COMMUNITIES, CONTESTATION, AND CONSERVATION: "SUCCESS" IN ADAPTIVE MARINE MANAGEMENT ON MOOREA, FRENCH POLYNESIA

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Communities, Contestation, and Conservation: "Success" in Adaptive Marine Management on Moorea, French Polynesia

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ABSTRACT OF THE THESIS

Communities, Contestation, and Conservation: "Success" in Adaptive Marine Management on Moorea, French Polynesia

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As the adverse effects of climate change continue to accelerate, community-based conservation (CBC) has become an important priority as a tool for sustainable development. Nevertheless, what is considered "success" is often taken to be self-evident and defined by technocrats that have been predetermined to be the authoritative voice in improving management. However, different versions of "success" may be composed by stakeholder groups involved in a project. This research explores how stakeholders compose "success" in the revised *Plan de Gestion de l'Espace Maritime* (PGEM), a conservation plan enacted in 2004 that established marine protected areas in the lagoon surrounding Moorea, French Polynesia. Through 100 semi-structured interviews and 65 surveys, this research reveals how different stakeholders' versions of "successful" management tie together heterogeneous elements that transcend the discrete domains of reality that are often taken for granted by technocrats studying CBC projects. I interviewed a variety of stakeholders including representatives of the municipality of Moorea-Maiao, French Polynesia's territorial government, local fishers, tourism representatives, and a natural scientist working on Moorea. Different compositions of "success" were often tied to livelihoods, the perceived "problem" of politics, how stakeholders composed the "environment" in need of being protected, and the criteria used by stakeholders to determine who belongs to the community that should be leading management. While CBC is often portrayed as a sound framework in that it is informed by expert knowledge and that failure is consequently due to erroneous implementation, I argue that the success or failure of a project is better understood as a productive practice that requires negotiation with and active enrollment of members across different stakeholders including local community members, technocrats, and NGOs. These findings contribute to understanding how CBC is put into practice and the impact stakeholders have on this process. Understanding how stakeholders articulate "success" in their own terms without relying on conventional technocratic theoretical predispositions can reveal complexities of CBC that might otherwise be overlooked. In sum, my research illustrates how to approach the question of improving management from a different epistemological perspective that balances our interpretations with alternative ways to assess conservation projects.

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CHAPTER 1
INTRODUCTION

"Ia or ana! C'est Caro. Je suis avec une étudiante americiane de San Diego qui s'intéresse au PGEM…" This was how my research collaborator, Caroline Tapao, would start nearly every phone call she made in our search for people to interview. Our daily task was to go around the island in search of interlocutors willing and able to speak with us. As we drove around Moorea with the windows down, we would pass by the smell of smoke and saltwater in the air, the friendly greetings people gave to each other passing by, "*Ia ora na!"* and the sound of cars' warning beeps to dogs running across the road. My right arm was consistently sunburned as it rested on the open car window, and my legs increasingly covered with bug bites that I often scratched despite knowing I was only making it worse. We would stop by the house of someone on a list of potential interviewees, and Caroline would yell from the car to see if anyone was home. No answer, no car in the lot, nobody home. Caroline would then make another call while my other research collaborator, Tevaiti Mare, and I would review our interview questions.

Upon arriving at a household, our interlocutors would invite us to sit, often offering us water, orange juice, *poisson cru,* or coconut. We would introduce ourselves and explain that we were there to discuss the recent revisions of the *Plan de Gestion de l'Espace Maritime* (PGEM), a marine conservation framework enacted in 2004 that established eight marine protected areas (MPAs) in the lagoon surrounding Moorea to regulate fishing practices and other lagoon activities. As many of the interviews began, the first mention of the PGEM was often met with a sarcastic smile, a resigned laugh, a shaking of the head, or a deep breath. While many people have a lot to say about the PGEM, there is a common sentiment of fatigue about and apathy with the management plan that has been frustrating the

fishing community for almost 20 years. Many were grateful to share their perspective with me on a topic that affects everyone on the island. And yet, I was also often reminded, both implicitly and explicitly, that I am just another student visiting for a short period of time, another countless face coming through to talk about the same topics, and there will probably be many more after me. For me, these questions concern a topic that has interested me for many years and is a part of my research that will fulfill the credentials to earn a graduate degree. For many people on Moorea, these are questions of their cultural identity, history, and livelihoods. For some, the lagoon is their "pantry" and their primary means of living and subsistence. For others, it provides employment opportunities due to the expanding tourism industry on the island.

A lot is at stake when it comes to the management of the lagoon on Moorea, both for the marine environment and the island's inhabitants. While most agree on the need to protect the lagoon, there is considerable disagreement amongst different stakeholder groups over how management should be done (Table 1). The stakeholder groups involved in the PGEM include scientists, fishers, NGO activists, tourism industry representatives, PGEM staff, and government officials. According to the PGEM staff, for example, a more "community-based approach" will lead to successful management. Despite this recent move towards community-based approaches, what is considered "success"[1] in conservation is often determined by Western scientists and thus reflects their narrow range of values and theoretical orientations.

On Moorea, like many coastal areas around the world, protecting the oceans has become an increasingly important priority. Recent assessments of climate-induced changes provide troubling projections for the future, with the Intergovernmental Panel on Climate Change (IPCC) predicting the ocean to experience, at minimum, a two-to-fourfold increase in temperature from 1970 levels by 2100 (Bindoff et al. 2019). Rising temperatures pose multiple threats to marine ecosystems, especially coral reefs. Coral bleaching, increased severity of algal blooms, exacerbated vulnerability of fish populations to stressors and environmental disturbances, and changes in species size and productivity all threaten coral

[1] For the purpose of this thesis, “success” and “failure” are best understood as relational concepts (rather than foundational ones), given that each stakeholder defines them differently, as implied by the quotation marks, However, to avoid the burden of a constant string of quotations around words, I will refrain from using quotation marks around these words for the rest of the document.

reef ecosystems to varying degrees (Laffoley and Baxter 2016). Fisheries play an essential role in food security worldwide, with over 4.5 billion people relying on seafood for more than 15% of their total protein intake (Bindoff et al. 2019). From 1961 to 2017, global seafood consumption experienced an average annual increase of 3.1%, a rate almost double the annual global population growth during this same period (1.6%) (Food and Agriculture Organization 2020). With most fisheries considered to be "fully-to-over-exploited," marine scientists have searched for solutions to confront these issues with varying degrees of success (Bindoff et al. 2019, 502). In their special report on the effects of climate change on the ocean released in 2019, the IPCC also expressed concerns about the increased risk "of potential conflicts among fishery area users and authorities…exacerbated through competing resource exploitation from international actors and mal-adapted policies" (Bindoff et al. 2019, 502).

For many scholars and local people, the threat of climate-induced degradation is not just a matter of environmental damage but also a threat to economic and social welfare. Given this, community-based conservation schemes have grown in popularity and are now widely understood as the most effective means to achieve sustainable development goals and environmental protection. To achieve success, many conservation practitioners and scholars assume that the knowledge of trained experts, such as ecologists or social scientists, provide a superior and more accurate account of environmental or social conditions and that these technocratic accounts are best suited to guide conservation interventions. In practice, however, other stakeholders may or may not heed the call of experts and instead may rely on their own knowledge of the social-ecological system to compose their own versions of success and failure. These compositions, which may or may not align with expert opinions, still influence how management regimes unfold over time.

The revisions of the PGEM offer a fruitful case study of how management is put into practice, what gains traction as "successful," and who supports that version of success. The management framework has recently taken a form similar to what scholars call "adaptive management" and has undergone a revision process that concluded in September 2021. Adaptive management is an iterative process in which conservation practitioners adjust their management decisions and behavior in response to the results of previous decisions and actions in the project. In response to various criticisms of the original PGEM, managers of

the framework have formulated a new version of success that hinges on delegating more decision-making authority to the local community.

Rather than providing a social assessment of the PGEM's success or failure, this research analyzes how different stakeholder groups on Moorea tie together heterogeneous elements to compose their versions of success. My approach is not to assume that I have a more accurate, clearer, or holistic understanding of the marine management process but instead to provide an analysis that provokes the stakeholders themselves, including social and natural scientists, to reflect on their assumptions and modify them if they deem it necessary.

Thus, the central goal of this research is to detail empirically how different stakeholder groups frame success in marine co-management under the PGEM. Exploring the framing of success helps elucidate how success varies across stakeholder groups, which version(s) of success gain traction in a project (and how they do so), and how this involves non-human elements such as the marine and terrestrial ecosystems. As I elucidate in this research, the framings of both success and failure of different stakeholder groups pull from a variety of domains and arguments that are often considered to be discrete objective realities, such as arguments concerning biological elements of the resource, cultural identity, political issues, religion, fish populations, or coral health. Understanding these different versions of success and how a narrative stabilizes by enrolling many different stakeholder groups to the point of emerging as an "official" account will help us answer a critical question: *how does community-based conservation play out in practice?*

CHAPTER 2

LITERATURE REVIEW

2.1 FROM FORTRESS CONSERVATION TO COMMUNITY-BASED CONSERVATION

Over the past few decades, threats to biodiversity such as climate change, endangered species, and deforestation, have led some members of the scientific community to conclude that the traditional approach to resource management, which rests on the assumption that the world's problems can be solved by "objective" and empirical expert analysis, has become untenable to varying degrees. These problems are different in the sense that they are "truly complex" and "have no definitive formulation, no stopping rule, and no test for a solution. There will likely never be a final resolution of any of them" (Ludwig 2001, 759). Given that these problems are inseparable from social issues, consensus-based methods that involved collaboration with local actors started to gain traction in the conservation sector.

In the 1980s and 90s, conservation practitioners began calling for a more participatory approach to resource management, most commonly known as community-based conservation (CBC). This trend was seen as an effort to move away from the traditional fortress conservation model most often characterized by the establishment of national parks and reserves, whose primary purpose is to protect nature from human activity. With this in mind, the rise of community-based conservation projects can be seen as a reflection of a paradigm shift in the field of ecology at the time. Fikret Berkes (2004) characterizes this paradigm shift into three conceptual elements, which concern: 1) the field's increasing adoption of a complex adaptive systems perspective (rather than a reductionist orientation), 2) the recognition that humans cannot be separated from nature when it comes to

understanding important dynamics in conservation (also indicative of the social-ecological systems perspective), and 3) a shift away from expert-based approaches to conservation to participatory frameworks that involve local actors. With this in mind, increased support for CBC models was a natural progression from this paradigm shift as ecologists and other disciplines acknowledged the integral role humans play in ecosystems that repositioned us away from the reductionist roles of "resource manager" or "resource user."

The political dimensions and implications of resource management have not gone unnoticed by figures in the conservation sector. Much of the literature pertaining to this recognition posits politics as a harmful and even corrosive force that impedes the successful implementation of conservation projects. In this regard, CBC is often framed as a means of overcoming the issue of politics in the sense that it decentralizes management by granting more authority to local actors (Agrawal and Gibson 1999; Belsky 1999; Brown 2003; Selfa and Endter-Wada 2008). Support for community-based conservation is predominantly based on the following central beliefs: 1) that local actors have a greater stake in the sustainability of local natural resources than conservation practitioners or the state, 2) local actors have a more intimate knowledge of local natural resources and ecological processes, 3) local actors can manage the resources more effectively through traditional practices and forms of access, and 4) CBC is the most effective means for achieving sustainable development (Berkes 2004; Tsing, Brosius, and Zerner 2005). With this in mind, CBC can be defined as a framework that “seeks to strike a balance between nature, conservation, and economic growth” by involving community members in the decision-making and implementation processes to varying degrees (Kalvelage et al. 2021, 282). In terms of efficacy, a recent study surveying 128 CBC projects found that over 80% of the surveyed projects “had some positive human well-being or environmental outcomes,” however, only 32% of the projects simultaneously achieved both social and environmental outcomes (Fariss et al. 2022, 1). For this study, the considered social outcomes included indicators of education, health, overall quality of life, and awareness of and attitudes toward natural resource management. On the other hand, environmental outcomes considered in this study included indicators of biodiversity, resilience, and resource recovery (Farris et al. 2022). In his analysis of the evolution of co-management[2], Berkes (2009) identifies six common elements of this structure. These six

[2] “Co-management” is another term that is often used to describe CBC structures

elements characterize co-management as an opportunity for the following: 1) a means of power-sharing between government and local actors, 2) institution building, 3) building trust and social capital within communities and between different actors, 4) an evolving process determined via negotiation and evaluation, 5) a tool for collaborative problem solving, and 6) good and equitable governance (Berkes 2009).

Multiple studies have demonstrated the critical role of stakeholder compliance in the efficacy of marine protected areas (Bergseth, Russ and Cinner 2015; Byers and Noonburg 2007; Iacarella et al. 2021; Smallhorn-West et al. 2018). With this in mind, the community-based conservation framework was also readily embraced by the marine management sector as a means to promote the efficacy of MPAs and avoid the issue of "paper parks," or protected areas that are not effectively enforced and thus only exist on paper (Villaseñor-Derbez et al. 2022). The most recent United Nations Sustainable Development Goals (SDGs) report from 2022 also acknowledges the utility of community-based marine conservation in response to restoring fish stocks in small-scale fisheries. CBC has also become significant in this regard as the inclusion of "participation in decision-making by small-scale fishers" has become part of the United Nation's criteria for measuring the quality of implementation of SDGs in marine management projects (United Nations 2022, 55). While many coastal and island communities have practiced their own generational marine management schemes that were inherently community-based, most community-based marine conservation projects today are implemented by external partners, such as non-governmental organizations (NGOs), members of the academic community, or government agencies (Beyerl, Putz, and Breckwoldt 2016).

Despite the widespread popularity of CBC, scholars have expressed concern over the various implications these projects can have on the local community. While "local participation" and "community empowerment" are attractive goals for CBC, Goldman (2003) argues that various community-based conservation projects suggest a less meaningful degree of the implementation of these goals as community members, though involved in the project, are delegated to the periphery with limited ability to impact or determine how management is done. With this in mind, while there appears to be widespread support for grassroots, "bottom-up" approaches to resource management, many CBC projects still operate in a top-

down structure in which local actors are “tools for, or commodities of, conservation rather than as active knowing agents” (Goldman 2003, 834).

2.2 MARINE PROTECTED AREAS AS A “TOOL” FOR RESOURCE MANAGEMENT

As the adverse effects of climate change continue to accelerate, the need for effective approaches to conservation has become integral in working towards a more sustainable future for our planet. However, until relatively recently, marine resources were generally considered abundant and inexhaustible. These historical perceptions of the state of marine resources were best characterized by Thomas Huxley’s (1883, 16) assertion that “nothing we do seriously affects the number of fish. And any attempt to regulate these fisheries seems consequently, from the nature of the case, to be useless.” The general perception of marine ecosystem abundance is also evident in the historical bias in the conservation literature that, until recently, primarily focused on the impact of anthropogenic pressures on terrestrial systems. This disproportionate focus would prove to be a detriment to future marine conservation efforts as it led to both a more limited understanding of marine ecosystem dynamics (and how anthropogenic stressors impact them) as well as a lack of documented baselines for earlier and healthier states of marine ecosystems (Fraschetti, Claudet, and Grorud-Colvert 2011). Given the abundance of studies on terrestrial resource management models, approaches to marine management evolved from the body of knowledge on terrestrial systems, incorporating “principles of landscape ecology, adaptive and ecosystem management, and zoning in protected-area plans” (Agardy 1994, 267).

As conservation practitioners became more aware of the vulnerability of marine ecosystems, various approaches emerged to manage marine resources and promote sustainable fisheries, with marine protected areas (MPAs) becoming a primary strategy. Throughout the decades of resource management, the implementation of MPAs gradually transitioned from an ad hoc approach for protecting vulnerable marine areas to a global conservation strategy. Within the literature, there are three commonly used terms for this management “tool” that have slightly nuanced definitions: marine protected areas, marine reserves, and a network of marine reserves. MPAs can be considered the general category of protected areas designated in the name of marine conservation in which the level of protection and restrictions vary. Nestled under MPAs, marine reserves, also known as "no-

take areas," are fully protected areas that prohibit any extractive or destructive activities except those pertaining to scientific research and monitoring. Marine reserves can also form a "network" when located in geographic proximity and are "connected by larval dispersal and juvenile or adult migration" (Lubchenco et al. 2003, S3).

While the first marine protected area is argued to date back to 1935 (Fort Jefferson National Monument in Florida, United States), the main stimulus for MPAs as a conservation strategy came decades later. Throughout the 1950s and 60s, marine ecosystems became exposed to increased anthropogenic stressors and over-exploitation due to industrial and technological developments (Maestro et al. 2019). As the need for marine management and protection strategies became more evident, the International Union for the Conservation of Nature (IUCN), a global organization considered to be “at the forefront of the global fight to save species from extinction,” became an important platform for the emerging conservation strategy (United Nations Environment Programme n.d.). The organization’s 1962 World Congress on National Parks became one of the first international conservation meetings that considered the topic of MPAs (Gubbay 1995). On the other hand, the first conference dedicated explicitly to marine protected areas was also held by the IUCN in 1975 as the International Conference on Marine Parks and Reserves, in which the need for a global MPA monitoring system was one of the primary suggestions (Maestro et al. 2019). In response to the 1962 IUCN meeting, the organization hosted a follow-up session in 1982 that determined that this conservation approach needed to be incorporated into the predominantly terrestrial global network of protected areas.

In terms of jurisdictional responsibility and enforcement, terrestrial management is considered less complex due to its more "evolved legislation framework" that grants a considerable degree of documented property rights (Fraschetti, Claudet, and Grorud-Colvert 2011, 14). On the other hand, managing marine resources has proved to be more difficult given that there are few property rights regimes other than the Exclusive Economic Zones (EEZ) when it comes to marine governance. With this in mind, the 1982 United Nations Conference on the Law of the Sea (UNCLOS) proved to be another turning point in the history of MPAs as it reshaped ideas of “ownership” of the ocean by granting sovereign states exclusive rights to the adjacent area of the ocean via the EEZ, which typically extends 200 nautical miles from the shore (Convention on the Law of the Sea 1982). While the EEZ

gives sovereign states more jurisdictional power to implement and enforce fisheries management regimes by providing a legal basis for establishing MPAs, the ability to do so has remained complex, especially for the marine area beyond the EEZ. The Caracas Action Plan, which was a result of the IV World Congress on National Parks and Protected Areas in 1994, was indicative of growing support for MPAs as it called for increased efforts to assist in MPA success. These efforts included establishing the goals of creating a global system that categorized coastal areas based on the sufficiency of protected areas in those regions, the use of MPAs as primary management "tools" in conservation frameworks, and the development and implementation of ecosystem-based integrated management programs for MPAs (Gubbay 1995). As marine management began to proliferate in the 1980s and 1990s, studies revealed the capacity of MPAs to satisfy various metrics of success for fisheries management, such as increased fish population density, biomass, organism size, and diversity (Halpern 2003). The subsequent years followed with MPAs becoming widely accepted and promoted as a critical conservation strategy. While many scientists and policymakers harness the goal of sustainable development as a call to action for a technocratic approach to environmental governance, critics have expressed concern over the consequent issue of the "numbers game," in which the quality of the result of a project is diminished in the name of "achieving" the target itself, which is most often outlined in international agreements (Humphreys and Clark 2020).

In the face of concerns over fisheries collapse, new solutions were necessary as traditional management strategies failed to curb the overexploitation of marine ecosystems. In this regard, MPAs were positioned as "sophisticated initiatives" that had the capacity to do it all: restoring marine biodiversity, accommodating various stakeholder groups, promoting economic development, solving the "tragedy of the commons" in marine resource use, and more—as long as the design and implementation of MPAs remained under the control of scientists (Agardy 1994; Fraschetti, Claudet, and Grorud-Colvert 2011). Marine resource management primarily occurred as a result of commercial regulation and institutional arrangements that "cover a broad range of rules, laws, economic instruments," along with community-based management initiatives to promote the sustainability of fisheries (Fraschetti, Claudet, and Grorud-Colvert 2011, 19). Common management regulations included spatial and temporal limitations on fish catch, gear restrictions, and fish catch size

limits. Up until the 1990s, the scientific understanding of MPAs was still in its infancy. These knowledge gaps ultimately led to a symposium on marine reserves hosted during the 1997 Annual Meetings of the American Association for the Advancement of Science (AAAS), which consequently sparked a series of collective inquiries into the science behind this promising conservation "tool." Largely emerging from the 1997 symposium, the primary aspects and emerging topics in marine reserve science focused on the theoretical basis of marine protected areas, particularly the "relationship between reserve design and fisheries/conservation functions," analysis of existing data on ecological aspects of marine species and communities, as well as the discussion of the application of marine reserves in real-world settings (Lubchenco et al. 2003, S4).

