOMIC FRAMEWORK OF MONTEGO BAY MARINE PARK	1999	10.1007/S003380 050215
MAYBE	YES	MULTIPLE CRITERIA ANALYSIS INTEGRATES ECONOMIC, ECOLOGICAL AND SOCIAL OBJECTIVES FOR CORAL REEF MANAGERS	1999	10.1007/S003380 050217
YES	YES	GOVERNANCE OF MARINE PROTECTED AREAS IN THE WIDER CARIBBEAN: PRELIMINARY RESULTS OF AN INTERNATIONAL MAIL SURVEY	1999	10.1080/0892075 99263794
YES	YES	SOLUTIONS TO THE TRAGEDY OF THE COMMONS - SEA-URCHIN MANAGEMENT IN ST-LUCIA, WEST-INDIES	1991	10.1017/S037689 2900021706

Title/ abstract review	Full text review	Title	Year	DOI
YES	YES	RECREATIONAL SNORKELING ACTIVITIES TO ENHANCE SEASCAPE ENJOYMENT AND ENVIRONMENTAL EDUCATION IN THE ISLAS ATLANTICAS DE GALICIA NATIONAL PARK (SPAIN)	2020	10.1016/J.JENV MAN.2020.1110 65
YES	YES	SHIFTED BASELINES AND THE POLICY PLACEBO EFFECT IN CONSERVATION	2020	10.1017/S003060 5318000169
YES	YES	MARINE SPATIAL PLANNING ON THE CARIBBEAN ISLAND OF MONTserrat: LESSONS FOR DATA-LIMITED SMALL ISLANDS	2020	10.1111/CSP2.15 8
YES	YES	MARINE SPATIAL PLANNING IN BARBUDA: A SOCIAL, ECOLOGICAL, GEOGRAPHIC, AND LEGAL CASE STUDY	2020	10.1016/J.MARP OL.2019.103793
YES	YES	LIVING MUSEUMS IN THE SEA: THE PAST, PRESENT AND FUTURE OF UNDERWATER CULTURAL HERITAGE PRESERVATION	2019	10.18520/CS/V1 17/I10/1612- 1616
YES	YES	EXAMINING LINKAGES BETWEEN ECOSYSTEM SERVICES AND SOCIAL WELLBEING TO IMPROVE GOVERNANCE FOR COASTAL CONSERVATION IN JAMAICA	2019	10.1016/J.ECOS ER.2019.100997
YES	YES	SMALL-SCALE FISHERS' PERCEPTIONS ABOUT THE PERFORMANCE OF SEASONAL CLOSURES IN THE COMMONWEALTH OF PUERTO RICO	2019	10.1016/J.OCEC OAMAN.2019.0 3.025
YES	YES	ECOLOGICAL SPILLOVER FROM A MARINE PROTECTED AREA REPLENISHES AN OVER-EXPLOITED POPULATION ACROSS AN ISLAND CHAIN	2019	10.1111/CSP2.17

### A.3

*Table of inclusion and exclusion criteria*

	Included	Excluded
Eligible populations or subjects	At least one of the article's study sites is within the specified geography	The study site is outside of the intended range (e.g., the name of a Caribbean nation or state may appear in the text, but it is not the focus of the article)  The study site is not part of the insular Caribbean
Eligible intervention(s) or exposure(s)	The authors of the article conduct community engagement, or the authors are evaluating community engagement implemented by another institution (e.g., MPA managers)  An MPA is the focus of the research or discussed in some respect to a form of community engagement	The article contains no human or social dimensions (e.g., the community referenced is of a non-human species)  The study only listed community engagement in a recommendation, the acknowledgments, or the references
Eligible outcomes	MPAs that have been implemented or are being developed	
Eligible types of study design	Case studies	Theoretical MPAs or analyses of MPAs in general and not specific to an existing MPA

#### A.4

*Table of natural and social science discipline categories*

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Natural Sciences	Social Sciences
Biodiversity & Conservation	Anthropology
Environmental Sciences & Ecology	Business & Economics
Fisheries	Education & Educational Research
Life Sciences & Biomedicine	Geography
Marine & Freshwater Biology	International Relations
Oceanography	Social Sciences
Science & Technology	Sociology
Water Resources	