As the implementation of MPAs began to proliferate, this management strategy was no longer considered "an end in itself but has evolved towards more ambitious targets," such as fighting against climate change and protecting marine resources on a global level (Maestro et al. 2019, 35). Recently, approaches to marine protected areas have experienced a shift towards ecosystem-based management (EBM), which diverges from the traditional focus on a single species in order to account for the interconnected elements of marine ecosystems (e.g., resources, habitats, humans, etc.). In 2010, the Tenth United Nations Conference of Parties produced the Aichi Targets, which included specific objectives for marine ecosystems. The most notable objective suggested that at least ten percent of coastal and marine areas globally become incorporated into "effectively and equitably managed, ecologically representative and well-connected systems" of marine protected areas by 2020 (Arnell et al. 2016, 30). As of 2020, a report published by the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) indicated that approximately 28.1 million square kilometers (7.74% of the ocean) of coastal and pelagic waters are located within protected areas and other effective area-based conservation measures (OECMs), which represents an approximate 1,468% increase from 1990 levels[3] (UNEP-WCMC and IUCN 2021). Despite the dramatic increase in global marine protected area coverage, many in the conservation sector still express concerns over the fact that the ocean continues to be one of the most vulnerable ecosystems to human activities. Setting

[3] Figure calculated from UNEP-WCMC and IUCN World Database on Protected Areas protected area time-series dataset (available at https://livereport.protectedplanet.net/chapter-3)

ambitious goals for MPA establishment has also led to the concern of “paper parks,” in which MPAs are established without sufficient resources for the design and management of the reserve, rendering these protected areas insufficient as they do not effectively protect the marine environment or restrict resource exploitation (Kareiva 2006; Rife et al. 2012; Villaseñor-Derbez et al. 2022; Wilhelm et al. 2014).

2.3 IDENTIFYING ELEMENTS OF MARINE MANAGEMENT FROM A SOCIAL SCIENCE PERSPECTIVE

Diverging from a biological focus on marine protected areas, social scientists seek to understand the sociopolitical dimensions of MPAs, which they argue have largely been neglected by natural scientists. Rather than referring to MPAs as a tangible, physical geographic space, Mascia (2004) refers to the management scheme as a set of rules that govern human behavior in relation to the marine environment. In framing marine reserves as a human product rather than a physical entity, the focus shifts from the ecological performance of marine reserves to the social dimensions, performance, and design of this conservation technique, all while stressing that social science can provide valuable insight into more effective MPA design. While this anthropocentric definition allows for a more flexible understanding of MPAs, it also reveals the common reliance on the human-nature divide that inherently forms the basis of this understanding. Mascia’s (2004) conceptualization of what constitutes a “marine reserve” breaks down various elements of the environment into discrete categories, from “human” to “nature,” “protected” to “unprotected,” "de facto" to "de jure" management, "scientific" to "social," and so on. Within this approach, there is the idea of what is *supposed* to happen versus what *actually* happens in marine management, with the difference between the two existing in the relationship between reserve design and performance.

Gurney et al. (2015) contribute to the overarching debate over the impacts of MPAs on local actors through an empirical study on the socioeconomic impacts of MPAs on local communities based on the social subgroups relating to gender, age, and religion. In their study, the authors argue that failing to understand the socioeconomic impacts of MPAs can present issues that impede the equitable distribution of risks and opportunities of a conservation project. This issue is often embodied in what is known as “elite capture,” in

which members of the community who already have a higher status than others leverage their positions of power as a means to advance their own interests without regard for the marginalized members of the community (Gurney et al. 2015). While CBC has been heralded as an effective and equitable approach to conservation, Quimby and Levine (2018) acknowledge potential issues concerning the power-sharing arrangements. In the process of devolving the responsibility away from the state to the local community, the conceptualization of CBC was indicative of an emphasis on "neoliberal individualism and self-reliance through market-based strategies," which would often conflict with local values and perceptions of "nature" (Quimby and Levine 2018, 3). Obscured by the "illusion" of community empowerment, this shift in the distribution of power-sharing could also present opportunities for local leaders to assert themselves in positions of power, which can lead to concerns about power asymmetries.

Many social science approaches to understanding MPAs seek to identify common, easy-to-grasp variables that make their policy prescriptions applicable in various contexts (Gurney et al. 2015; Hunter et al. 2018; Mascia 2004; Mascia, Claus, and Naidoo 2010; Thornton and Scheer 2012; Quimby and Levine 2018; Quimby and Levine 2021). In this regard, Elinor Ostrom's (2009) framework for analyzing the sustainability of social-ecological systems is such an approach that has gained significant traction within the social sciences as a means to identify the necessary conditions for success in conservation. A series of subsequent adaptations have followed this framework in the continuing effort to define what success means in community-based conservation (Ban et al. 2013; Binder et al. 2013; Cinner et al. 2009). While conventional approaches to resource management relied on top-down management structures in which government institutions imposed conservation policies and frameworks, Ostrom's (2009) framework highlights the possibility of local actors to self-organize in efforts to manage the resources themselves. In this framework, the variables affecting the likelihood of users' self-organizing to manage a resource include: 1) the size of the resource system, 2) the productivity of the resource system, 3) the predictability of system dynamics (i.e., the level of cause and effect that can be accurately predicted when considering different management actions), 4) the mobility of the resource, 5) the number of users, 6) the presence, or lack thereof, of leadership within the community, 7) degree of shared social norms and mutual trust in the community, 8) the degree of shared

knowledge of the resource system, 9) the degree of dependence on the resource for livelihoods, and 10) the degree of autonomy resource users have in determining and enforcing regulations (Ostrom 2009). While this framework recognizes the inefficiency of oversimplified, “one-size-fits-all” solutions, it establishes a relatively simple approach to assessing CBC projects to allow for the use of this framework in various contexts. Ostrom (2009, 420) argues that “without a framework to organize relevant variables identified in theories and empirical research, isolated knowledge acquired from studies of diverse resource systems in different countries by biophysical and social scientists is not likely to cumulate.”

The inclusion of local and traditional ecological knowledge (LTK) in marine conservation efforts is another common theme within the social science literature. Thornton and Scheer (2012) assess the state of scientific engagement with LTK to support their argument that more meaningful incorporation of and collaboration with LTK can not only better inform resource management but can also improve ecosystem adaptation and resilience. Framing LTK as a “living, dynamic body of knowledge,” the “co-production” of knowledge (i.e., LTK and Western science) is considered a continuous process of evolution, refinement, and translation into action via management decisions (Thornton and Scheer 2012, 3). While the authors acknowledge that LTK and Western science can, in some instances, contradict one another, they do not discuss how to move forward when these epistemologies diverge in what they believe to be the “truth.” Other members of the conservation community have noted that LTK can be helpful in multiple contexts, such as providing additional information on fish behavior and abundance (Silvano and Valbo-Jørgensen 2008), being incorporated into geographical information systems (GIS) to assist in MPA design (Aswani and Lauer 2006), informing conservation approaches for specific species (Aswani and Hamilton 2004), and promoting social-ecological resilience in response to climate change risks (Hosen, Nakamura, and Hamzah 2020).

By focusing on the social dimensions of marine protected areas, many social scientists share the common goal of the applied significance of these social elements as a window into the potential success of CBC projects. Each paper has an applied focus on informing policy in order to achieve "social" and "biological" goals of marine management, which are elucidated through the assessment of variables that are posited as necessary conditions for success by the different authors. Throughout these readings, marine reserves

are often referred to in terms of a “regime” or “institution,” which insinuates a top-down management structure involving a group of people (or stakeholder groups) with shared goals, values, and ideas of how the marine environment should be managed. Are these goals, values, and ideas shared, or are they imposed by the higher scales of management?

CHAPTER 3

RESULTS

I conducted 12 weeks of research in June, July, and August of 2021 and 2022 on Moorea, French Polynesia. During my first round of fieldwork, I conducted 59 semi-structured interviews[4] with my research collaborators, Caroline Tapao and Tevaiti Mare. These interviews focused on the general perceptions of the revision process and structure of the PGEM. Based on the interviewee's preference, the interviews were conducted in French or Tahitian and then translated into English by my research collaborators. Participants were recruited through snowball sampling. Upon completing an interview, we would ask the participant to provide the names and contact information of other individuals we should speak to (if they were willing to do so). When I returned to the field in the summer of 2022, I conducted 41 semi-structured interviews[5] that were built off my initial round of fieldwork. These interviews were structured to understand 1) how different stakeholder groups frame success under the revised PGEM, 2) how these framings of success are reflected in the implementation of the PGEM, and 3) what knowledge and expertise are mobilized and acted upon by different stakeholders. Of the 75 unique individuals interviewed over both courses of fieldwork, the majority (74.7%) of the individuals belonged to the fishing community (Table 1)

[4]Refer to Appendix A

[5] Refer to Appendix B

Table 1 Stakeholders interviewed during 2021 and 2022 fieldwork[1]

Stakeholder Group	Description	N
Fishing community	Representatives of the fishing committees, fishers who were previously involved with the fishing committees, retired fishers, fishers involved in the *Rahui* Association, and fishers who were not involved in the committees	56
Government	Representatives of the municipality of Moorea-Maiao, including the PGEM office, mayor's office, and district-level mayor's offices, and a representative of the territorial government's[6] fisheries service	15
Technocratic Institutions/Environmental Protection Organizations	A marine biologist working with a local environmental protection organization	1
Tourism Industry	Representatives of Moorea's tourism office and representatives of local hotels and tourism activities	3

[1]While some stakeholders were interviewed during both rounds of fieldwork, the numbers reflect the cumulative number of unique individuals interviewed (i.e., individuals interviewed in both rounds of fieldwork were only counted once)

In order to understand the fishers' perceptions of the state of the lagoon and marine management in a quantifiable manner, a cumulative total of 65 surveys[7] with close-ended questions were conducted in 2021 and 2022. These close-ended questions were also included in the semi-structured interviews with fishers. In order to identify general trends in fishers' main goals of management and their perceptions of the biggest problems for the lagoon, the fishers were asked to select from a list of provided answers (Table 2) and were able to select more than one answer. In order to track any changes in the trends of perceptions of lagoon health and management goals, these close-ended questions were also included in the 2022 survey. While the 2022 survey contained some of the same questions as the 2021 survey,

[6]This term is often used to refer to the French Polynesian government, which holds a considerable degree of autonomy in comparison to other French territories

[7] Refer to Appendices A and B, which include both close-ended survey questions and semi-structured interview questions (as interviews were conducted in a hybrid format) for 2021 and 2022 (Appendices C and D are the French-translated versions)

additional questions were included to gain insight into local perceptions of the current status of the revised PGEM in terms of its efficacy. In order to allow fishers to articulate their perceptions in their own terms, the surveys also included open-ended questions regarding various elements of the PGEM. At this point, the interview would transition into the semi-structured interview format. The 2022 fisher survey consisted of a series of statements concerning whether the revised PGEM was more effective in managing the lagoon compared to the original PGEM, whether the revisions better represent the interests of fishers, whose interests are served in the revisions, and so on. Interviews with the other stakeholder groups (i.e., the municipality, the territorial government, natural scientists, environmental protection organizations, and tourism representatives) primarily consisted of open-ended questions concerning perceptions of PGEM efficacy, community involvement, and the PGEM revision process. However, members of the other stakeholder groups were also asked several close-ended questions, mostly pertaining to perceptions of lagoon health, in order to compare their perceptions to the fisher survey responses.

Data from the 2021 and 2022 surveys were analyzed using the SPSS statistical software in order to gather basic descriptive statistics of the data set. The primary tests used in SPSS included calculating the averages of the responses of different groups within the fishers, such as age group and the year they were interviewed. The 2021 and 2022 survey data were analyzed separately to identify general trends in each data set (given that the surveys had several different questions). However, in order to obtain a general understanding of the perceptions of all of the fishers we spoke to, respective data points from both surveys were combined into one data set.

Overall, a total of 54 unique fishers were interviewed during my fieldwork, as some individuals were interviewed during both courses of fieldwork. Most of the fishers we spoke to were male (90.7%). The average age of the sample population was 49.65 years, with the most significant proportion of respondents (38.9%) reporting an age between 51 and 70 years old.

Table 2 List of questions concerning perceptions of lagoon health and management goals (from 2021 and 2022 fisher surveys[1])

Perceptions of Lagoon Health

- How would you describe the condition of the lagoon?

  - Very healthy
  - Healthy
  - Somewhat healthy
  - Not healthy

- Since the original PGEM was passed in 2004, how has the health of the lagoon changed?

  - Has significantly improved
  - Has slightly improved
  - Has stayed the same
  - Has gotten slightly worse
  - Has gotten significantly worse
  - I don't know

- What are the biggest problems for the lagoon? (select all that apply)

  - The PGEM
  - Overfishing
  - Damaged coral reefs
  - Algae
  - Pollution
  - Declining fish populations
  - The population
  - Tourism activities (e.g., jet skis, scuba diving, shark feeding, boating)
  - Lack of enforcement of the PGEM
  - Climate change
  - Unfair enforcement of the PGEM
  - People not respecting the PGEM regulations
  - Other:_____
  - I don't think there are any problems in the lagoon
  - I don't know

Perceptions of Management Goals

- What should be the main goals when it comes to managing the lagoon? (select all that apply)

  - Involving the community in management
  - Protecting lagoon resources
  - Communication between different groups involved in management
  - Making sure everyone respects regulations
  - Fair enforcement of the PGEM
  - Implementing *rahui*
  - Controlling tourism activities in the lagoon (e.g., jet skis, scuba diving, boating)
  - Making sure people respect the lagoon
  - Other:_____
  - I don't know

- Who should be involved in the management of the lagoon in Moorea?

  - Fishers
  - The municipality of Moorea-Maiao
  - The territorial government
  - Scientists
  - Tourism industry representatives
  - Environmental protection associations
  - Cultural associations
  - The *Rahui* Association
  - Everyone
  - I don't know

[1]Refer to Appendices for complete versions of the survey questions and semi-structured interview questions from 2021 and 2022 (Appendices A and B are in English, C and D are in French)

3.1 PERCEPTIONS OF LAGOON HEALTH AND PRESCRIPTIONS FOR EFFECTIVE MANAGEMENT

When speaking to fishers during the initial round of fieldwork in 2021, the majority (59.5%) believed that the lagoon was not healthy, with 31% of the fishers claiming that the lagoon's health had declined since the establishment of the original PGEM in 2004. On the other hand, only 20% of municipality and tourism industry representatives believed that the lagoon was not healthy, with the remaining 80% reporting that the lagoon was either 'somewhat healthy' or 'healthy.' For fishers, the top two lagoon health issues identified in the 2021 survey questions were pollution (47.6%) and tourist activities (38.1%). In 2022, pollution remained the most prevalent concern (65.2%); however, damaged coral reefs took the place of the second-most reported concern (30.4%), whereas tourist activities appeared in only 13% of the responses (Table 3). When the interviews moved to a semi-structured format after completing the survey, many of the fishers also referenced additional concerns that were included in the answer selections for this question. For example, while the survey data indicates a significant decrease in concern over tourist activities from 2021 to 2022 (Table 3), many fishers still mentioned the issue of tourism during the semi-structured interviews, with a particular focus on the disruptions caused by jet skis in the lagoon.

Table 3 Comparison of problems of the lagoon from 2021 and 2022 fisher surveys[1]

2021 Survey Responses (*n* = 42)		2022 Survey Responses (*n* = 23)	
Problem	**Percent**	**Problem**	**Percent**
Pollution	47.6%	Pollution	65.2%
Tourist activities	38.1%	Damaged coral reefs	30.4%
People not respecting the PGEM regulations	16.7%	Overfishing	17.4%
Damaged coral reefs	14.3%	Algae	17.4%
Overfishing	14.3%	People not respecting the PGEM regulations	13.0%
Declining fish populations	11.9%	Tourist activities	13%
The PGEM	11.9%	The population	8.7%
The population	11.9%	Declining fish populations	8.7%
Algae	9.5%	The PGEM	4.3%
Climate change	7.1%	Climate change	0%
Other	7.1%	Other	43.5%

[1]Results from the question "What are the biggest problems for the lagoon?" which appeared in both surveys. Respondents were able to select more than one answer for this question.

When it came to identifying the goals of management, the top two selected goals from the 2021 survey (Table 4) were making sure everyone respected the PGEM regulations (33.3%) and involving the community in management (21.4%). On the other hand, the top two selected goals from the 2022 survey (Table 4) included protecting the lagoon resources (26.1%) and a tie between making sure everyone respects the PGEM regulations and implementing *rahui*, which is a traditional Polynesian management practice connected to local knowledge and kinship systems (17.4%). However, a large proportion of 2022 respondents also chose to provide goals that were not in the answer selections (47.8%). At this point in the survey, discussing other goals of management took a semi-structured interview format; however, a few goals were mentioned by more than one fisher. These reported goals included devolving *all* of the decision-making authority to fishers (28.6%) and changing the mindsets of fishers who are perceived to be self-interested in order to encourage them to adopt more sustainable fishing practices in order to protect the lagoon for future generations (14.3%).

In the semi-structured interviews, many fishers expressed concern about the younger generations fishing in the lagoon, claiming that they often use less sustainable fishing practices and lack an intimate knowledge of and connection to the lagoon. When comparing the fishers' perceptions of the most pressing problems in the lagoon by age group (Table 5), a few differences emerged. For example, fishers aged 18 to 30 appeared to be the most concerned about pollution in the lagoon, with 71.4% indicating this issue as one of the biggest problems, whereas only 20% of fishers aged 71 and above selected this as a problem. The same trend appears in the concern over tourist activities in the lagoon, as 57.1% of fishers aged 18 to 30 indicated this lagoon use as a primary concern, while only 20% of fishers aged 71 and above selected this issue during the survey portion of the interview.

However, a higher proportion of fishers (40%) aged 71 and above indicated that the PGEM itself is one of the biggest problems in the lagoon, whereas only 14.2% of fishers belonging to the 18 to 30 age group selected this perceived problem as an issue. When selecting the PGEM as one of the largest problems, many fishers expressed concern about the

management framework being ineffective and bad for the lagoon. Sometimes the perceived inefficacy of the management framework was linked to religious beliefs, as some fishers maintained that the PGEM impeded God's ability to provide for the fishers. This argument was often expressed through the belief that God will always provide for them, which meant that the more one fishes, the more fish there are in the lagoon. In this sense, the fishers argued that the PGEM was the culprit behind the declining fish populations as it prohibits fishing in parts of the lagoon (as less fishing means fewer fish in the lagoon). A higher proportion (40%) of the 71 and up age group also selected "The population" as one of the most pressing issues, compared to the fact that none of the fishers in the 18 to 30 age group indicated this concern as one of the most significant problems.

Table 4 Comparison of fishers' main goals of management from 2021 and 2022 fisher surveys[1]

2021 Survey Responses (*n* = 42)		2022 Survey Responses (*n* = 23)	
Goal	**Percent**	**Goal**	**Percent**
Making sure everyone respects regulations	33.3%	Protecting lagoon resources	26.1%
Involving the community in management	21.4%	Making sure everyone respects regulations	17.4%
Protecting lagoon resources	16.7%	Implementing *rahui*	17.4%
Implementing *rahui*	11.9%	Involving the community in management	13.0%
Communication between the groups involved in management	11.9%	Communication between the groups involved in management	13.0%
Making sure everyone respects the lagoon	11.9%	Fair enforcement	4.3%
Fair enforcement	2.4%	Control tourism activities	4.3%
Control tourism activities	2.4%	Making sure everyone respects the lagoon	0%
Other	33.3%	Other	47.8%

[1]Results from the question "What should be the main goals when it comes to managing the lagoon?" which appeared in both surveys. Respondents were able to select more than one answer for this question.

Table 5 Fishers' perceptions of problems in the lagoon by age group[1]

Age Group	Pollution	Tourist activities	People not respecting the PGEM regulations	Damaged coral reefs	Over-fishing	Declining fish populations	The PGEM	The population	Algae	Climate change	Other
18-30 (*n* = 7)	71.4%	57.1%	--	28.6%	28.6%	14.3%	14.2%	--	14.3%	--	42.9%
31-50 (*n* = 20)	55.0%	15.0%	10.0%	10.0%	15.0%	15.0%	5.0%	5.0%	--	5.0%	25.0%
51-70 (*n* = 21)	57.1%	28.6%	19.0%	28.6%	14.3%	4.8%	4.8%	14.3%	19.0%	4.8%	14.3%
71+ (*n* = 5)	20.0%	20.0%	20.0%	--	20.0%	20.0%	40.0%	40.0%	20.0%	20.0%	--

[1]Results from the question "What are the biggest problems in the lagoon?" which appeared in both the 2021 and 2022 fisher surveys (n = 54). Only the most recent responses were counted for those who were interviewed during both years. Respondents were able to select more than one answer for this question.

3.2 TECHNOCRATIC PRODUCTIONS OF "SUCCESS" IN THE PGEM

Most technocratic evaluations of community-based conservation projects conform to a specific format that has become the accepted norm within the academic or expert community. Whether it is peer-reviewed publications or government documents, technocrats typically begin their evaluation by describing and establishing the "setting." This introduction usually involves the use of one of the most powerful ordering devices, a cartographic representation of the research area (Fig. 1). Maps stabilize the authority of technocrats by redistributing forms of knowledge from some stakeholders, such as fishers, towards researchers who produce and annotate the map, situating the setting relative to a "global context." In addition to cartographic representations, the authors of technocratic reports and articles further strengthen their interpretation of reality by drawing on previous literature to compose an overview of the local demographics and culture, a history of the topic in question (in this case being the history of the PGEM), as well as a summary of the relevant ecological characteristics.

Why is it important to include this context? For technocrats, situating a conservation project within a broader "context" is a useful means to further assert their authority and composition of success. Providing an ecological context of the setting is a nod to the biological characteristics that are deemed to be "relevant" and "necessary" by the technocratic community, whereas providing the social, cultural, political, and economic context appeal to the social characteristics required for a thoughtful analysis. When other technocrats assess the interpretation of reality put forth in these documents, the provided context serves as the backdrop of the author's line of reasoning and methodology. For example, when assessing the author's composition of success (in terms of what prescriptions they provide to improve management), the context provided by the author helps show the reader (i.e., other technocrats) how the context led to these prescriptions in combination with the research that was conducted on the specific topic. However, the legitimacy of the technocrat's interpretations of a conservation project are also often tied to the applied significance of the research. Rather than confining the knowledge generated in this research to its local setting, technocrats often expect that the research will contribute to a greater cause, "research gap," or some other greater body of knowledge. In other words, the validity

of the prescriptions put forward by the technocrat is strengthened if they can be applied in different contexts around the world.

Even social scientists who have an interest in the cultural aspects of the target population rarely reflect on this redistribution of expertise away from fishers and other stakeholders towards technocratic experts. Indeed, the goal of technocratic literature is not to draw in a wide range of readers and broaden their comprehension about a research topic; rather it is to chase away and exclude those readers who do not have a similar understanding of the project being assessed. With this in mind, the success of a research article is not based on its popularity among a diverse pool of stakeholders but instead on its capacity to discriminate against as many stakeholders as possible except those that count for the technocrat: their own stakeholder group (scientists, government officials, etc.). By presenting an assessment in a manner that is consistent with the language and structure that is considered commonplace, it is much more likely to be accepted by the technocrat's community and that version of the project's interpretation is strengthened. For technocrats, the key test of an article's viability is peer review. Similar to other stakeholders, the technocrat's goal is to stabilize their interpretation of reality and their version of success by following the common practices of their community. A technocratic framing of the "setting" of the PGEM would resemble a structure similar to the one that follows.

Located in the southern Pacific Ocean, French Polynesia consists of 118 islands scattered across 4,167 square kilometers and is home to approximately 300,000 people (Central Intelligence Agency 2022). French Polynesia comprises five archipelagos, including the Society Islands, the Tuamotu Archipelago, the Gambier Islands, the Marquesas Islands, and the Austral Islands. Hosting approximately 70% of the nation's population, Tahiti is the most populous island in French Polynesia and is also home to the nation's capital, Papeete (Central Intelligence Agency 2022).

Located 12 miles northwest of Tahiti, Moorea is an island of French Polynesia that is divided into five districts: Afareaitu (the municipal seat of the Municipality of Moorea-Maiao), Haapiti, Papetoai, Paopao, and Teavaro. The island is enclosed by a barrier reef fragmented by 11 reef passes, encompassing a lagoon that covers 49 square kilometers with a width ranging from 500 to 1,500 meters and a depth from 0.5 to 30 meters (Leenhardt et al. 2016). Within the lagoon, there is considerable variation in fish populations, disturbances,

and recovery rates among various reef habitats. The lagoon ecosystem faces numerous threats, such as fluctuating algal coverage, coral bleaching events, wavering fish populations, and outbreaks of crown-of-thorns sea stars.

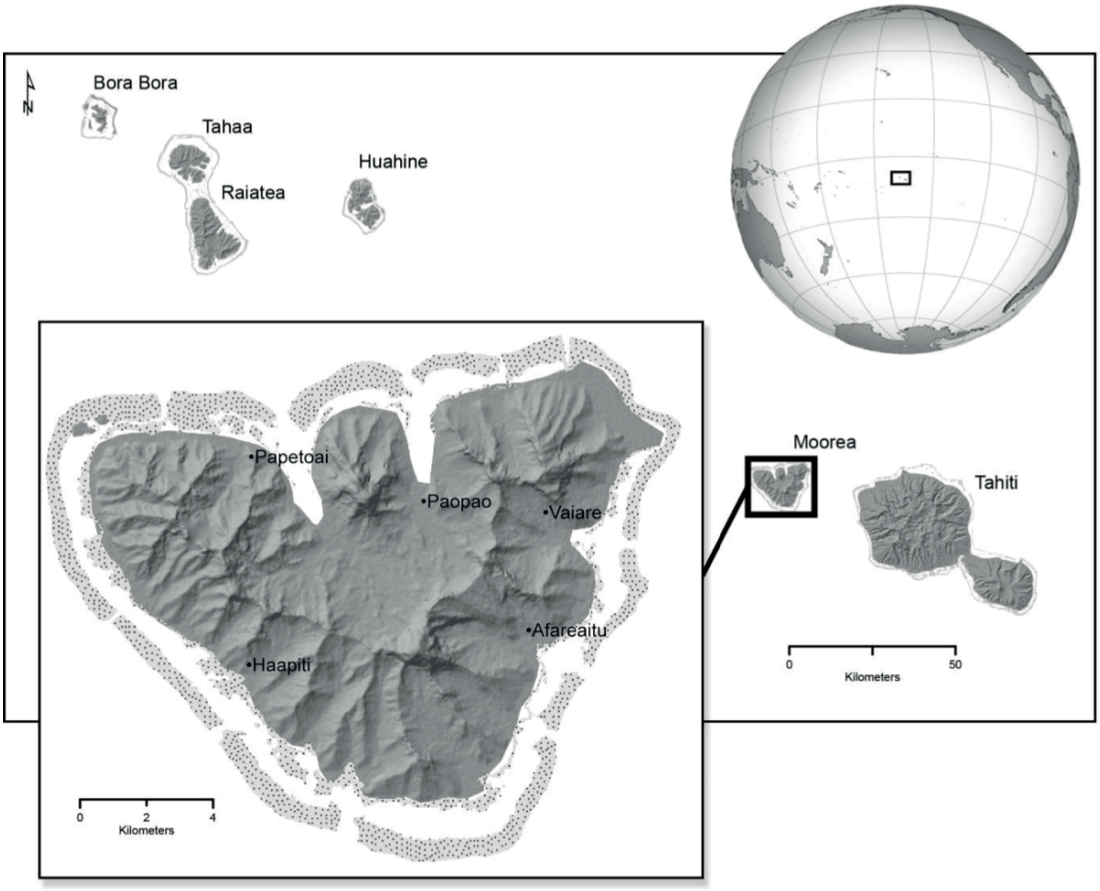

Figure 1 Map of Moorea in relation to the Society Islands (from Hunter 2017)

Subsistence fishing is an integral element of the livelihoods for many in the Pacific, with roughly 80% of total fish production in the South Pacific being consumed within small-scale subsistence fisheries (Leenhardt, Moussa, and Galzin 2012). In French Polynesia, it has been estimated that roughly 79% of fish production consists of fish caught within lagoons, with roughly 3,400 tons of these fish being consumed each year (Leenhardt, Moussa, and Galzin 2012). On Moorea, the lagoon surrounding the island serves as an important small-scale fishery that is a primary source of livelihood for many of the island's inhabitants. In fact, the annual fish consumption on Moorea (110 kilograms per year) is almost five times greater than the average 23 kilograms consumed in other parts of the Pacific (Labrosse, Ferrais, and Letourner 2006; Young 2002). While the lagoon serves as an essential source of

cultural heritage and food security for many on the island, it is also central to the growing tourism industry on Moorea. In recent years, there has been rising concern over the sustainability of the lagoon, which ultimately led to the establishment of the original PGEM in 2004.

3.2.1 French Colonialism & The Economic Development of French Polynesia

The first documented European contact in French Polynesia was in 1520 with the arrival of Ferdinand Magellan (Central Intelligence Agency 2022). The country would later become an official colony of France in 1880. As European colonialism penetrated the Pacific, the ecosystems and traditional land tenure systems were subjected to dramatic transformations by settler exploitation. These dramatic transformations were also shaped by intensive agriculture and the introduction of domesticated plants and animals (Flexner 2014). On Moorea, this ultimately led to a shift away from a predominantly subsistence-based economy to one that was focused on tourism development and cash crops such as vanilla and copra (Leenhardt et al. 2016). In 1946, the French Republic changed the status of French Polynesia from a "colony" to an "overseas territory" in response to a Tahitian nationalist movement and ultimately granted French citizenship to the inhabitants of French Polynesia (Central Intelligence Agency 2022). The relocation of French nuclear testing to French Polynesia in 1962 provided an impetus for economic development as the consequent expansion of infrastructure, including an international airport in Papeete. This opened the country to more international travelers and greater tourism revenue (Walker 2001). In the 1960s, the expanding economy attracted residents from other parts of French Polynesia to the nation's capital for employment opportunities. The establishment of a regular ferry service between Moorea and Tahiti also provided the opportunity for individuals residing on Moorea to commute to Papeete for employment, consequently transforming Moorea into a "suburb" of the nation's capital (Walker and Robinson 2009). The tourism industry has been steadily growing in French Polynesia. In 2012, French Polynesia's service sector, which predominantly consists of tourism activities, made up 85% of the total value added to the nation's economy (Central Intelligence Agency 2022).

The detrimental health effects of nuclear testing have since become a point of political contention amongst Polynesians, fueling anti-colonial sentiments towards the French

Republic (United Nations 2018). Upon the termination of French nuclear testing in 1993, the territorial government established *Le Pacte de Progrès*, an economic development plan meant to supplement the loss of French funding from the nuclear testing program by focusing on the key sectors of tourism, export agriculture, and commercial fishing. However, resources were predominantly allocated to the tourism industry as it funded projects including the construction of new hotels, improvements to existing hotels, and loans to tour companies (Walker 2001).

In 2004, French Polynesia was granted a higher degree of autonomy under the Organic Act, allowing the country to govern itself and exercise any powers that were not held by the French Republic, including control over most environmental affairs (Communauté du Pacifique and INTEGRE 2017). Although the country experiences more autonomy than other French territories, the French Republic still maintains jurisdiction over matters concerning "money, credit, international relations, higher education, and the military and police forces" (Poirine 2010, 24). The local governance structure of French Polynesia consists of an elected territorial assembly, 48 municipal councils, along with an Economic, Social, and Cultural Council. French Polynesia also holds positions in the government of the French Republic as it is represented by two senators and two deputies in the French Parliament and one seat on the national Economic, Social, and Environmental Council (Communauté du Pacifique and INTEGRE 2017, 8). The culmination of the impacts of European colonialism and economic development has led Moorea to become a "complex entanglement of neo-colonial agitation, dynamic coral reefs, powerful hotel conglomerates, vocal fishing communities, and a resurgence of Polynesian identity and culture" (Hunter et al. 2018, 78).

3.2.2 The *Plan de Gestion de l'Espace Maritime* (PGEM)

The *Plan de Gestion de l'Espace Maritime* (PGEM) is considered one of the first management frameworks of its kind in the Pacific. Beginning in the 1990s, the formation of the PGEM was consistent with the priorities of the time as participatory, community-based frameworks dominated the discourse within the conservation and development sectors (Walley 2004). The development process of the PGEM included opportunities for community involvement and representation, primarily through opening the framework to public inquiry prior to its ratification as well as the establishment of a permanent

management committee that granted seats to different stakeholder groups affected by the PGEM. The official development of the framework began in 1992 with a "collegial technical body" that consisted of French Polynesia's ministries of planning, fishing, and the environment, which established the administrative, budgetary, and technical dimensions of the framework (Municipality of Moorea-Maiao 2021, 22268). Three years later, the municipality of Moorea-Maiao submitted a request to the territorial government to implement the management plan on their island. At this time, the main concern that motivated the establishment of the PGEM was to preemptively account for potential conflicts that would arise due to the expansion of the island's coastal development and activities in the lagoon. With this in mind, the PGEM was initially established as a "tool" that gave both the municipality and the territorial government the ability to define long-term guidelines for the development of Moorea's lagoon through the establishment of eight marine protected areas and two regulated areas in the lagoon (Fig. 2). The primary issues of concern included safety, the protection of marine resources, nautical activities, tourism development, environmental protection, and cultural promotion (Municipality of Moorea-Maiao 2021).

Given that this type of framework was unprecedented in French Polynesia, the initial development of the PGEM would take over a decade before the framework was validated by the Council of Ministers on October 21, 2004. Governance capacity was subsequently allocated to a permanent committee that would be responsible for considering proposals relating to lagoon activity and reporting difficulties regarding the implementation of the PGEM to the territorial government. Aimed to represent all the stakeholder groups involved in the management of the lagoon, the permanent committee consisted of representatives from the following sectors: the territorial government, the municipality of Moorea-Maiao, and "representatives of the economic, social, cultural, environmental and scientific actors of Moorea" (Municipality of Moorea-Maiao 2021, 22269). In the following years, the PGEM was deemed by the municipality to have optimistic results, with officials citing a significant behavioral change in island residents and visitors as well as a perceived increase in marine resources in the lagoon (Municipality of Moorea-Maiao 2021). However, for many actors, the PGEM has been a point of contention as the agendas of various users of the lagoon conflict in a manner that inhibits effective participation and undermines the efficacy of the management initiative. Due to the widespread controversy and criticism surrounding the

original PGEM, the municipality officially began a collaborative revision process in 2015, which led to the ratification of the revised management framework in September 2021.

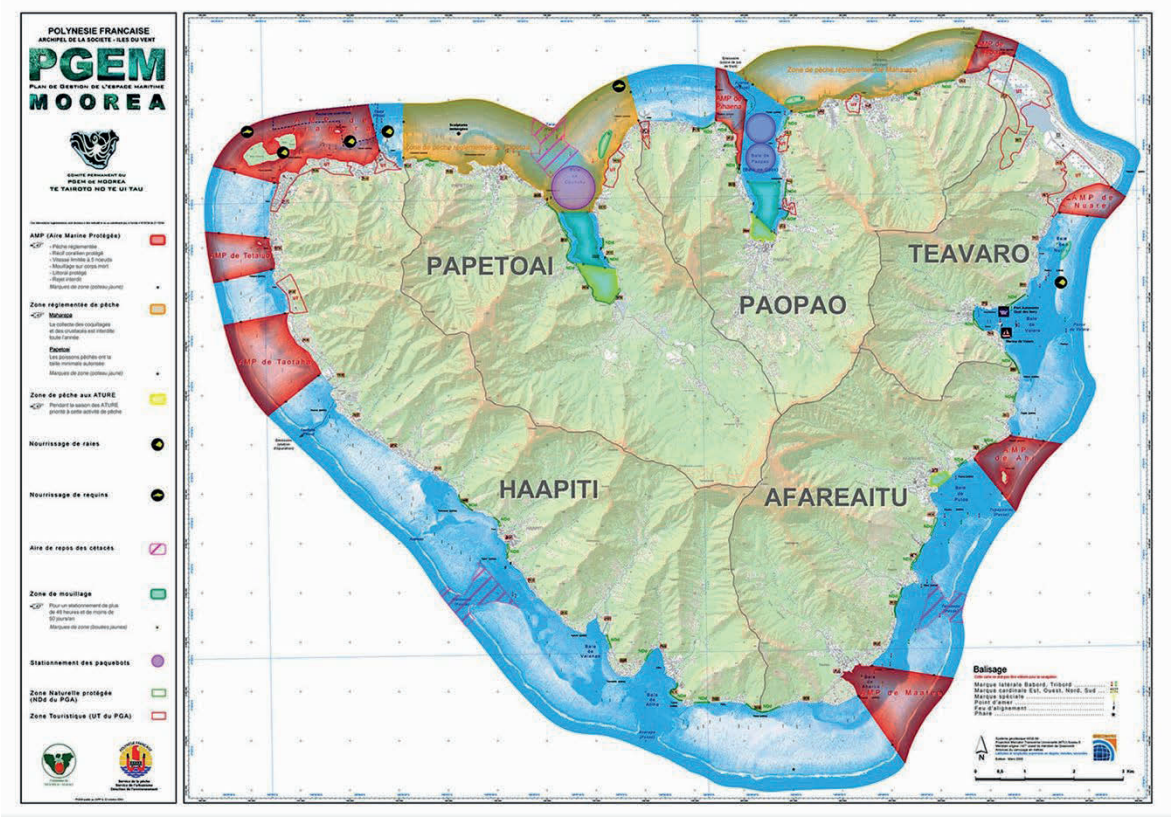

Figure 2 Map of the original PGEM established in 2004

3.2.3 The Revised PGEM

Some of the primary criticisms addressed in the revisions include the lack of legal efficacy, governance, funding and resources, and the ability to adapt to increasing populations, changing lifestyles, and increased lagoon activities (Municipality of Moorea-Maiao 2021). In order to achieve adequate representation of various stakeholder interests in the revisions, the Municipality of Moorea-Maiao consulted with two international sustainable development projects to implement an efficient consultation process with stakeholder groups that were identified to be relevant in terms of providing input on the revision of the PGEM. This consultation process was followed by a series of meetings with local stakeholder groups on Moorea and relevant departments of the territorial government in order to "collect their opinions, needs, experiences and proposals" that would be incorporated, as much as possible, into the revised framework (Municipality of Moorea-Maiao 2021, 22270).

After consulting with the various stakeholder groups, it became evident that three primary necessities needed to be addressed. These needs included assigning the role of guiding the PGEM implementation process to the *Comité de Gestion de l'Espace Maritime de Moorea*[8] (translated into the Maritime Space Management Committee of Moorea, formerly known as the permanent committee), establishing a manager who is responsible for implementing and monitoring the PGEM, and to "reinforce the good governance" of the PGEM committee, which involves the creation of a strategic document to guide the appointed manager with the implementation and surveillance of the framework (Municipality of Moorea-Maiao 2021, 22270). Concerns that were raised during the consultation process are also addressed in the eight main objectives of the revised PGEM (Table 6).

Table 6 Objectives of the revised PGEM (Municipality of Moorea-Maiao 2021)

Objective	Role in the PGEM
Promotion of cultural heritage	Involves the incorporation of local knowledge into the management of fishing practices as well as efforts to promote the transmission of cultural heritage to younger generations. A representative of Moorea's cultural associations also holds a seat on the PGEM committee.
Safeguarding and restoring the coastline	Involves the establishment of zones dedicated to coastline restoration along with other efforts to preserve and protect natural coastal areas and the restoration of coral reefs. New projects are required to be authorized by the PGEM committee after assessing the potential impacts the activities may have on the coastline and environment.
Equitable access and safety of the lagoon	Involves the new zones with security, environment, and tourism goals *(zones à vocation sécuritaire, environnementale et touristique*). Lagoon activities are regulated in order to ensure the safety of lagoon users (via speed limits, restricted activities, and other regulations). Public beaches are also protected (motorized boats are also prohibited from these areas).
Sustainable development of nautical and recreational activities	Involves the new zones for the sustainable development of activities (*zones à vocation de développement durables des activités*), limiting the damaging effects of nautical activities, and the goal to limit conflict between lagoon users. The zones were established in areas of the lagoon where multiple activities occur.