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*Note. Web of Science paper categorizations split between natural and social science categories*



## A.5

*Table of subcategories for who is engaged in the community*

Broad Category	Subcategories
Businesses	attraction; banks and insurance companies; business owners; dive operators; dive services; entrepreneurs; film and tv; hoteliers; in-bond stores; ray tourism operators; rental car services; restaurants; tour guides; tourism stakeholders; watersport operators
Community	base communities; community; community members; community organizations; elders; the general public; residents; second homeowners
Environmentalists	conservationists; environment stakeholders; environmental technocrats
Fishers	commercial fishers; directors of local fishing and diving associations; fishers; fishing cooperatives; a fisherman who spearfishes for his food and extra money; recreational fishers
General stakeholders	key informants; key stakeholders; local stakeholders (private); local stakeholders (public); stakeholders
Government	government; local government; national government
MPA/Park officials	managers; marine park decision-makers; mgmt officials; mpa govt officials; mpa staff; natl parks authority stakeholders; park authorities; park staff
NGOs	local NGO; national NGO; NGOs
Other	Barbuda council stakeholders; development control authority stakeholders; educators; students; teacher at a secondary school that provides scuba training for local youth; technical personnel from various departments of the Tobago House of Assembly
Researchers	academics; experts; faculty; protected area specialists; researchers; scientists
Resource users	direct resource users; divers; marine park users; nonresident users; professional divers; recreational boaters; recreational divers; recreational users; resident users; resource users; shark divers; sport divers; traditional resource users

## A.6

*Table of counts for who is engaged in the community*

Categories	Counts
Interviews	27
Surveys	23
Participant observation	8
Education	7
Monitoring/enforcement	7
Communication	5
Participation	5
Focus groups	5
Mapping	4
Public meetings	4
Consultation	3
Oral history	2
Volunteer	2
Workshops	2
Documents	2
Citizen science	1
Advisory council	1
Awareness	1
Decision-making	1
Ethnographic fieldwork	1
Management	1
Meeting minutes	1
People exchange lionfish for bounty	1
Ranking exercises	1
Scenarios	1
Stakeholder collaboration	1
Stakeholder meetings	1
Tournament	1
Work-related activity	1
Working groups	1
Stakeholder exercises	1
Total	123

APPENDIX B

SUPPLEMENTARY MATERIALS FOR CHAPTER 3

## B.1

### Interview guide

Semi-structured interview questions for Caribbean marine protected area managers and key informants

*Gather information about the history of the marine protected area(s) the participant is/are familiar with and then proceed to open-ended questions.*

What year was the MPA established?

Why was the MPA established?

Who, or which institutions, advocated for its establishment?

What IUCN management category does the MPA fall under?

Is there a management plan?

If so, is the plan followed?

What are the objectives of the MPA?

Does the MPA have no-take areas?

*Community in the following questions refers to the people who live within the districts within the boundary of, or are adjacent to, the marine protected area(s).*

*Questions related to the interviewee:*

How long have you been working with the MPA?

How long have you lived in XX (country)?

In what field is your educational background?

Have you worked in other MPAs in your current country?

Have you worked in MPAs in any other countries?

If so, where?

*Questions related to the marine protected area:*

What institution manages the marine protected area?

How many people are involved in the management of the MPA?

What are all of their roles?

How much money is spent annually in the management of the MPA?

*For the following questions, ask many probing questions to get at the nuances of how people were engaged and perceptions/knowledge of what has and has not worked:*

Were communities engaged in the creation of the marine protected area?

How were they engaged?

Are communities currently engaged in the ongoing operation of the marine protected area?

If yes, how are they engaged?

If yes, how often are they engaged?

Do communities and community members benefit from the MPA?

If yes, how so?

What percent or proportion of the people in the community derive their livelihoods from the MPA?

Roughly, how many people is this?

*Follow-up questions*

Is there anything else you would like to add?