[8] For the sake of brevity, the *Comité de Gestion de l'Espace Maritime de Moorea* will be subsequently referred to as the PGEM Committee

Promotion of sustainable and equitable fishing	Involves the establishment of district-level fishing committees who are responsible for implementing "responsible and fair" fishing practices in the PGEM's sustainable and fair fishing zones (*zones à vocation de pêche durable et equitable*).
Improving communication strategies and local awareness	Expert consultants from the RESCCUE and INTEGRE sustainable development projects assisted with determining the most effective approaches to engaging with the public. Current strategies include community meetings, announcements at local churches, signs, and engaging with "legitimate" stakeholders in the local community.
Securing a participatory co-management structure of the PGEM	Involves granting seats on the PGEM committee to the various stakeholder groups involved in the PGEM, including the tourism industry, fishing committees, and technocratic institutions[2]
Protection of marine species, ecosystems, and landscapes	This is the primary objective of both the original and revised PGEM. Involves regulations on all activities taking place in the lagoon

[1]Refer to Fig. 3 for a map of the revised PGEM zones
[2]Refer to Table 7 for more information on the structure of the *Comité de Gestion de l'Espace Maritime de Moorea*

3.2.4 Role of Stakeholder Groups in the Revised PGEM

In what was formerly known as the permanent committee, the PGEM committee includes representatives of the various stakeholder groups on Moorea who are granted voting rights in the decision-making process (Table 7). The structure of the PGEM committee includes representatives from the municipality of Moorea-Maiao (with the mayor serving as the committee chair), the district-level fishing committees (which was one of the most notable updates to the PGEM), the tourism industry, cultural organizations, environmental organizations, scientific institutions[9], as well as the territorial government agencies involved in the PGEM (i.e., the fisheries service, department of urban planning, the environment agency, and the department of maritime affairs). Members without voting rights who are able

[9] The two scientific institutions on Moorea include CRIOBE (Centre of Island Research and Environmental Observatory), a research center affiliated with the French *Université Perpignan*, and the UC Berkeley Gump Research Station, which is primarily affiliated with UC Berkeley and other University of California institutions

to sit on the committee include the autonomous port of Papeete, the appointed manager of the PGEM (responsible for implementing and monitoring the management plan), and sectors of the territorial government responsible for tourism, land affairs, equipment, and culture. Along with developing the strategic document for the implementation of the revised PGEM, the committee is also consulted on matters that concern proposals for activities in the lagoon, commercial navigation, terrestrial activities that have an impact on the coastline and lagoon, scientific research in the lagoon, environmental restoration projects, and various tourist activities (e.g., sailing, kitesurfing, stingray, and shark observation sites, etc.). When presented with proposals, the PGEM committee votes on a final decision that is passed on to the "competent authorities of the territorial government" (Municipality of Moorea-Maiao 2021, 22273). However, the decisions made by the committee are only considered opinions as the territorial government can go against the committee's decision if they have reason to do so. The committee is also able to request the intervention of "competent authorities" in the event of a violation of the PGEM so that "legal action can be taken" (Municipality of Moorea-Maiao 2021, 22275). The committee will also be responsible for developing an annual report on the PGEM that will be delivered to the "competent authorities" in the territorial government.

Along with holding seats on the committee, the Municipality of Moorea-Maiao also serves the role of the manager of the PGEM. Some of the primary responsibilities of the municipality in this capacity include the execution of the committee's validated action plan for PGEM implementation, monitoring, and evaluation. The manager is also responsible for ensuring regulatory compliance and submitting an annual operations report to the PGEM committee. In order to monitor the efficacy of the PGEM, the municipality is expected to develop an evaluation tool that considers ecological, economic, social, and cultural criteria.

Table 7 Composition of the *Comité de Gestion de l'Espace Maritime de Moorea* (Moorea Maritime Space Management Committee)

Members with voting rights:	
Stakeholder Group	Members
The municipality of Moorea-Maiao	- The mayor of the municipality of Moorea-Maiao - The deputy mayors for the five districts on Moorea

Fishing community	- Five representatives of the district-level fishing committees (appointed by each committee)
Territorial government of French Polynesia	Representatives from: - The Directorate of Marine Resources (*Direction des Ressources Marines*) - The Urban Planning Department (*Service de l'Urbanisme)* - The Environment Agency (*Direction de l'Environnement*) - The Department of Maritime Affairs (*Direction Polynésienne des Affaires Maritimes*)
Tourism industry	- Five representatives of tourism activities (appointed by Moorea's tourism committee)
Scientific Institutions	- Representative from the local scientific institutions on Moorea (UC Berkeley Gump Research Station and CRIOBE)
Local NGOs/associations	- Representative of the environmental protection associations on Moorea - Representative of the cultural associations on Moorea
Members without voting rights:	
Stakeholder Group	Members
The municipality of Moorea-Maiao	- The appointed manager of the PGEM (from the municipality)
The territorial government of French Polynesia	- The Tourism Service (*Service du Tourisme)* - The Equipment Directorate (*Direction de l'équipement* - responsible for managing construction and public facilities) - The Department of Land Affairs (*Direction des Affaires Foncières)* - Culture Service (*Service de la Culture*)

3.2.5 Zoning under the Revised PGEM

Under the revised PGEM, the term "marine protected area" has been discarded; however, there are still protected zones that operate similarly to MPAs and cannot be modified until the next revision of the PGEM. The zoning of the lagoon under the revised

PGEM (Fig. 3) has changed considerably and is organized into zones known as *Vocations Générales* and *Vocations Particulières* (Municipality of Moorea-Maiao 2021). The *Vocation Générales* are loosely defined zones in the lagoon that do not have specific regulations and are instead to be used as a way to assist the PGEM committee in making decisions on which types of activities should be prioritized in these areas. On the other hand, there are four categories of *Vocations Particulières* that are clearly defined in the revised PGEM text and resemble the eight MPAs and two regulated zones that were established in the original PGEM (Fig. 2). The zones include: 1) z*ones à vocation de protection de l'environnement* (environmental protection areas), which have the main priority of protecting the environment but do not completely prohibit fishing, 2) *zones à vocation de pêche durable et équitable* (areas dedicated to sustainable and fair fishing), which fall under the authority of the district level fishing committees and territorial government's Directorate of Marine Resources (DRM), 3) *zones à vocation de développement durables des activités* (areas for the sustainable development of activities), which regulate tourism activities, and 4) *zones à vocation sécuritaire, environnementale et touristique* (zones with security, environmental and tourism goals), which are essentially two of the previous MPAs from the original PGEM that prohibit fishing with limited exceptions (Municipality of Moorea-Maiao 2021).

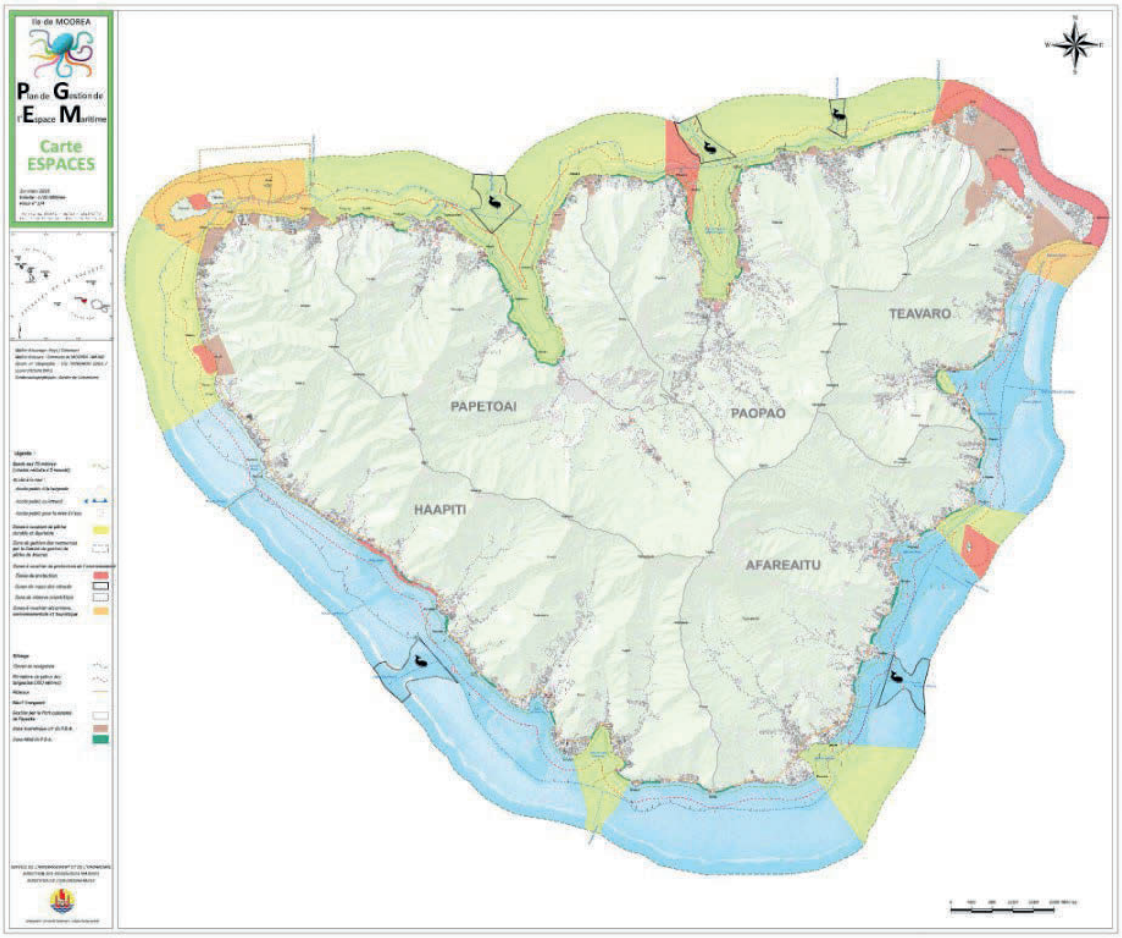

Figure 3 Map of the revised PGEM. The goal-driven zones on this map include environmental protection zones (red), sustainable and equitable fishing zones (green), and security, environmental, and tourism zones (orange)

3.2.6 The PGEM Revision Process

The influence of the technocratic interpretation of a "successful" PGEM would continue to impact the implementation of the framework as it went through the revision process that began in 2015. The framework itself was predominantly produced by technocrats in the sense that most of the revision process was controlled by government officials in collaboration with expert consultants from the ecological and social sciences, who assisted in identifying management priorities and developing effective strategies to engage with local stakeholders. As the need for revisions became more apparent, the Municipality of Moorea-Maiao recruited consultants from two international projects: the Pacific Territories' Initiative for Regional Management of the Environment (INTEGRE) and the Restoration of

Ecosystem Services and Adaptation to Climate Change (RESCCUE). The enlistment of expert consultants thus also invited the influence from actors at the higher scales of conservation efforts through the involvement of these projects that are funded by global institutions such as the European Union, the French Development Agency, and the French Global Environment Facility.

Funded by the European Union from the 10th European Regional Development Fund, the INTEGRE project focuses on sustainable development and integrated coastal zone management (ICZM). ICZM is an iterative and interdisciplinary approach to promote sustainable coastal management that is founded on principles including "the use of participatory and deliberative processes, institutional integration and coordination, the application of science to decision-making, and human and technical capacity development" (Rosendo, Celliers, and Mechisso 2018, 29). The INTEGRE project's involvement in the PGEM revision process mainly consisted of assisting with efforts to address sustainable development challenges, establishing participatory governance structures that involve the local community in decision-making, communicating with local actors on the importance of conservation and the PGEM, and implementing management strategies (Communauté du Pacifique and INTEGRE 2017). Given its focus on ICZM, the approach employed by the INTEGRE project rested on the assumption that technocratic knowledge is the foundational ingredient for project success. INTEGRE's involvement began with a SWOT analysis, or an assessment of the current management scheme's strengths, weaknesses, opportunities, and threats. Variables identified in the analysis focused on factors such as ecosystem health, economic opportunities, land use, bureaucratic obstacles, and more. While the project's action plan framed the establishment of the PGEM as a strength that provided the opportunity for a revision process that could improve the framework, the report also addressed weaknesses and threats concerning the PGEM (Communauté du Pacifique and INTEGRE 2017). Aside from over-harvested marine resources and declining marine ecosystem health, the SWOT analysis also expressed concerns over the lack of institutional resources for PGEM implementation along with "community resistance to political leaders and projects" (Communauté du Pacifique and INTEGRE 2017, 34).

The RESCCUE project was active from 2014 to 2019 and received a total of 8.5 million euros that were predominantly funded by the French Development Agency and the

French Global Environment Facility (Charles et al. 2018). The project also focused on the promotion of ICZM and sustainable development and hired consultants to carry out several pilot studies to inform the improvement of marine management, including one study on Moorea. Consultants from the RESCCUE project took on the role of designing strategies to communicate with and involve the local community in the PGEM revision process. After conducting a series of workshops with members of the territorial government, the municipality, and representatives of the local community, the consultants developed a path to success (Fig. 4) for the revision of the PGEM, with success relying on the qualifier that the community is meaningfully involved and represented in the revision process. However, what degree of community involvement could be considered "meaningful" remains unclear.

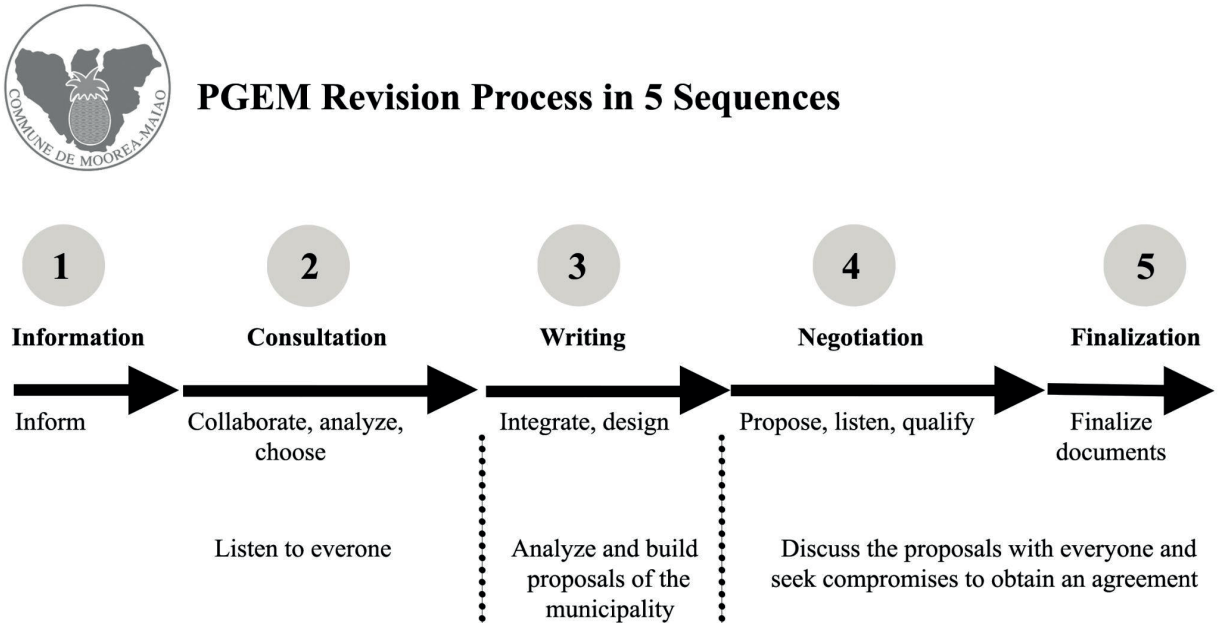

Figure 4 RESCCUE's 5-step process to a "successful" PGEM revision process. This is an English-translated version of the original graphic provided in the "Rapport Final du Projet RESCCUE en Polynesie Française" (Charles et al. 2018).

RESCCUE's technocratic composition of success is expressed through their final report that is centered around "keys to success" that stress the importance of meaningful collaboration with and integration of the local community into the decision-making process without entirely discarding the important, if not dominant, role of government agencies. Arranged in a five-step process, RESCCUE's plan would have an active influence on how the revision process would be carried out as the municipality would follow a similar process to what was expressed in the consultants' final report (Fig. 4).

Figure 5 Photos of RESCCUE workshops (Charles et al. 2018)

In RESCCUE's final report on its operations in French Polynesia, the section reviewing the PGEM revision process provided a variety of photographs (Fig. 5) displaying the implementation of this five-step process. The photos featured scenes of public presentations of the PGEM with various speakers and PowerPoint presentations, various actors surrounded by an array of documents discussing what can be assumed to be matters relevant to the PGEM, demonstrations of fish size regulations through the use of fish catch (indicating what the minimum regulated size of different fish actually looks like), along with an image of a graphic covered with post-it notes of various ideas (Charles et al. 2018, 18-20).

While the five-step process developed by RESCCUE seeks to achieve a more democratic and collaborative approach to community-based marine management, there is little discussion over the challenges that come with "listening to everyone" and "seeking compromises to obtain agreement" (Charles et al. 2018, 18). Given that complete agreement amongst all stakeholder groups is in practice highly problematic, the degree of "agreement" necessary for a successful PGEM remains unclear. In fact, there was a considerable number of fishers who did not attend any of the meetings, either due to their lack of awareness or inability to attend due to time constraints (as many fishers noted that they could not afford to take time away from fishing to attend a meeting). With this in mind, the process of "listening to everyone" was contingent on which actors attended the meeting. While many fishers expressed that they felt that they were listened to during the revision process (and that the consequent revisions were thus representative of their interests), others criticized the process based on arguments that those who attended the meetings, including people from the community, were not "real" fishers (in the sense that they do not make a living from fishing) and the revisions thus did not adequately reflect the priorities of the fishers.

Overall, the role of expert consultants in the PGEM's revision process reveals the technocratic approach assumed by management officials. The PGEM revisions, as crafted by its staff, assume that experts, in this case being social and ecological scientists from internationally funded sustainable development organizations, are in the best position to produce an accurate interpretation of management that will serve as a useful guide to improve the management scheme. The knowledge generated by the pilot studies and workshops conducted by consultants with local stakeholders was repurposed in project reports as a tool to assert expert authority over management actions and guide the PGEM towards their version of success.

In terms of assessing whether these revisions would make the PGEM more effective, 33.3% of the fishers I interviewed refrained from providing a definite prediction and instead indicated that they would have to wait and see how the revised PGEM would be implemented before they could judge its efficacy. Only 9.5% of fishers stated that they believed the revisions would improve the PGEM. On the other hand, while none of the municipality representatives we spoke to expressed pessimistic predictions for the future of the PGEM, the majority (63.6%) of municipality representatives maintained a similar

hesitance to provide a definite prognosis, expressing sentiments along the lines of "we will just have to wait and see." The remaining 36.4% of the municipality representatives indicated that they believe the revisions will make the PGEM more effective. When the municipality would discuss the anticipated improvements of the PGEM, they would often mention the meetings facilitated by RESCCUE as a justification for their optimism, claiming that the fishers' participation, which they determined to be meaningful, would lead to more fishers respecting the new regulations given that they played a significant role in revising the framework.

As is the case with many social scientists' approaches to understanding CBC initiatives, the revision process of the PGEM was guided by expert-identified, common, and easy-to-grasp variables that illuminate pathways to improve the efficacy of the marine management framework. The primary goals prescribed by experts, in consultation with the local community, are best represented in another infographic (Fig. 6) that came out of the revision process, featured as a figure in RESCCUE's final report with the title *"Le lagon de Moorea bien géré à long terme"* (Moorea's lagoon well managed in the long term). The center of the infographic displays an octopus, which is a reference to the origin story of Moorea in which it was believed that an octopus lived on the island's famous Mount Rotui, separating Moorea into two bays, Cooks Bay and Opunohu Bay, with each tentacle being understood as one of Moorea's valleys (Wencélius, Lauer and Bambridge 2022). The octopus also serves as the "divine protector of Moorea and symbol of peace and unity" (Tahiti Nui Travel n.d.) On the infographic, each tentacle of the octopus extends to one of the ten identified long-term goals for the management of Moorea's lagoon (Fig. 6).

Figure 6 Goals of management defined by the PGEM. Entitled "Moorea's lagoon well managed in the long term." Translated into English in clockwise order from the top-right corner, the ten goals are 1) preserved species and landscapes, 2) communication and enhanced awareness, 3) participatory management and balanced governance, 4) supervised pleasure boating (anchoring/mooring), 5) sustainable and fair fishing, 6) supervised and respectful water activities (tourism & leisure), 7) access to the sea for all, 8) safety for all guaranteed, 9) coastline preserved and restored, and 10) *Maohi* cultural heritage safeguarded and enhanced (Charles et al. 2018)

These objectives would have an active influence on the revision of the PGEM as they were infused into the first chapter of the revised document that reflects these priorities in the scope of the management framework (Table 6). The inclusion of the octopus in the infographic defining these long-term objectives also represents an effort on behalf of the consultants and municipality to infuse cultural values into the revised framework.

3.2.7 Natural and Social Scientists' Production of PGEM "Success"

As reflected in the scientific literature on marine management, the technocratic framing of success is often determined by ecological evaluations that create accurate, peer-reviewed, and methodologically sound results. Several studies have been conducted on the PGEM by both natural and social scientists. In a recent evaluation of the PGEM, Thiault et al. (2019) echo the priorities of the global marine management agenda as they maintain that

MPAs are a “useful tool” to successfully carry out fisheries management and resource conservation. In order to assess the efficacy of the marine protected areas established by the PGEM, the authors argue that *ecological data* on the state of the lagoon prior to the framework is necessary. The authors of this study go on to discuss their approach to assessing the efficacy of the PGEM, which consisted of a series of repeatable data collection spanning over 12 years in both protected areas and non-protected areas, and at times before and after the establishment of the PGEM (Thiault et al. 2019). The primary methods used in this survey were survey sampling and the point-intercept transect method, both of which require the scientists to go into the lagoon and quantify their observations of the ecosystem that can be compared to other observation sites. When conducting point-intersect transect sampling, scientists break down the lagoon into different transects of a specified size. In order to collect data on ecological characteristics such as fish biomass and population density, scientists count the number of fish (or other characteristics such as fish size) that pass through the transect over a specified amount of time. The point-intercept transect method was also used to estimate coral and algal cover in the lagoon, in which 50 points (equally spaced apart) were marked along each transect that were used to indicate the presence of algae or coral.

The data collected from these methods was then used to extrapolate predictions on the health of the lagoon, which was consequently used to infer the efficacy of the PGEM in relation to the metrics that were measured. The discussion of methods is marked by a significant degree of specificity as the repeatability of experiments is integral to the perceived integrity of the conclusions made from such experiments. Despite the lack of abundant baseline data on marine ecosystem health (in comparison to terrestrial ecosystems), the authors compare the data collected before and after the establishment of the original PGEM to determine whether or not it has satisfied their framing of success (i.e., significant improvements in identified biological metrics). Although the data indicated improvements in metrics such as fish density and biomass, the authors refrained from framing the PGEM as a complete success due to the fact that most of their findings lacked statistical significance and were considered “small” in comparison to analyses of ecological responses to other MPAs (Thiault et al. 2019). In this regard, the primary impediments to effective management on Moorea were determined to be a lack of PGEM compliance and enforcement; however, the

authors also noted the debilitating effects of extreme weather events and crown-of-thorns starfish outbreaks.

Using time series data from the preceding 15 years, another study conducted in 2020 corroborated the findings of Thiault et al. (2019) as it was determined that fish biomass did not significantly increase in the lagoon's protected areas in comparison to the non-protected areas (Stoner-Osborne 2020). With this in mind, the technocratic composition of success pivots on the ability of a management strategy to protect natural resources, which is often determined through assessments of characteristics such as coral reef health, fish biodiversity, fish size, and fish biomass. The validity of such assessments is often supported in numerical terms, whether it be graphical representations of species abundance, statistical figures of species size distributions, or complex formulas that can be used across different management contexts.

Studies conducted by social scientists are often concerned with a management framework's ability to satisfy several variables that are often deemed "enabling conditions" for effective management. Hunter et al.'s (2018) evaluation of the challenges and opportunities for success under the PGEM is guided by variables identified as "enabling conditions for success" from an amalgamation of sources such as Elinor Ostrom's (2009) influential framework for assessing the sustainability of social-ecological systems, The Nature Conservancy, as well as other prolific figures in the conservation arena such as Fikret Berkes and Joshua E. Cinner. Building upon these conditions for success, Hunter et al. (2018) identify "enablers" and "challenges" that are specific to Moorea, many of which I also encountered during my fieldwork. Some of the enabling characteristics of Moorea include stakeholder support for resource management, local self-organization in the effort to devolve management to district-level fishing committees, and continuous ecological surveillance of the lagoon. On the other hand, some of the key challenges to the success of co-management identified by the authors included: 1) the belief among fishers that the PGEM serves the interests of the tourism industry over those of other stakeholders, 2) the island-level framework of the plan that fails to address the ecological complexities and differences among reef habitats around the island, 3) political inequalities, 4) the lack of interaction between scientists and fishers, 5) social differences on the island, 6) tourism, and 7) resentment of neo-colonial powers (Hunter et al. 2018).

In another assessment of the social elements of the PGEM, three types of conflict that emerged from the management scheme were identified. These conflicts included modern versus traditional lagoon conservation frameworks (such as *rahui*), technocratic knowledge versus local knowledge, and conflicts over lagoon access (Walker 2001). Rather than engendering local participation in the PGEM's conservation framework, these conflicts led to resistance, noncompliance, and the formation of multiple politicized associations that advocated for the livelihoods and independence of local community members in opposition to the PGEM.

Focusing on the relationships between conservation and social marginalization, Walker and Robinson (2009) analyze the PGEM's marine protected areas in the context of gendered access to fisheries and social differentiation from a development-oriented point of view. Pulling from the women, culture, and development (WCD) approach, the authors' theoretical orientation combines elements of critical development studies, feminist studies, and cultural studies to focus on the specific impacts the PGEM's marine protected areas may have on the women on Moorea. Walker and Robinson's (2009) analysis is augmented by a variety of graphs and tables comparing the relative frequencies of men and women in relation to fishing practices. Upon separating their interlocutors based on gender, the authors compare the relative differences in fishing frequency, methods, reliance on fishing, and the types of fishing (i.e., subsistence, commercial, or recreational). Although the study did not find a significant degree of gender variation in fishing practices, their analysis revealed a potentially disproportionate impact of MPAs on those in younger age groups or of lower-income status. Attesting to the often-cited concern of considering differentiations in the social impacts of conservation, the authors ultimately argue that the recognition and inclusion of women's knowledge and contributions in fishing would aid community welfare, economic development, and environmental conservation. The methods employed by these social scientists included interviews with local community members in structured, semi-structured, and structured formats. While both studies included some basic statistical analysis comparing the relative frequencies of factors such as fishing practices and perceptions of marine management, much of the data was described in qualitative terms in order to expand on the quantitative factors that were used to identify generalizable patterns in the data.

In many studies on MPAs, including the PGEM, the significance of the study is often framed in the larger context of global challenges such as climate change, declining biodiversity, population growth, and sustainable development challenges. The significance of international conventions and agreements is also regularly referenced in many of these peer-reviewed articles, such as the United Nations' Sustainable Development Goals (SDGs), and more specifically SDG 14, which aims to protect at least 10% of coastal and marine areas by 2020 (Stoner-Osborne 2020). Technocratic assessments of conservation projects often pull from and build upon pre-existing literature as a means to justify their results and further "refine" their prescriptions for effective management. However, other stakeholders involved in the PGEM, such as the fishers, often frame the PGEM in more intimate terms. Rather than being a matter of contributing to the global conversation on marine management, for fishers the efficacy of MPAs is a matter of livelihoods, cultural heritage, and the ability to feed one's family. In lieu of peer-reviewed journals and presentations, the fishers' concerns, whether it be in forms of support or contestation, are often articulated in local settings, such as fishing committee meetings, conversations with friends or family, or in interviews with the vast array of scientists who come to Moorea (including myself). Though these concerns are not universal, in an effort to decentralize management, scientists and other technocrats have sought to translate the diversity of these concerns into a coherent document that attempts to balance the protection of the lagoon with the interests of the different stakeholders. That which gets lost in translation serves as instrumental points of contention in stakeholders' efforts to fail the PGEM.

3.3 CONCEPTIONS OF ENVIRONMENT AND PGEM SUCCESS

While elements of the PGEM may have changed on paper, upon returning to Moorea seven months after the territorial government had ratified the revisions in September 2021, not much seemed to have changed in practice. Individuals in multiple stakeholder groups cited the same issues discussed during my first round of fieldwork in the summer of 2021, including concerns over the lack of enforcement and fishers not respecting the PGEM regulations. While the revisions were officially accepted, there was still much confusion both within and between stakeholder groups regarding the status of the PGEM in terms of its implementation. While some in the fishing community were aware of the ratification of the

revised PGEM, other fishers were not aware of this fact. When we would ask interlocutors across the stakeholder groups, "What is the current status of the new PGEM?" some would claim that nothing has changed or that they were still waiting to hear from the territorial government, while others reported that the revised PGEM has already been accepted and was currently being implemented.

Amongst the various stakeholder groups involved in the PGEM, there were slightly nuanced framings of what is considered success in the framework. However, most framings converged on the importance of the health of the marine ecosystem to varying degrees regardless of which stakeholder group the individual identified with. Rather than focusing on a single resource in the lagoon (e.g., the fish, coral, water quality, etc.), success in marine management often focused on the overall functioning of the ecosystem. However, for many individuals across the stakeholder groups we engaged with, the "ecosystem" in question was not necessarily characterized by the discrete categories of "terrestrial" and "marine" when it came to determining the best ways to manage the lagoon. In this sense, the "environment" that needs to be protected by the PGEM varied amongst stakeholders.

Different understandings of the "environment" also influenced notions of success across stakeholder groups. For the scientists working on Moorea, the PGEM deals specifically with the *marine* ecosystem surrounding the island. This perception is indicative of the approach employed by natural scientists, in which Western science is a fundamental element of conservation measures that consequently focus on addressing issues such as coral health, declining fish populations, fishing practices, and species-specific regulation. Given that the PGEM explicitly deals with activities in the lagoon, the Western framing of the "environment" appears to impact how management under the legal framework is carried out as it predominantly focuses on activities within the marine domain. When it comes to managing activities on land, the *Plan Général d'Aménagement de Moorea-Maiao* (General Development Plan of Moorea-Maiao) establishes parameters for activities such as construction, waste management, property rights, the protection of archaeological sites, and land development (Municipality of Moorea-Maiao 2013). Unlike the PGEM, the local community did not participate in determining the regulations for terrestrial activities in this framework.

3.3.1 Traditional Knowledge and Polynesian Constructions of "Environment"

An examination of elements of Polynesian languages is useful in understanding Polynesian notions of "environment" as reflected in names and categories. The interconnectedness between humans and the environment is most notably reflected in Marquesan place names. While many landscape terms and place names in this language are strongly associated with the histories and folklore of the people of the Marquesan Islands, many are also derived from Marquesan words for human body parts. For example, *mata'ae*, the term for "cape," is comprised of a combination of two terms referencing the eye, *mata,* and forehead, *'ae* (Cablitz 2008). *Tuaivi*, the Marquesan name for "mountain," combines the words for "spine," *tua*, and "bone," *ivi* (Cablitz 2008). These landscape terms imply an intimate connection between Marquesan identity, as well as the understanding of human anatomy, with the understanding of the environment and geography of the islands they inhabit (Cablitz 2008).

For many fishers on Moorea, fishing practices are often informed by knowledge that has been passed down through generations. This knowledge is often focused on different seasonal and temporal characteristics that help fishers decide where and when to fish, and what species to fish at particular times. Seasonal changes in vegetation is one indicator used by local fishermen to determine what types of fish are available for catch based on events such as the blooming of the springfire tree (Eichenseher 2011). This traditional indicator further illustrates the Polynesian concept of "environment" that conceives the land and ocean as an interconnected entity. Another hallmark of traditional knowledge in relation to fishing practices is the *tarena*. The *tarena* is a lunar calendar established by Polynesian elders that informs the fishing decisions and practices of Polynesians by establishing a connection between lunar cycles and the abundance of particular fish species (Strother 2017).

When comparing names and classifications of fish species in French Polynesia, there is an apparent distinction between the Western technocratic approach and the traditional Tahitian understanding of the marine environment. The Western technocratic approach notably uses the Linnaean taxonomic classification system for species, which are defined in terms of ancestry, physical traits, and the ability to reproduce. Comparatively, when looking

at the Tahitian classification of fish, the structure is more diverse as one “species,” which has a single name in the Linnaean context of classification, can have multiple names in Tahitian based on its age, size, and life phase (Rensch 1988). Tahitian fish names illuminate how language shapes Polynesian's view of components of nature, as the terminology is also determined on the basis of other physical characteristics, such as color, size, gender, as well as habitat, and location, amongst others.

Upon comparing the Western technocratic and traditional Tahitian categorization of fish species, key differences are present in what is and is not considered a different fish as communicated in fish names. For example, the tuna (*‘a’ahi*), belonging to the scientific family *Scombridae*, can have up to five different Tahitian names that are predominantly based on size. In order of increasing size, these names include *'oputea, tari'a'uri, mapepe, tatumu,* and *araroa* (Rensch 1988). The *Scarus* genus, which consists of most parrotfish, a prized species on Moorea, is particularly interesting in this regard due to its relatively unique morphological flexibility. Known as sequential hermaphrodites, parrotfish undergo an initial and terminal phase, in which a change in phases results in a sex change (Warner 1984). While parrotfish maintain the same scientific name regardless of their phase, the Tahitian language designates different names (and thus considers them different fish) based on their stage, with *pahoro* assigned to initial phase parrotfish and *pa’ati* assigned to those in the terminal phase (Rassweiler et al. 2022; Rensch 1988). In what is described as a “monoterm,” certain Tahitian names can also apply to multiple fish species (Rensch 1988). For example, the term *‘atara* refers to multiple species within the *Epinephelus* genus, including *Epinephelus socialis*, *Epinephelus fuscoguttatus*, and *Epinephelus microdon* (Rensch 1988).

The intimate connection to the environment among Polynesians is additionally reflected in their use of fish names as colloquial metaphors. For example, someone who is considered restless or fidgety can be called *tunahaavaro,* the name for the eel species, while an insignificant matter can be called *ruheruhe,* the term for a small freshwater fish (Rensch 1988). The term *ohua*, which translates to “a fish found at the bottom of the rocks,” can also be used to describe someone who is hard to find (Rensch 1988, 163).

Rather than assuming that what is meant by “the environment” on Moorea is a universally agreed-upon classification rooted in Western perspectives of nature, it is essential to consider the different ways stakeholders articulate and produce their conceptions of the

"environment." Approaching the composition of the "environment" from the Actor-Network Theory (ANT) perspective, the "environment" itself can be considered a non-human actor that has an active influence on the different compositions of success. Jepson, Barua, and Buckingham's (2011) ANT-informed consideration of what/who can be considered a "conservation actor" further illuminates the active influence that the "environment" itself has on the outcome of a conservation project. For scientists and other technocratic actors in conservation projects, peer-reviewed "objective" science is the primary determinant of success. When it comes to how management is done in practice, technocratic-informed strategies divide the environment into discrete categories of marine and terrestrial, as well as sub-categories such as benthic habitats, lagoon, and fore reef, while also focusing on ecological metrics of success such as fish biomass, measures of biodiversity, and other ecological benefits. With this in mind, the "environment" that is composed by scientists can be considered a conservation actor in the PGEM that is an active catalyst for action. This construction of the environment has its own influence on the outcome of a management intervention in the sense that, according to scientists, the "environment" in need of being protected is the *marine* ecosystem, in this case being the lagoon surrounding Moorea. The focus on the marine ecosystem thus establishes the boundaries that determine what actions are necessary to achieve this composition of success, which is predominantly focused on regulating activities in the lagoon (fishing, tourist activities, scientific research, and other nautical activities).

On the other hand, the Polynesian construction of the "environment" expands the boundaries within which success is produced amongst the fishing community. The Polynesian composition of "nature" involves a cohesive unit that includes what Western science would categorize as the terrestrial and marine environment. According to Papa Mape, a respected fisher on Moorea, "You have to understand that the land and the ocean are one…Whatever you do on the land, the ocean suffers. Whatever you do in the ocean, the land suffers" (Eichenseher 2011). Given that this framing of the "environment" is not as reliant on discrete ecological categories, the priorities that fall under the fishers' composition of success also expand into the terrestrial realm, which, in the event that success is achieved, necessitates a new set of actions that would not necessarily be present in the technocratic

framing of success in the PGEM, such as modifying agricultural practices, limiting construction projects, and implementing other strategies to deal with pollution.

When fishers specifically focused on the marine environment, many individuals identified fish size and abundance as significant indicators of success. However, the perceived resource needing protection was the ecosystem overall rather than parsing out distinct elements of the lagoon (e.g., coral, benthic habitats, fish populations). As one fisher claimed, "Tahitians do not separate the lagoon and marine resources. They're the same." However, that is not to say that fishers displayed a negative attitude towards Western science, as many of them believed that scientists should play an essential role in informing management strategies, especially when it comes to addressing the issue of algae in the lagoon and improving the health of the coral reefs.

This framing of the "ecosystem" that blurs the distinction between terrestrial and marine environments is also consistent with the traditional Polynesian construction of "environment" that is reflected in *rahui*, which in the past was a resource management strategy of land and sea that were separated into pie-shaped units that extended from the mountain ridgetops of an island to the reef crest of the lagoon (Hunter et al. 2018).

3.3.2 *Rahui*

Prior to European contact there were pervasive marine conservation strategies throughout Oceania (Kirch 1984). These strategies are known by many names throughout the Pacific, such as *rahui, tapu*, and *tabu*. Nested within the larger institution of kinship systems, the traditional management framework was affected by environmental change that engendered impositions of harvest restrictions and consequently influenced ecological systems through periods of both resource exploitation and conservation. In this management framework, fishing rights were regulated by management decisions made by a certain chief, clan, or family that controlled fishing harvests in specified areas that extended from the shore to the reef crest (Handy 1932). On a single island, fishing grounds were often divided into areas controlled by different villages, and access to a particular fishing ground was contingent on village membership (Johannes 1978). Restrictions on resource use were implemented through the order of *tapu*, a term used to describe that "an object, person, or location was 'marked,' 'contained,' 'restricted,' or 'put aside' … the state of a person, a

thing, a place where *mana* (divine power) is present" (Bambridge 2016, 119). The structure of this traditional management system also reflected the Pacific Islander concept of nature, in which land and ocean are inseparable parts of one being in the sense that *rahui* simultaneously governed both fishing and agricultural areas (Strother 2017). The division of areas controlled by different villages also represents the Polynesian notion of *fenua*, in which "nature" was not conceptualized as a separate entity but rather as a specific place considered the "land of one's ancestors" (Rigo 2016, 21). The notion of *fenua* thus consisted of a complex network of all human and non-human components of that area, in which the distribution of surplus resources was an essential means of maintaining and strengthening the network (Rigo 2016).

For Polynesians, power was infused with religion, with the power of a chief deriving from "*mana*; that is, it was founded on the ancestrality of the bond with a particular land (*fenua*)" (Rigo 2016, 15). While *rahui* was often controlled by the more powerful members of Polynesian society, religious and political power were distributed among community members based on genealogical ties to sacred elders. With leadership deriving from genealogical ties, the inherent sacredness of the chief granted them the power to impose *rahui* on a particular resource or harvesting area. While the imposition of *rahui* can be seen as a conservation measure to limit the exploitation of natural resources available to the village, Kirch (1984) also analyzes how this ritualized framework affects resource exploitation in the opposite direction. Although the position of the chief was secured by their genealogical position in the lineage of ancestral elders, the chief's power was still heavily reliant on their control of resources and ability to distribute surplus resources to community members (Kirch 1984; Rigo 2016). With this in mind, the incentive for maintaining power can be linked to the intensification of resource exploitation of both marine and terrestrial resources. Thus, the traditional management practices were not always conducted sustainably as they could lead to significant environmental degradation, particularly in the face of population growth that would necessitate further resource exploitation and surplus production.

While these traditional management practices still exist to varying degrees today, the arrival of European contact and subsequent colonization profoundly influenced management practices in the Pacific Islands. Although the practice of *rahui* allowed Polynesian chiefs to

“take charge of the economic forces … in the interest of the community,” the dissolution of Pacific Island chiefdoms by European colonial powers would be a crucial inflection point in both the management practices and human-environment interface of the Pacific Islands (Kirch 1984, 166). In his publication on the demise of traditional management practices in Oceania, Johannes (1978, 356) attributes this shift to three causal factors imposed by colonial powers: "(a) the introduction of money economies, (b) the breakdown of traditional authority, and (c) the imposition of new laws and practices by colonial powers."

In lieu of the PGEM, many fishers proposed that *rahui* would lead to more successful lagoon management. The appeal of *rahui* was often linked to the issue of the enforcement of the PGEM. Given the concerns over the lack of PGEM enforcement, many fishers argued that *rahui* would be a better means of achieving successful marine management due to the fact that it was stricter than the PGEM. Fishers determined *rahui* to be stricter given its social and spiritual sanctions, which included the destruction of the violator’s *mauri* (life-giving energy), expulsion from the community, possession by “destructive forces,” or death (Torrente 2016). With this in mind, it was argued that more fishers would respect regulations if *rahui* was implemented given the severity of its associated sanctions that extended beyond fines and material confiscation.

In 2014, the *Rahui* Association was established as a means to call for traditional management framework as an alternative to the PGEM. However, the Association’s activities appeared to slow down after the original president was brought into the municipality to assist with running the PGEM. When I first arrived on Moorea in the summer of 2021, the *Rahui* Association was described by many as being “on hold.” However, the landscape had slightly changed when I returned in the summer of 2022. Frustrated by issues of representation in the PGEM, a group of fishers established an island-wide Federation that would represent the fishing community more effectively by circumventing the *Direction des Ressources Marines* (the territorial government office the fishing committees and municipality worked with during the revision process) and going directly to the higher levels of the territorial government with their demands. Ultimately the *Rahui* Association was absorbed into the Federation.

For many in the fishing community, success in marine management was often framed as a grassroots approach to protecting the ecosystem in the sense that they argued that only

fishers should be responsible for making decisions when it comes to managing the lagoon. For many fishers who put forth this argument, *rahui* was considered an effective means of achieving success due to its conception as a community-based governance scheme that would command more respect from local community members. Moreover, many described the appeal of *rahui* in connection to its significance as a sacred ancestral practice. As one fisher described it, *rahui* is about an individual's connection to the land and sea, a relationship based on respect that is completely separate from laws and politics– "it's just you and the lagoon." For some, *rahui* was also an ideal alternative to the PGEM as it was untouched by the perceived problems of politics that rendered the PGEM an ineffective management strategy. With this in mind, while this sacred practice was structured by some degree of power hierarchies within the community, many fishers framed *rahui* as an apolitical solution to the issues surrounding the PGEM given the fact that it would delegate more authority to the local community instead of the municipality or territorial government.