I am sharing this information in a database so that all managers can see each other's information. First, is that okay with you? Second, is there a better way to share this information and make it the most useful for everyone?

Are there any other managers or people you can think of, either on your island or elsewhere in the Caribbean, that you think would be willing to talk to me?

**B.2**

IRB exemption



EXEMPTION GRANTED

Leah Gerber

CLAS-NS: Life Sciences, School of (SOLS) 480/727-3109

Leah.Gerber@asu.edu

Dear Leah Gerber:

On 11/7/2019 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Perceptions and knowledge of community engagement as a tool for marine protected area managers
Investigator:	Leah Gerber
IRB ID:	STUDY00011026
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"><li>• Consent, Category: Consent Form;</li><li>• Interview questions, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li><li>• Protocol, Category: IRB Protocol;</li><li>• Recruitment script, Category: Recruitment Materials;</li></ul>

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 on 11/7/2019.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Miranda Bernard Leah Gerber

APPENDIX C

SUPPLEMENTARY MATERIALS FOR CHAPTER 4

C.1

IRB exemption



EXEMPTION GRANTED

Leah Gerber  
Life Sciences, School of (SOLS)  
480/727-3109  
Leah.Gerber@asu.edu

Dear Leah Gerber:

On 1/16/2018 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Tourism, coral reefs and climate change: A model of community well-being and reef health
Investigator:	Leah Gerber
IRB ID:	STUDY00007533
Funding:	Name: SOLS - Graduate Programs, Grant Office ID: LM5 1079 MB
Grant Title:	LM5 1079 MB;
Grant ID:	LM5 1079 MB;
Documents Reviewed:	<ul style="list-style-type: none"> <li>• Bernard_RTI_proposal_April2017_LG.pdf, Category: Sponsor Attachment;</li> <li>• Bernard_HRP-503a-TEMPLATE_PROTOCOL_SocialBehavioralV02-10-15.docx, Category: IRB Protocol;</li> <li>• Bernard_IRB_survey, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li> <li>• Bernard_verbal-script.pdf, Category: Recruitment Materials;</li> <li>• Bernard_social_consent, Category: Consent Form;</li> </ul>

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 1/16/2018.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Miranda Bernard  
Miranda Bernard



C.2.

IRB modification approval



APPROVAL: MODIFICATION

Leah Gerber  
Life Sciences, School of (SOLS)  
480/727-3109  
Leah.Gerber@asu.edu

Dear Leah Gerber:

On 7/5/2018 the ASU IRB reviewed the following protocol:

Type of Review:	Modification
Title:	Tourism, coral reefs and climate change: A model of community well-being and reef health
Investigator:	Leah Gerber
IRB ID:	STUDY00007533
Funding:	Name: SOLS: Graduate Programs, Grant Office ID: LM5 1079 MB
Grant Title:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"><li>• Bernard_HRP-503a-TEMPLATE_PROTOCOL_SocialBehavioral_April2018.docx, Category: IRB Protocol;</li><li>• Consent for residents, Category: Consent Form;</li><li>• Bernard_RTI_proposal_April2017_LG.pdf, Category: Sponsor Attachment;</li><li>• Consent for tourists, Category: Consent Form;</li><li>• Bernard_verbal-script_April2018.pdf, Category: Recruitment Materials;</li><li>• Tourist survey, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li><li>• Resident interview, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li></ul>

The IRB approved the modification.

When consent is appropriate, you must use final, watermarked versions available under the “Documents” tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Miranda Bernard  
Miranda Bernard

### C.3

#### Interview Guide

##### *Semi-structured interview questions for residents in Charlotteville, Tobago*

How has Charlotteville changed over time?

How has the environment and nature in, and surrounding, Charlotteville changed?

What has been the cause of these changes?

Do you view these changes as good? Bad? Neither?

Is there anything that can be done to further support or prevent these changes?

About how many tourists come here every year?

What do tourists like to do when they come here?

What do you think about that?

Looking in the future, how do you think Charlotteville will change?

Looking in the future, how do you think the environment will change?