However, *rahui* and the PGEM were not necessarily considered mutually exclusive, as many fishers and representatives of the municipality believed they could work together to improve management. For some, the rotational closures proposed by the Teavaro fishing committee were a key example of what this could look like in practice. As the revised PGEM devolved more authority to the community through the district-level fishing committees, members of the Teavaro fishing committee drafted up regulations that specifically dealt with night fishing practices in the lagoon adjacent to their district. After a series of meetings (including the attendance of municipality representatives), the committee proposed dividing parts of the lagoon into four zones that would serve as temporary closures that would rotate every two years. When the temporary closures were presented to fishers around the island, many reported favorable opinions of the management strategy, often mentioning its resemblance to *rahui.* For many fishers we spoke to, temporary closures were determined to be more effective than permanent MPAs. The efficacy of temporary closures was often connected to the issues of fish size and reproduction rates as many fishers reported concerns that "greedy" fishers did not allow enough time for the fish to reproduce and replenish the population. With this in mind, many individuals argued that temporary closures would provide sufficient time for the fish populations to grow (in both population and size) and allow for a sense of equilibrium between fishing practices and fish populations. However,

other fishers believed that temporary closures would be ineffective due to the fact that the fish populations would be "massacred" once the zone was reopened. For the fishers who advocated for the coexistence of the PGEM and *rahui*, the ancestral practice was perceived to be an ineffective strategy on its own as *rahui* only dealt with fishing and thus could not account for other activities that have emerged in the lagoon in more recent years. In this regard, fishers often described the coexistence of *rahui* and PGEM in this manner: "the PGEM controls what happens on the surface of the lagoon, and *rahui* controls what happens under the surface." In other words, the PGEM could control such factors as the presence of jet skis and sailboats, which are contentious issues for many people, and other tourism activities. On the other hand, *rahui* would determine the fishing regulations in the lagoon and other forms of resource extraction.

3.3.3 Who Should Be Involved?

Aside from protecting the environment, many framings of success also pivoted on each stakeholder group's ideas of what community-based conservation should look like when it came to the question of who should make the decisions. While all stakeholder groups acknowledged the importance of the involvement of fishers, the perceived degree of authority this group should hold in making decisions varied. The question of who should be involved in management was thus a discussion of different versions of "politics" in relation to the PGEM. For members of the municipality, territorial government, and tourism industry, decentralized marine management still existed within the bureaucratic sense of politics as they believed that the decision-making authority should be shared across different scales of governance (including the territorial government, the municipality, and the fishing committees). For fishers, the question of involvement in the PGEM was connected to a grassroots form of politics in which the fishing community held the power to regulate activities in the lagoon. Similar to the fishers' justification for *rahui,* this grassroots approach to management was often framed as an apolitical alternative to the current governance structure of the PGEM in the sense that all of the decision-making authority remained within the community, thus absolving the PGEM of the perceived corrupt influence of wealthy tourism industry executives and politicians in the municipality and territorial government. The justification for the fishers to take the dominant role in managing the lagoon was often

centered around the claim that the fishers know the lagoon better than anyone else and thus are well-positioned to make decisions regarding how it should be managed. Speaking with a young fisher on the subject, this justification was fundamental to his framing of "successful" management.

> *Question: What is the most effective way to manage the lagoon?*
>
> **Fisher:** Let the fishers manage the lagoon, not the PGEM. Because it is us fishers who manage the lagoon…We're the ones who know what's going on in the water, not the PGEM. And we're always in the water.
>
> *Question: What would you do differently from the PGEM?*
>
> **Fisher:** To be in the water…for everyone to go check what's happening. Same for the [fish] reproduction. It is the fisher who knows the reproduction of this fish, this fish, and this fish. To improve.
> (Fisher, July 2022)

When it came to the role that other actors should play in the PGEM, there were a few diverging opinions amongst the fishing community. However, regardless of stakeholders' opinions regarding their own involvement in the PGEM, most of our interlocutors identified scientists as valuable participants in management given their ability to conduct empirical assessments that could inform management strategies. On the other hand, the primary points of contention that emerged in our discussions with fishers concerned the role of the tourism industry, the municipality, and the territorial government. The expansion of tourism activities in the lagoon was a primary concern for many of the people we spoke with. For fishers, this often meant that the tourism industry needed to be controlled without any input from the tourism operators. For the stakeholder groups, there were opportunities for tourism operators and fishers to work together, which most often was in the form of coming to an agreement regarding where each group could conduct their activities (i.e., establishing zones where tourism activities could operate that were separate from fishing zones).

When it came to determining who should be part of the decision-making process in management, the few members of the scientific community and tourism industry that we spoke with seemed to predominantly rely on the fishers as the legitimate actors in management. Reflecting the acknowledgement of the value of traditional ecological knowledge in scientific assessments, the scientist we spoke with cited the fishers' unique

historical and experiential knowledge of the lagoon as a critical element that made them ideal for the job. However, representatives from these stakeholder groups still believed that the municipality and territorial government should play a central role given the bureaucratic nature of the PGEM that requires legal approval in order for it to exist as an official management framework.

3.4 FRAMING "FAILURE" IN THE PGEM

For many in the fishing community, the PGEM has been a disappointing set of empty promises obscured by political motivations that marginalize the fishing community. Nevertheless, for other fishing community members, the PGEM in itself is a good thing—the problem is the lack of respect and the individualist mindsets amongst the fishers who violate it by "stealing" fish from the protected areas. When it comes to the proposed revisions, there seems to be some disagreement over the degree to which they represent the interests of the fishers. Amongst the fishing community, the failure of the PGEM was often composed within two key dimensions: the boundary between those who are inside the fishing community and thus legitimate voices and those who are outside and the degree to which the management process is purified of supposedly corrosive political motivations and interests.

3.4.1 The "Real" Fisher

As the relevant literature indicates, the "community" that is the focus of community-based conservation projects is often anything but homogenous. On Moorea, what it means to be a member of the fishing community is different for some of the fishers we spoke with, many of whom could be considered professional fishers in the sense that they make a living from selling the fish that they catch (as 57.1% of fishers interviewed in 2021 indicated that selling fish was one of their primary reasons for fishing). For professional fishers, the assertion of a "real" fisher serves as the qualifier for the "community" that should participate in the PGEM. During my time in the field, this issue of the "real" fisher arose multiple times. The issue of the "real" fisher was most noticeably present with the perceived legitimacy of a leader of one of the district fishing committees on the island, which had attracted considerable interest due to their proposed rotational closures that reminded some, but not all, of the traditional management practice of *rahui*. When speaking to other fishers in the district, we would ask them about their opinion of the revisions that had been proposed by

the committee that was supposed to represent their interests. While many reported favorable perceptions of the revisions, several people, some of whom had attended the fishing committee meetings during the revision process, argued that it was ineffective, which was often tied to their argument that the leader of the committee "was not a real fisher" and thus did not know what they were talking about. However, when we went to speak with the committee leader, it turned out that they do, in fact, fish. At first, I wrote it off as an issue of miscommunication as I had become accustomed to this common issue. However, after hearing it so many times despite the fact that this leader does fish, I began to wonder whether or not I was approaching the question in the correct manner. Over 50% of the residents on Moorea, with at least one individual in the majority of households, engage in fishing activities to varying degrees, and yet it is highly contested who constitutes "real fishers" (Leenhardt et al. 2016). In this sense, the appropriate understanding of "fishing" extended beyond the mere practice and rather became more concerned with an individual's motivations for fishing.

Typically, a "real" fisher was described to me as one who makes a living off fishing. If an individual had another source of income, such as a desk or tourism-related job, they were discredited by others in the community who claimed that "they were not a real fisher." In other words, if an individual's livelihood did not depend on fishing, they were not perceived as legitimate representatives of the fishing community and thus should not be making decisions regarding how the lagoon should be managed. As many fishers described it, it is the fishers who live off it that are always in the lagoon and more intimately aware of what is happening and changing in the lagoon to an extent that is not possible if someone only engages in fishing as a hobby or occasional practice.

Fishing experience and skill also played an essential role in the legitimacy of a fisher as they were often believed to be correlated with greater knowledge and awareness of the lagoon. The notion of the legitimate fisher was thus harnessed as a means to identify who can and cannot participate in the "community" in the community-based conservation seen on Moorea. So what about the members of the general community who do not fit the mold of the "real" fisher? According to most fishers we spoke to, they should not have a say in managing the lagoon because they "do not know what they are talking about." This framing of legitimacy was also often used to discredit the role of members of the municipality and

territorial government, portraying them as bureaucrats confined to their desks who were out of touch with the needs and priorities of the fishing community. The notion of the "real fisher" attests to the often-cited importance of rethinking how we engage with the framing of "community" in CBC projects. Rather than resting on the assumption that the local community is a homogenous unit that shares common interests, acknowledging the diversity inherent in any community reveals how management decisions affect individuals in different ways. The composition of legitimate actors by different members of the community also reveals an essential way in which the PGEM or leaders in the fishing committees are failed as insufficient representatives who should not be controlling management.

The claim of the "real" fisher amongst the fishing community also impacted how the municipality approached engaging with the local actors. In order to have a better understanding of how the municipality approaches the question of how to engage with the fishing community, we spoke with several representatives involved in the PGEM. As we arrived at the office of one of the key representatives of the municipal arm of the PGEM, we were invited in with a warm welcome. Sitting across from them at their desk, I looked around at the walls that were covered with shelves of PGEM files, various maps relating to the PGEM and marine governance, and other infographics promoting the PGEM and marine management. One infographic (Fig. 7) displayed a variety of lagoon activities, such as the traditional *haapua* fishing method, jet skis, swimming, and overwater bungalows. The top of the infographic included a promotional message that read, *"Le Lagon est à tout le monde, sachons le partager!"* with its Tahitian translation just below, both of which translate into "The lagoon is for everyone, let's share it!" After settling in, we begin the interview. Working with the PGEM for four years, the representative that we spoke with was primarily responsible for communicating with the local community and acting as a liaison between the fishers, municipality, and territorial government during the revision process. When the question of how the municipality engaged with the local fishers came up, the PGEM representative explained how identifying "legitimate" representatives of the community was an important part of effectively working with the fishers.

> This is precisely how to speak to a group– it is to seek out people who are representative of the group. And above all legitimate, because it is often said…like

> Atea[10]. He's not a fisher. He is legitimate for whom, in fact? Is he legitimate for us, or is he legitimate for the fishers? Because for the fishers and the legitimate ones there, we don't know. So it really depends on whose interpretation it is….I can only trust the fishers because I have a reputation. So I said representativeness, legitimacy, and neutrality. That is to say that in reality, what would be good and important is that I do not come to defend individual opinions. I will not answer for myself, but I come to defend for the well-being, the public interest. (Municipality representative, June 2022).

Figure 7 Promotional graphic of the PGEM that reads, "*Le Lagon est à tout le monde, sachons le partager!,*" with its Tahitian translation just below, both of which translate into "The lagoon is for everyone, let's share it!"

The interpretation of legitimacy amongst the fishing community, as articulated through the assertion of the "real" fisher, thus also played a vital role in the municipality's composition of success. For the municipality, "representativeness, legitimacy, and neutrality" are central to making the PGEM successful (Municipality representative, June 2022). Thus, when it came to securing the representation of the fishing community through those who are

[10] Mentions the name of a leader of one of the fishing associations in Moorea, which has been changed in order to maintain confidentiality.

considered legitimate representatives, the municipality relied on the fisher's interpretation of legitimacy as a means of identifying key actors to engage with in the new structure of the PGEM.

Although many factors influence these compositions, what one considers success and failure often depends on how they are impacted by the regulations outlined in a conservation project. For fishers, livelihood was a central element to their ideas of how conservation should be done, as a "successful" conservation project is one that is led by the community. However, the "community" that fishers often referred to was also open to interpretation and dependent on where they placed the boundary between who does and does not belong to the community that should be leading management. For the municipality, success was often linked to the population's well-being, necessitating a degree of impartiality that considers the interests of all the stakeholder groups involved and affected by the PGEM. For scientists, "successful" conservation is often measured by its ecological effects, such as an increase in biodiversity, recovering habitats, and improving fish stock. For many in the tourism industry, success is also centered around individual and collective livelihoods given the central role tourism plays in the local economy.

3.4.2 The "Problem" of Politics

Critically inclined scholars writing about politics in conservation have identified "depoliticization" as a strategy of technocrats. For technocrats, politics is an obstacle to rational, expert-led planning. However, less attention has been paid to how other stakeholders perceive the role of politics in conservation. When discusing the problems of the PGEM with fishers, they often pointed to the municipality and territorial government, arguing that the revisions represent the government's interests in the sense that they favor the tourism industry, which is a central element of the economy of French Polynesia. With this in mind, many argued that the PGEM was just about "money and politics." Fishers and other stakeholders frequently asserted that the PGEM was a tool for financial and political gain rather than environmental protection. If it is just about money and politics, there is no recourse for making the PGEM successful, as the framework is perceived as merely a tool for developing the tourism industry. This argument was framed as an issue by fishers in the sense that they posited tourism activities as a threat to both their fishing efforts and the health

of the lagoon, often citing concerns about the harmful impact of jet skis, which they argue often exceed the speed limits, damage coral, and create noise that scares away the fish.

The issue of politics was also linked to the failure of the PGEM in the manner that it inhibited any progress or implementation of the new revisions. With elections on the horizon, many stakeholders were concerned that politicians were hesitant to push for any action until their position was secured in order to avoid any blowback. On the other hand, any talk from politicians about improving the PGEM was perceived as just a set of self-serving empty promises that would soon be forgotten after they were officially (re)elected into office. In this sense, many fishers argued that the PGEM will always be "all talk and no action."

Concern over the issue of politics in management was not exclusive to the fishing community. While many fishers framed the problem of politics around the issue of their perceived disenfranchisement, stakeholders working in the tourism industry also predominantly focused on the issue of nepotism and lobbying when it came to approving projects in the lagoon as they believed that people who are friendly with members of the committee or the municipality would be approved to conduct tourist operations in the lagoon whereas others who lack these connections would be denied. For the tourism representatives, this was also a threat to management as it contributed to the issue of adding more activities on the lagoon that was already oversaturated with tourism activity. There were also moments when those in the tourism industry expressed sympathy with fishers when it came to the perceived issue of a politicized PGEM.

The interpretation that politics is antithetical to an effective PGEM was a particularly salient issue to Vaiata[11], a former member of the PGEM committee who represented the tourism industry. When we arrived for our scheduled interview, Caroline, Tevaiti, and I were invited to wait in the lobby until Vaiata was ready. I sat down in one of the chairs and looked up at the television screen by the front desk, which displayed a collection of images of what French Polynesia is famous for—vanilla bean, the Tahitian gardenia—or *tiare ma'ohi* (the national flower of French Polynesia), a pineapple plantation, the traditional Polynesian tattoo method, as well as a fisher setting up his nets in the lagoon and smiling at the camera. After being invited into Vaiata's office, we began our interview by discussing their general

[11] Name is a pseudonym to maintain the confidentiality of the interviewee

perceptions of the management of the lagoon. When it comes to the efficacy of the PGEM, Vaiata claimed that the management framework has the potential to be effective, but only if everyone respects the regulations. Vaiata went on to explain that "the PGEM is political. And whenever it's political, it's not good." They continued with the example of the Sofitel hotel, which had recently received permission from the territorial government to expand its bungalows into the lagoon despite the fact that the new bungalows would encroach an MPA that was established by the original PGEM, an event that has sparked considerable controversy on the island. For Vaiata, allowing the hotel to expand its bungalows into the lagoon was a hard decision to explain to the population. At the time of this decision, fishers had not been allowed to fish in that area for 18 years—but as soon as a hotel wanted to expand into the lagoon to grow their business, it changed? With this in mind, Vaiata explained that when it came to the Sofitel bungalow expansion, it would have been unrealistic for the government to expect that immediately changing MPA regulations after 18 years would go smoothly. The issue of the Sofitel hotel expansion was also a common point of contention amongst the fishers who often used it as a primary example exhibiting the corrupt politics surrounding the PGEM. From Vaiata's perspective, the future of the management framework hinges on how the PGEM will approach this delicate balance of local livelihoods and environmental protection. In other words, those involved in the PGEM will need to decide whether or not they want to "put business or the environment first" when making their decisions. For Vaiata, business is important and needs to be expanded on Moorea, but *how* it is done is critical. While promoting economic development and environmental protection are not necessarily mutually exclusive, the tourism representative acknowledged that sacrifices would need to be made on both sides. While many fishers framed the tourism industry in negative terms, the tourism representative reminded us that the industry plays a central role in the livelihoods of many people on the island, including fishers who sell their catch to various hotels around the island. Managing one of the many hotels on Moorea, Vaiata described how she had 170 employees working at the hotel, which for her means that there are 170 families on Moorea who depend on these jobs. While many fishers posited that revenue from tourism was the source of the political issues of the PGEM, for Vaiata maintaining a delicate balance between protecting the environment without

jeopardizing the livelihoods of those who live off the tourism industry would be the best way to move beyond the problem of politics.

CHAPTER 4

DISCUSSION

4.1 MARINE MANAGEMENT COMPOSITIONS

4.1.1 The Rationalist Approach

While the most recent iteration of the PGEM has created more space for community members to have a voice in management, the framework itself has been shaped by technocrats who relied on the rationalist approach that is consistent with most social science and natural science approaches to management. Rationalist approaches assume that experts produce a clearer or more accurate interpretation that will be useful for stakeholders as a guide to action and will increase the probability of successful marine management. These approaches are instrumental in the sense that the knowledge generated by social and natural sciences is wielded as a tool to convince stakeholders and policymakers, regardless of stakeholder interpretations, that expert knowledge is superior and should direct the course of action. Natural scientists provide biological data that they deem necessary to improve success, while social scientists provide social data for the same purpose. These approaches also pivot on the idea that what is *supposed* to happen, based on expert analysis, will *actually* happen in practice. Thus, the overarching goal of these approaches is to produce and rely on more and better expert knowledge so that management practices can be further rationalized through the increased refinement of planning schemes.

As seen in the technocratic assessments of the PGEM, the rationalist production of success often relies on the value of science and quantifiable targets as the ultimate indicators, most of which are determined by a conservation agenda at the international level. On the other hand, the failure of a project is often framed as the result of erroneous implementation,

"especially with regard to the devolution of authority and responsibility" (Berkes 2004, 622). In this sense, the framework of CBC itself is considered sound due to the fact that it is informed by "valid scientific theories and adequate information"—problems arise when the implementation strays from the framework (Ostrom 1990, 22). The rationalist approach often seeks to make sense of the complex "real world" by organizing it into coherent categories in an attempt to provide solutions for complex issues that can be applied in multiple contexts.

The recruitment of expert consultants from international sustainable development agencies to assist in the PGEM revision process reveals the extent to which the "success" that the management framework is supposed to achieve was shaped by technocrats employing the rationalist approach. While the revisions were focused on devolving more decision-making authority to the local community, the manner in which this would be done was determined by members of the municipality and territorial government (with assistance from hired consultants) before the community was integrated into the process. After conducting a series of workshops, consultants identified keys and challenges to success to determine the most effective strategies to collaborate with the local community. Whether or not the fishing community would have decided to employ similar tactics is unknown as they were not the ones initially spearheading the implementation of the revision process. Amongst the local community, the efficacy of these strategies was up for debate as many fishers leveraged the claim of the "real" fisher as a means to discredit the representatives of all of the stakeholder groups involved in the revision process (as the consultants, representatives of the fishing committees, municipality, and territorial government were not "real" fishers and thus were not in a position to make decisions).

On Moorea, the widespread influence of the rationalist approach is also evident in various studies conducted by social and natural scientists concerning the PGEM, most of which have relied on variables predetermined by the technocratic community as necessary for successful management. Thiault et al.'s (2019) ecological assessment of the PGEM was centered on the importance of ecological data as a means to determine the extent to which the management framework has achieved their own composition of success, which was reliant on the ecological metrics of success we have become accustomed to in this thesis. Given the nature of this study, which was focused on scientific methods and data collection, there was

minimal discussion of local perceptions of the efficacy of the PGEM; however, the authors note that they communicated their findings to "some local community members and to local administrations to facilitate the ongoing revision" of the management framework (Thiault et al. 2019, 9). However, it is evident that the intended audience for this study was not the local community members. In order to present their interpretation of reality when it comes to the success of the PGEM as legitimate, the authors follow the commonplace principles accepted by their own stakeholder group (technocrats). Published in an academic journal, the study is presented in the structure that is expected and often required in such publications, including an abstract, introduction, overview of the methods that includes a series of complicated formulas and other esoteric language, graphs displaying collected data, the results of the study, as well as a "literature cited" section. The "literature cited" section is a crucial element of any academic paper as the legitimacy of a study is often tied to the literature used to inform and situate the research (in the sense that technocrats are expected to cite other notable experts in their community). As is the case with technocratic literature, the authors of this scientific evaluation frame their assessment of the PGEM within a larger framework that determines the degree of success achieved by the PGEM in comparison to other case studies, as they argue that the most salient proof of the benefits of MPAs is determined through "meta-analyses that synthesize data from many empirical studies" (Thiault et al. 2019, 2). While this study has been helpful in understanding the ecological effects of the PGEM, it frames the management framework in a manner that is not consistent with how other stakeholder groups compose the success or failure of the PGEM.

Hunter et al.'s (2018) evaluation of the PGEM was built upon "enabling conditions of success" that are commonly prescribed by social scientists, such as local support for management, ecological surveillance of the lagoon, and community self-organization to take part in management. While operating in a different discipline, this study still conforms to the rationalist approach as it seeks to assess the success of the PGEM through the identification of straightforward and discrete variables identifying the challenges and opportunities that "may enable a more successful transition" of the PGEM to a more community-based structure (Hunter et al. 2018, 77). The variables discussed in this study are identified as "social" elements of marine management; however, this is also reflective of how scientists often assume that there are distinct "social" and "ecological" domains when in practice

stakeholders mix up what social scientists call “social” with a variety of elements that transcend disciplines. Similar to Thiault et al. (2019), this study was published in an academic journal and was thus subjected to the peer-review process that is central to determining the viability of a study. With this in mind, the composition of success put forward by technocrats conducting research is, to some degree, also controlled by other members of the academic community who have an influence on how these compositions of success are communicated to the technocratic community. While reviewers are determined to be experts in the area(s) of research relevant to the study, they may have little to no intimate understanding of the PGEM specifically, Moorea, or the perceptions of the local community aside from what is presented by the expert author. Reviewers may thus frame their assessment of the validity of this presentation of reality through a different lens that is informed by factors that might not be deemed relevant by other stakeholders directly affected by the PGEM.

Given that the technocratic framing of success relies on common, easy-to-grasp variables to inform policy prescriptions, the evaluations carried out by scientists such as Hunter et al. (2018) and Thiault et al. (2019) are useful in displaying the strengths and weaknesses of the framework, which is integral to adaptive management as addressing the identified weaknesses in the next iteration of the PGEM will be crucial. As technocrats have taken steps to decentralize management, other stakeholders have been given space to construct their own versions of success in a manner that may (or may not) affect how the revised PGEM is implemented. Embracing that we can never fully predict or account for what is going to happen in practice does not mean that we need to completely abandon the rationalist perspective, but rather balance it with alternative ways to assess conservation projects that give a voice to local stakeholders. What actually happens when conservation is put into practice will always overflow our predictions and theoretical interpretations and predispositions. With that in mind, being open to the unexpected can allow us to discover complexities of community-based conservation that might have otherwise been overlooked.

4.1.2 Critical Political Ecology

In contrast to rationalist approaches, many critical political ecologists seek to debunk and contextualize marine management by asserting that the intended outcomes are not what

they appear. Most of this literature focuses on the infusion of neoliberalism into conservation agendas. These researchers are critical of the oversimplified neoliberal logic depicting the world "as a pie that can grow bigger and bigger until everyone can have a piece" and that market mechanisms will be a panacea for issues of economic disparity and biodiversity loss (Igoe and Brockington 2007, 434). Despite the supposed benefits of neoliberal conservation, critical political ecologists assert that local actors are being duped into adopting conservation practices that exacerbate rather than ameliorate systemic inequalities and power relationships and ultimately lead to more environmental destruction rather than less. Igoe and Brockington (2007) assess the state of conservation efforts through the lens of neoliberalism to support their critiques of how the “neoliberalisation of nature” dispossesses and transforms the lives of the local communities. The authors depict this concept as a disillusioned and over-idyllic approach that fails to deal with the "messiness" of the "real world" in that it conveniently overlooks the systemic inequalities and power relationships that are an inherent part of environmental issues. The neoliberal conservation agenda focuses on the "reregulation" of nature, in which resources are commodified, and territorialization, in which territories (namely protected areas) are demarcated by new forms to exert control over the local people and resources. In other words, rather than protecting nature, these strategies are understood as new forms to exert state, bureaucratic, or capital control over local people and resources. In this sense, local actors are still delegated to the periphery as unsuspecting victims while the experts reveal the “true” interpretation of a conservation project.

Although there are many problems surrounding the revised PGEM, the issues of neoliberal conservation are not readily seen in the stakeholders’ compositions of success. Stakeholders did not frame the shortcomings of the PGEM as a symptom of the issue of a neoliberal conservation agenda but rather linked it to issues of livelihood, legitimacy, and politics. Rather than misleading and exerting control over local people, the PGEM has been adapted to integrate the local population into the decision-making process regarding the management of the lagoon. While it is crucial to consider the negative implications of neoliberal conservation, employing a myopic focus that is predominantly guided by a critical approach restricts the manner in which one can approach the assessment of a conservation project.

On the other hand, other critical political ecologists highlight the difficulties of community-based management that can be seen in the PGEM. This literature notes the tendency for community-based conservation projects that promote the participation of stakeholders in the decision-making process instead ultimately reflecting the interests of state actors and experts. While this was a concern that was often expressed by fishers in relation to the "problem" of politics, the current literature on this subject often fails to engage with how local stakeholders perceive this issue. Moreover, critical political ecologists argue that the "community" itself is often assumed to be a homogenous unit in which everyone shares the same interests and priorities and that everyone wins in successful resource management. As community-based conservation gained traction as a viable conservation strategy in the 1980s and 90s, the "community" in CBC projects was often portrayed as "images of coherent, long-standing, localized sources of authority tied to what are assumed to be intrinsically sustainable resource management regimes" (Brosius, Tsing, and Zerner 1998, 165). Instead, political ecologists argue that communities are composed of intersecting and opposed interests, and thus there inherently will be winners and losers in management. In his seminal work entitled "Rethinking Community-Based Conservation," Fikret Berkes (2004) challenges the traditional notion of "community" present in earlier literature on community-based conservation. In his discussion on the emerging trends and paradigm shifts in community-based conservation, Berkes (2004) makes a point to recognize that the assumption that the "community" in CBC projects is a homogeneous unit is too reductionist and does not account for the complexity of the local community in any context. With this in mind, Berkes (2004) argues that the expectation of working with a community that shares common interests when it comes to managing natural resources is impractical and over-idealized. The recognition of the need to consider communities as multidimensional and evolving "social-political units or networks" is not a recent trend in the conservation arena. However, keeping this framing of the "community" in mind is still critical when assessing community-based management schemes as conflicts between and among stakeholder groups is not only prevalent in this research but in a multitude of other case studies as well (Buijs et al. 2011; Kearney et al. 2006; Warner 2000; White and Vogt 2000; Sterling et al. 2017; Young et al. 2016). Understanding the conflicts between and among stakeholder groups is essential in understanding how different compositions of success are mobilized or denied in

CBC projects and how this imposes an active influence on how management is done in practice.

The claim of the "real" fisher attests to the inherent multidimensional and fluid nature of the "community" in CBC projects. While community-based conservation has been advanced as a "win-win" solution to sustainable development, simply enlisting the local "community" in conservation efforts will not eradicate all the friction and discord that occurs when access to a resource that is significant in terms of cultural heritage and livelihood is restricted. Contestation is an unavoidable part of community-based conservation. Social scientists have extensively engaged with this argument, often arguing for the importance of being cognizant of how conservation may affect certain sectors of the community disproportionately. While these authors often break down the community into segments based on gender, age, or socioeconomic status, whether or not the local actors would organize their community in this manner is a different question that needs to be addressed.

Being open to the local actors' framing(s) of the multidimensionality of the "community" breaks down the presumption of a ubiquitous framing of success as different compositions of success emerge across the stakeholder groups participating in a project. The assertion of the "real" fisher further demonstrates the importance of accounting for this diversity as the stakeholders' perceptions of who should belong in the "community" involved in a conservation project have a significant influence on their compositions of success and failure. With fishers having the primary authority in determining regulations being a central element of fishers' composition of success, the notion of the "real" fisher establishes the parameters for who can lead action in improving management. Successful community-based resource management is not just about what actions need to be done to improve management but also about *who* should participate in deciding what actions are necessary. Abandoning the assumption of a homogenous community also leads to an important conclusion: it is impossible to make *everyone* happy. While community-based conservation has been posited as a sort of panacea to the challenges of traditional approaches to conservation, simply involving the community in conservation efforts will not eliminate all the disagreement and conflict. Relinquishing an overzealous commitment to "making everyone happy" or coming to a "unanimous" agreement allows the freedom to focus on more feasible objectives that can

be determined by the stakeholders themselves. However, deciding the degree of agreement that would be necessary for improving management is not an easy exercise.

4.2 "SUCCESS" IN ACTION

As an alternative to the rationalist and critical approaches, this research draws on the work of David Mosse (2005) and others who seek to ethnographically describe how success is produced and carried out in action by different stakeholders. The primary focus of Mosse's (2005) ethnography is not about whether or not projects work but rather *how* they work and how success is produced in the process. Mosse (2005) opens his book with a discussion on the "new ethnography of development," which reframes our understanding of international development projects. Until the 21st century, the notion of "development" provided a means of understanding the relationship between the global West and its "others." Since then, this traditional framework of development has come under scrutiny within the development community in an attempt to distance themselves from the colonial past and political motivations of international aid projects and thus "reframe" development to focus on global poverty reduction, democracy, and citizens' rights. Similar patterns can be recognized within the conservation sector, where the international community has predominantly shifted its focus away from fortress conservation techniques, which had their own negative implications on local communities, to the enrollment and participation of the local community in conservation projects while simultaneously putting forward a number of international targets.

In studying development projects in India, Mosse (2005) seeks to avoid the tendency to focus solely on community members, which is common across studies of CBC and development projects. While studying community members is still an integral part of understanding the production of success in a project, employing a myopic focus on this group diverts attention away from the complexities and ethnographic insight that can be inferred from studying government agencies, conservation organizations, and the practitioners themselves. Failing to account for the higher scales of a project thus leads to a static understanding of success in conservation as something that is self-evident and supported by technocratic indicators of success (be it biological, economic, or social). In this sense, exploring the nuanced relationship between policy and practice at every scale of a project helps illuminate issues that surround conservation projects, such as power dynamics, issues

of "elite capture" within the local community, and the effect of institutional politics and donor-pressured agendas on the outcomes of a project.

In order to gain ethnographic insight from studying actors at the higher scales of the PGEM, I engaged with representatives of the Municipality of Moorea-Maiao and the Territorial Government of French Polynesia. Accounting for the technocratic composition of success has proven to be crucial in my understanding of how management plays out in practice, as this version of success played a fundamental role in constructing the future of the PGEM. Without this understanding, my analysis would have been predominantly limited to the local community's compositions of success. While understanding how the local community composes success is important, augmenting this understanding with the technocratic framings of success can help identify similarities and differences between the ways in which different stakeholders approach the question of how to make management successful. Providing an account of the compositions of success and failure of stakeholder groups at different scales in the PGEM can thus promote a reflexive awareness among the stakeholders so that they can modify their strategies as they see fit without relying too heavily on assumptions that may be incongruous with how other stakeholders approach the issue. Understanding how these different compositions of success compete with and complement each other can reveal how "power," in this case being the ability to make management decisions, can be reconsidered as a productive practice that requires negotiation with and active enrollment of members of the local community into the project.

It is in Mosse's (2005) discussion of the reconceptualization of "power" that we can see the subtle influence of Foucault's (1994) notion of governmentality, in which power and hegemony are reconsidered to be a productive practice that requires negotiation with and active enrollment of members of the local community. Rather than assuming that a successful project is a self-evident and stable process that can be grasped by experts, instead, success or failure is thus reconceptualized as a *process that is achieved* by a stakeholder group or groups through controlling and stabilizing a particular composition of elements that constitute the project. Local community members involved in the project are not simply duped into engaging with the project, but instead they are enrolled through different processes catering, convincing, or seducing to participate in the production of success. In essence, the success that is produced in a development project relies on interpretive

communities, or those who "participate in the order as if its representations were reality" (Mosse 2005, 8). However, affirming its own reality does not lie within the capacity of development projects but instead relies on the "outside judgments" of experts who interpret events in connection to policy concepts and texts. With this in mind, success in a project is also produced through the affirmation of the project's representation of reality, which occurs when expert observers determine that the project satisfies its objectives and yields a positive impact. Thus, the production of success in conservation projects often relies on the interpretation of technocrats, especially social or natural scientists, of how the project satisfies these targets that are often determined at a broader scale by donors and international organizations.

Given that the regulations in the PGEM are predominantly informed by the technocratic framing of success, the reality of a successful PGEM was weakly affirmed by social and natural scientists who conducted a series of empirical studies to assess the effectiveness of the framework in connection to common biological and social metrics of success. The success of the PGEM was weakly affirmed in the sense that the studies revealed that while there were a few “enabling conditions” for effective management or measurable increases in fish density and biomass, most of the studies conducted with specific attention to the PGEM also revealed several challenges that inhibit greater success, especially in comparison to other marine management frameworks (Hunter et al. 2018; Thiault et al. 2019; Stoner-Osborne 2020; Walker and Robinson 2009). However, this judgment also attests to the potential of the revised framework as the ability to affirm or challenge this reality of the PGEM has been opened to more stakeholders who hold different compositions of success and failure to use as a baseline with the observed outcomes of the revised management strategy.

4.3 THE PGEM: SUCCESS AND FAILURES

In this research, I have shown how different stakeholders’ versions of successful marine management tie together heterogeneous elements that transcend the discrete domains of reality that technocrats have become comfortable with to organize reality in an attempt to further rationalize management. From different conceptions of the “environment” to the assertion of the “real fisher” and other boundaries that determine who belongs to the

"community," to different approaches to the "problem" of politics, the variety of ways in which stakeholders frame elements they deem to be relevant to the PGEM reveals different compositions of success and failure that will continue to have an impact on the future of the management framework.

Table 8 Stakeholder groups' perceptions of the PGEM and key elements of "success" and "failure"

Stakeholder Group	General Perceptions of Revised PGEM	Who Should Be Involved in Management?	Key Elements of "Success"	Key Elements of "Failure"
Fishing community	Somewhat negative, but definite prognosis is dependent on how the revisions will play out in practice in the future	Scientists help inform management strategies, and other stakeholder groups can participate, but "real" fishers should take the primary role	Fishers have primary control in management and should be represented by "real" fishers, manage what happens both on land and in the lagoon	People who are not "real" fishers should not take part in management (as they are not as familiar with the lagoon), the PGEM is "too political"
Municipality/ Territorial Government	Positive, but definite prognosis is dependent on how the revisions will play out in practice in the future	Everyone, but the municipality/ territorial government maintains primary control	The text of the PGEM, meaningful involvement of the local community, and impartial representation of the entire population, manage what happens in the lagoon	The community does not understand the regulations and involvement of the community is not meaningful
Technocratic Institutions/ Environmental Protection Organizations	Positive, but definite prognosis is dependent on how the revisions will play out in practice in the future	Fishers (in collaboration with the municipality/ territorial government and scientists)	Biological indicators (e.g., fish biomass, biodiversity, population density, coral cover), Precise and methodologically- sound data collection techniques, manage what happens in the lagoon	There is no improvement in biological indicators within (and outside) of MPAs

Tourism Industry	Mostly positive, but definite prognosis is dependent on how the revisions will play out in practice in the future	Fishers (in collaboration with the municipality/ territorial government and scientific institutions)	Balancing the protection of the environment with the growing tourism industry and interests of the fishers, manage what happens in the lagoon	The PGEM is "too political," the lagoon is oversaturated with tourism activities

So how does community-based conservation play out in practice? While the course of the PGEM has been predominantly influenced by the technocratic framing of success, the revision process has created space for the management framework to be shaped by other compositions of success as the local community has been integrated into the decision-making process. The promise of the CBC approach is often premised on the assumption that involving the community in a conservation project will improve the project's success as stakeholders will be more likely to comply with regulations. However, it is not just about involving the community in conservation projects. According to Mosse (2005), the success or failure of a project is best understood as a *process that is achieved* by a stakeholder group (or groups) through controlling and stabilizing a particular composition of elements that constitute the project. With this in mind, in order for management to improve, the local community needs to be enrolled in the production of success that is also aligned with their priorities. In the case of Moorea, various compositions of success exist across the stakeholders involved in the PGEM. As more decision-making authority is devolved to the local community, these different compositions of success among the stakeholder groups will play an integral role in determining the future of the PGEM. It is important not only to discuss how management can be improved but also to consider who should have the power to control the conversation. In the past, this role has been primarily entrusted to policymakers, scientists, and other experts. However, understanding how different stakeholders frame the PGEM and how this in turn is reflected in its implementation will be best used in the hands of the stakeholders themselves.

While other stakeholders were able to provide input (that was informed by their own definitions of success) during the revision process, conflicting priorities, and opinions of how the lagoon should be managed have created a landscape of contestation in which stakeholders

pull from a variety of elements that move beyond strict categories of "social," "political," "biological," or "economic" domains. The fishers' definition of success, which predominantly focuses on their ability to be granted authority when it comes to implementing the PGEM, is reflected in the revised framework through the establishment of district-level fishing committees (who also hold positions on the PGEM committee) and the *zones à vocation de pêche durable et equitable* that are controlled by the fishing committees in collaboration with the DRM. Establishing fishing committees at the district level also reflects how many fishers determine how the lagoon should be managed as many in the fishing community fish in the lagoon area adjacent to their district and thus are mainly concerned with how that area of the lagoon should be managed. The tourism industry's framing of success, which is centered around a balance between protecting the environment and supporting the livelihoods of those who work in tourism-related jobs, can be seen in the revised PGEM's attempts to account for the importance of tourism development in a manner that is supposed to be more compatible with protecting the lagoon. These priorities are primarily reflected in the new zoning of the lagoon, including the *zones à vocation de développement durables des activités* (areas for the sustainable development of activities*)* and *zones à vocation sécuritaire, environnementale et touristique* (zones with security, environmental and tourism goals). Given that the interests of environmental protection associations are aligned with the goals of scientists, their framing of success is consistent with that of the technocrats (as success is determined by discrete variables, such as biological data measuring the lagoon's health). As is reflected in the text and the overall framing of the PGEM, the technocratic composition of success will have a significant impact on marine management on Moorea as it establishes the boundaries within which other stakeholders can produce their own versions of success without supplanting the authority of the territorial government and municipality.

By providing an account of how different stakeholders compose success and failure under the PGEM, I hope my work will help stakeholders reflect on their assumptions in relation to other stakeholder groups in a manner that will promote more effective communication and collaboration as individuals can modify their assumptions accordingly if and when they deem it necessary. Holding an understanding of other stakeholders' priorities and challenges that affect their respective stake in management that is informed by accounts

of the stakeholders themselves rather than one's assumptions will help inform a more amenable approach to the question of what needs to be done to make the PGEM successful. However, this is not to say that my account is "objective," "holistic," or anywhere near a complete understanding of the way in which different stakeholders produce success. While I have tried my best to provide an account that is articulated by stakeholders in their own terms, my analysis is still based on my own assumptions and interpretations. A lot is at stake when it comes to the future of the PGEM, both for the marine environment and the people of Moorea. Determining what "success" will look like in the future will require ongoing negotiation within and amongst the different stakeholder groups involved in the PGEM. I hope that this account of the priorities of different stakeholder groups will be a step in the right direction in promoting equitable and effective negotiation on how to make the PGEM more "successful" for more people on Moorea.

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APPENDIX A: 2021 FISHER SURVEY & SEMI-STRUCTURED INTERVIEW QUESTIONS (ENGLISH VERSION)

Introduction: Hello, my name is _____. We are working with *[UCSB/SDSU/Gump]*. We are interested in understanding the marine management framework under the *Plan de Gestion de l'Espace Maritime*, or the PGEM, along with local participation in and perceptions of the PGEM. Information collected from this survey may be used to inform fisheries management in the future, but only with cooperation from local fishing communities. Your answers are confidential.

If you have any questions or concerns, please contact[12]:

- Matt Lauer (Principal Investigator)
- Jean Wencélius

INTRODUCTION

1. Are you involved in the regulation of marine resources in Moorea? [ ] Y [ ] N
    a. If not, do you know anyone involved in the regulation of marine resources in Moorea?

MARINE MANAGEMENT / PERCEPTIONS OF THE ENVIRONMENT

2. Do you believe it is necessary to manage the lagoon space?
    a. Why/why not?

3. What should be the main goals when it comes to managing the lagoon?
    [ ] Involving the community in management
    [ ] Protecting the lagoon resources
    [ ] Communication between the groups involved in management
    [ ] Making sure everyone respects regulations
    [ ] Fair enforcement of the PGEM
    [ ] Implementing *rahui*
    [ ] Controlling tourism activities in the lagoon
    [ ] Making sure everyone respects the lagoon
    [ ] Other:_____
    [ ] I don't know

[12] Contact information has been removed

4. Have you heard of rahui?

5. If yes,
    a. What does rahui mean to you?
    b. How would you compare rahui to the PGEM?

6. How would you describe the condition of the lagoon?
   [ ] Very healthy [ ] Healthy [ ] Somewhat healthy [ ] Not healthy

7. What are the key factors that indicate the condition of local marine resources?

8. Since the original PGEM was passed in 2004, how has the condition of local marine resources changed??
   [ ] Has gotten significantly worse [ ] Has stayed the same
   [ ] Has gotten slightly worse [ ] Has slightly improved
   [ ] Has significantly improved [ ] Don't know

9. What are the biggest problems for the lagoon?
   [ ] The PGEM
   [ ] Overfishing
   [ ] Damaged coral reefs
   [ ] Algae
   [ ] Pollution
   [ ] Declining fish populations
   [ ] The population
   [ ] Tourism activities (e.g., jet skis, scuba diving, shark feeding, boating)
   [ ] Lack of enforcement of the PGEM
   [ ] Climate change
   [ ] Unfair enforcement of the PGEM
   [ ] People not respecting the PGEM regulations
   [ ] Other:_____
   [ ] I do not think there are any problems in the lagoon
   [ ] I don't know

10. How would you describe your relationship to the lagoon?
    a. Why is it important to you?

The PGEM

11. Do you think the PGEM has been successful? [ ] Yes [ ] No
    1. Why/why not?

12. Have you heard about the proposed revisions of the PGEM? [ ] Yes [ ] No
    a. If yes, how did you hear about them?

13. Do you know any of the proposed revisions? [ ] Yes [ ] No
    a. If yes, do you support these proposed revisions? [ ] Yes [ ] No

i. If no, what would it take for you to support the PGEM? What changes would you like to see?

14. Have these revisions made you more or less likely to support the PGEM? Or have they had no impact?
    [ ] Less likely [ ] More likely [ ] No impact
    a. Why or why not?

15. How would you compare rotational closures to permanent closures?
    a. What are the strengths and weaknesses of each?
        i. Is one more effective than the other?

16. How long should a rotational closure last in order to be effective in terms of protecting marine resources?
    a. Why?

17. Have you heard about the proposed revisions of the PGEM? [ ] Yes [ ] No
    a. If yes, how did you hear about them?

18. Have you heard of temporary closures? [ ] Yes [ ] No
    a. If yes, how would you define temporary closures?

19. How would you compare rotational closures to permanent closures?
    a. What are the strengths and weaknesses of each?
    b. Is one more effective than the other?

20. How long should a rotational closure last in order to be effective in terms of protecting marine resources?

21. Who should be involved in the management of the lagoon space in Moorea?
    [ ] Fishers
    [ ] The municipality of Moorea-Maiao
    [ ] The French Polynesian territorial government
    [ ] France
    [ ] Scientists
    [ ] The tourism industry
    [ ] The environmental protection associations
    [ ] The cultural associations
    [ ] The rahui association
    [ ] Other:_____
    [ ] Everyone
    [ ] I don't know

22. How well do these revisions represent the interests of the community?
    [ ] Poor [ ] Fair [ ] Good [ ] Excellent
23. How effective is the PGEM at protecting important marine resources?

[ ] Very effective [ ] Effective [ ] Somewhat effective [ ] Not effective

a. Why or why not?

24. Do you think these proposed revisions would make the PGEM more effective?
[ ] Yes [ ] No
a. Why/Why not?

25. Have you heard of the [district] fishing committee? [ ] Yes [ ] No
a. If yes, how did you hear about the committee?

b. Do you know any of the leaders of the committee? [ ] Yes [ ] No
i. Who?

c. Have you interacted with the committee in any way? [ ] Yes [ ] No
ii. How?

26. Does anything besides the PGEM keep you from fishing in certain locations?
[ ] Yes [ ] No
If yes, what:_____

27. Does anything besides the PGEM keep you from fishing certain species?
[ ] Yes [ ] No
If yes, what:_____

28. Has the PGEM changed your relationship to the lagoon in any way? [ ] Yes [ ] No
a. If yes, how so?

29. Do you think there is a more effective way to manage the lagoon than the PGEM?
[ ] Yes [ ] No
a. If yes, what would it be and why?

FISHING PRACTICES

30. How many days per week do you fish?
[ ] Every day [ ] 2-3x week. [ ] 1x per week [ ] Not often
a. *When was the last time you fished?*_____

31. What fishing gear do you use?

32. For you, what are the most important reasons for fishing? (select all that apply)
a. To sell the catch
b. To eat the catch
c. To give to friends/family
d. Enjoy it/for fun
e. No other work available
f. Other:_____

DEMOGRAPHIC INFORMATION

33. What is your date of birth?

34. Gender: [ ] Male [ ] Female [ ] Other

35. What is your religion/church?

[ ] Catholic	[ ] Assembly of God	[ ] Don't know
[ ] Methodist	[ ] Jehovah's Witness	[ ] None
[ ] Mormon	[ ] CCCAS	[ ] Other: _____
[ ] Bahà'i	[ ] Seventh Day Adventist	[ ] Prefer not to answer

36. What is your ancestry? (check all that apply)

[ ] Tahitian	[ ] Other European/US/NZ	[ ] Other:_____
[ ] Non-Tahitian Islander	[ ] Asian	[ ] Don't know
[ ] French	[ ] African	[ ] Prefer not to answer

37. What is the highest level of education that you have completed?

[ ] Less than elementary school	[ ] University (4-year)
[ ] Elementary school	[ ] Graduate school
[ ] High school	[ ] Other:_____
[ ] Community college (2 year)	[ ] Prefer not to answer

38. Do you know of other fishers in your village who we should interview, and would you mind sharing their names and contact information?

Name	**Location**	**Phone/email/How to contact**

39. Do you have any additional information or comments you would like to share?

APPENDIX B: 2022 FISHER SURVEY AND SEMI-STRUCTURED INTERVIEW QUESTIONS (ENGLISH VERSION)

Introduction: Hello, my name is _____. We are working with *[UCSB/SDSU/Gump]*. We are interested in understanding the marine management framework under the *Plan de Gestion de l'Espace Maritime*, or the PGEM, along with local participation in and perceptions of the PGEM. Information collected from this survey may be used to inform fisheries management in the future, but only with cooperation from local fishing communities. Your answers are confidential.

If you have any questions or concerns, please contact[13]:

- Matt Lauer (Principal Investigator)
- Jean Wencélius

We have a number of questions we want to ask you about the PGEM and the lagoon in general. For each question, please select from the answers provided below.

PERCEPTIONS OF LAGOON HEALTH & MANAGEMENT

1. What are the biggest problems for the lagoon?
   [ ] The PGEM
   [ ] Overfishing
   [ ] Damaged coral reefs
   [ ] Algae
   [ ] Pollution
   [ ] Declining fish populations
   [ ] The population
   [ ] Tourism activities (e.g., jet skis, scuba diving, shark feeding, boating)
   [ ] Lack of enforcement of the PGEM
   [ ] Climate change
   [ ] Unfair enforcement of the PGEM
   [ ] People not respecting the PGEM regulations
   [ ] Other:_____
   [ ] I do not think there are any problems in the lagoon
   [ ] I don't know

[13] Contact information has been removed

2. Since the original PGEM was passed in 2004, how has the condition of local marine resources changed?
   [ ] Has gotten significantly worse
   [ ] Has stayed the same
   [ ] Has gotten slightly worse
   [ ] Has slightly improved
   [ ] Has significantly improved
   [ ] I don't know

3. What is/are the most effective way[s] to manage the lagoon? (select all that apply)
   [ ] Involving the community in management
   [ ] Protecting the lagoon resources
   [ ] Communication between the groups involved in management
   [ ] Making sure everyone respects regulations
   [ ] Fair enforcement of the PGEM
   [ ] Implementing *rahui*
   [ ] Controlling tourism activities in the lagoon
   [ ] Making sure everyone respects the lagoon
   [ ] Other:_____
   [ ] I don't know

PGEM REVISIONS

4. Are you aware of the revisions of the PGEM?
   [ ] Yes [ ] No
5. Under the revised PGEM, the municipality met with members of the community in Moorea on multiple occasions to address problems with the original PGEM and proposed changes, which were passed in September 2021. [*Show map of different zones under the new PGEM]* Under the new PGEM, there are different zones in the lagoon with different regulations.
   a. ***Zones à vocation de protection de l'environnement (red on map****) zones for which the priority of the environment is the main goal. All the specific zones within this category do not prohibit fishing. But a couple of them do see yellow highlights and two are exactly like the previous MPAs (Aroa and Pihaena), two are smaller (Ahi and Tiahura), and one new one (small circle near shore on Haapiti side - see red zones in map).*
      i. On a scale of 1 to 5, how effective do you think these zones will be in managing the lagoon? (1 = not effective at all, 5= very effective)
         1 2 3 4 5

   b. ***Zones à vocation de pêche durable et équitable (green on map)*** *These are the zones that fall under the control of the fishing committees and DRM. There are no specific regulations built into the revised PGEM, but regulations will be decided upon through concertation between fishing committees and DRM and will be enacted through a separate bill written by DRM and signed by the Minister of Blue Economy. Their zoning is very similar to the previous MPAs from the original PGEM.*

i. On a scale of 1 to 5, how effective do you think these zones will be in managing the lagoon? (1 = not effective at all, 5= very effective)
1 2 3 4 5

c. ***<u>Zones à vocation de développement durables des activités</u>***—*these zones are not represented on the map, but they will mainly regulate tourism activities (and don't concern fishing)*

i. On a scale of 1 to 5, how effective do you think these zones will be in managing the lagoon? (1 = not effective at all, 5= very effective)
1 2 3 4 5

d. ***<u>Zones à vocation sécuritaire, environnementale et touristique (orange on map).</u>*** *These zones are basically the two previous MPAs of Temae and Tiahura. Fishing is prohibited except line fishing and 'ouma net-fishing (juvenile goat fishing*).

i. On a scale of 1 to 5, how effective do you think these zones will be in managing the lagoon? (1 = not effective at all, 5= very effective)
1 2 3 4 5

6. Do you think the new PGEM will be more effective in managing the lagoon as compared to the original PGEM?
[ ] Yes
[ ] No

7. In your opinon, which group(s) had the most influence in deciding the revisions for the new PGEM? (select all that apply)
[ ] Fishers
[ ] The municipality of Moorea-Maiao
[ ] The French Polynesian territorial government
[ ] France
[ ] Scientists
[ ] The tourism industry
[ ] The environmental protection associations
[ ] The cultural associations
[ ] The rahui association
[ ] Other:_____
[ ] Nobody had influence in deciding the revisions
[ ] I don't know

8. Which group(s) benefit most from the changes in the new PGEM? (select all that apply)
[ ] Fishers
[ ] The municipality of Moorea-Maiao
[ ] The French Polynesian territorial government
[ ] France
[ ] Scientists

[ ] The tourism industry
[ ] The environmental protection associations
[ ] The cultural associations
[ ] The rahui association
[ ] Other:_____
[ ] Nobody benefits from these changes
[ ] I don't know

DEMOGRAPHIC INFORMATION

9. What is your date of birth? _____
10. Gender: [ ] Male [ ] Female [ ] Other

11. What is your religion/church?
[ ] Catholic [ ] Assembly of God [ ] Don't know
[ ] Methodist [ ] Jehovah's Witness [ ] None
[ ] Mormon [ ] CCCAS [ ] Other: _____
[ ] Bahà'i [ ] Seventh Day Adventist [ ] Prefer not to answer

12. What is your ancestry? (check all that apply)
[ ] Tahitian [ ] Other European/US/NZ [ ] Other:_____
___
[ ] Non-Tahitian Islander [ ] Asian [ ] Don't know
[ ] French [ ] African [ ] Prefer not to answer

13. What is the highest level of education that you have completed?
[ ] Less than elementary school [ ] University (4-year)
[ ] Elementary school [ ] Graduate school
[ ] High school [ ] Other:_____
[ ] Community college (2 year) [ ] Prefer not to answer

14. How many days per week do you fish?
[ ] Every day [ ] 2-3x week. [ ] 1x per week [ ] Not often
a. *When was the last time you fished?*_____

15. What fishing gear do you use? (select all that apply)
[ ] Net [ ] Haapua
[ ] Spear gun [ ] Line
[ ] Other: _____

16. When you fish, do you usually do so
[ ] Alone [ ] With friends
[ ] With family [ ] Other: _____

17. How would you describe the condition of local marine resources? (select one)
[ ] Very healthy [ ] Somewhat healthy
[ ] Healthy [ ] Not healthy

18. Do you know of other fishers in your village who we should interview, and would you mind sharing their names and contact information?

Name	**Location**	**Phone/email/How to contact**

19. Do you have any additional information or comments you would like to share?

APPENDIX C: 2021 FISHER SURVEY & SEMI-STRUCTURED INTERVIEW QUESTIONS (FRENCH VERSION)

Présentation: Bonjour, je m'appelle_____. Nous travaillons avec [UCSB/SDSU/Gump]. Nous sommes intéressés à comprendre le cadre de gestion marine dans le cadre du Plan de Gestion de l'Espace Maritime, ou le PGEM, ainsi que la participation locale et les perceptions du PGEM. Les informations recueillies à partir de cette enquête peuvent être utilisées pour éclairer la gestion des pêches à l'avenir, mais uniquement avec la coopération des communautés de pêcheurs locales. Vos réponses sont confidentielles.

Si vous avez des questions ou des préoccupations, veuillez contacter:
• Matt Lauer (chercheur principal)
• Jean Wencélius

INTRODUCTION

1. Vous êtes impliqué dans la régulation des ressources marines à Moorea? [ ] Oui [ ] Non
    a. Si non, connaissez-vous des personnes impliquées dans la régulation des ressources marines à Moorea?

GESTION MARINE / PERCEPTIONS DE L'ENVIRONNEMENT

2. Pensez-vous qu'il est nécessaire de gérer l'espace lagon?
    a. Pourquoi/pourquoi pas?

3. Quels devraient être les principaux objectifs en matière de gestion du lagon?
    [ ] Impliquer la communauté dans la gestion
    [ ] Protéger les ressources du lagon
    [ ] Communication entre les groupes impliqués dans la gestion
    [ ] S'assurer que chacun respecte la réglementation
    [ ] Application équitable du PGEM
    [ ] Implémentation de rahui
    [ ] Contrôler les activités touristiques dans le lagon
    [ ] S'assurer que chacun respecte le lagon
    [ ] Autre:_____

    [ ] Je ne sais pas

4. Avez-vous entendu parler du rahui?

5. Si oui,
   a. Que signifie rahui pour vous?
   b. Comment compareriez-vous le rahui au PGEM?

6. Comment décririez-vous l'état du lagon?
   [ ] Très sain [ ] Sain [ ] Assez sain [ ] Pas sain

7. Quels sont les facteurs clés qui indiquent l'état des ressources marines locales?

8. Depuis l'adoption du PGEM original en 2004, comment l'état des ressources marines locales a-t-il changé?
   [ ] A considérablement empiré [ ] Est resté le même
   [ ] S'est légèrement aggravé [ ] S'est légèrement amélioré
   [ ] S'est considérablement amélioré [ ] Je ne sais pas

9. Quels sont les plus gros problèmes du lagon ?
   [ ] Le PGEM
   [ ] Surpêche
   [ ] Récifs coralliens endommagés
   [ ] Algues
   [ ] La pollution
   [ ] Déclin des populations de poissons
   [ ] La population
   [ ] Activités touristiques (e.g., jet skis, plongée sous-marine, nourrissage des requins, navigation de plaisance)
   [ ] Manque d'application du PGEM
   [ ] Changement climatique
   [ ] Application inéquitable du PGEM
   [ ] Personnes ne respectant pas la réglementation PGEM
   [ ] Autre:_____
   _____
   [ ] Je ne pense pas qu'il y ait de problèmes dans le lagon
   [ ] Je ne sais pas

10. Comment décririez-vous votre relation au lagon?
    a. Pourquoi est-ce important pour vous?

Le PGEM

11. Pensez-vous que le PGEM a été un succès?
    a. Pourquoi/pourquoi pas?

12. Avez-vous entendu parler des révisions proposées du PGEM? [[ ] Oui [ ] Non
    a. Si oui, comment en avez-vous entendu parler?

13. Connaissez-vous l'une des révisions proposées? [[ ] Oui [ ] Non
    a. Si oui, appuies-tu ces révisions proposées? [[ ] Oui [ ] Non
        i. Si non, que faudrait-il pour que vous souteniez le PGEM? Quels changements aimeriez-vous voir?

14. Ces révisions vous ont-elles rendu plus ou moins enclin à soutenir le PGEM? Ou n'ont-ils eu aucun impact?
    [ ] Moins probable [ ] Plus probable [ ] Aucun impact
    a. Pourquoi ou pourquoi pas?

15. Comment compareriez-vous les fermetures tournantes aux fermetures permanentes?
    a. Quelles sont les forces et les faiblesses de chacun?
        i. L'un est-il plus efficace que l'autre?

16. Combien de temps doit durer une fermeture tournante pour être efficace en termes de protection des ressources marines?
    a. Pourquoi?

17. Avez-vous entendu parler des révisions proposées du PGEM? [[ ] Oui [ ] Non
    a. Si oui, comment en avez-vous entendu parler?

18. Avez-vous entendu parler de fermetures temporaires? [ ] Oui [ ] Non
    a. Si oui, comment définiriez-vous les fermetures temporaires?

19. Comment compareriez-vous les fermetures tournantes aux fermetures permanentes?
    a. Quelles sont les forces et les faiblesses de chacun?
    b. L'un est-il plus efficace que l'autre?

20. Combien de temps doit durer une fermeture tournante pour être efficace en termes de protection des ressources marines?

21. Qui doit être impliqué dans la gestion de l'espace lagonaire de Moorea?
    [ ] Pêcheurs
    [ ] La commune de Moorea-Maiao
    [ ] Le gouvernement territorial de la Polynésie française
    [ ] France
    [ ] Scientifiques
    [ ] L'industrie du tourisme
    [ ] Les associations de protection de l'environnement
    [ ] Les associations culturelles
    [ ] L'association rahui
    [ ] Autre:_____
    [ ] Toutes les personnes
    [ ] Je ne sais pas

22. Dans quelle mesure ces révisions représentent-elles les intérêts de la communauté?

[ ] Médiocre [ ] Passable [ ] Bon [ ] Excellent

23. Quelle est l'efficacité du PGEM dans la protection des ressources marines importantes?
[ ] Très efficace [ ] Efficace [ ] Assez efficace [ ] Pas efficace
a. Pourquoi ou pourquoi pas?

24. Pensez-vous que ces révisions proposées rendraient le PGEM plus efficace?
[ ] Oui [ ] Non
a. Pourquoi/pourquoi pas?

25. Avez-vous entendu parler du comité de pêche [du district]? [ ] Oui [ ] Non
a. Si oui, comment avez-vous entendu parler du comité?

b. Connaissez-vous l'un des dirigeants du comité? [ ] Oui [ ] Non
i. Qui?

c. Avez-vous interagi avec le comité d'une manière ou d'une autre? [ ] Oui [ ] Non
ii. Comment?

26. Y a-t-il autre chose que le PGEM qui vous empêche de pêcher à certains endroits?
[ ] Oui [ ] Non
Si oui, quoi:_____

27. Y a-t-il autre chose que le PGEM qui vous empêche de pêcher certaines espèces?
[ ] Oui [ ] Non
Si oui, quoi:_____

28. Le PGEM a-t-il changé votre rapport au lagon d'une manière ou d'une autre? [ ] Oui [ ] Non a. Si oui, comment?

29. Pensez-vous qu'il existe un moyen plus efficace de gérer le lagon que le PGEM?
[ ] Oui [ ] Non
a. Si oui, quel serait-il et pourquoi?

PRATIQUES DE PÊCHE

30. Combien de jours par semaine pêchez-vous?
[ ] Tous les jours [ ] 2 à 3 fois par semaine. [ ] 1x par semaine [ ] Pas souvent
a. À quand remonte la dernière fois que vous avez pêché?_____

31. Quels engins de pêche utilisez-vous?

32. Pour vous, quelles sont les raisons les plus importantes pour pêcher? (Sélectionnez tout ce qui s'y rapporte)
a. Pour vendre la prise
b. Pour manger la pêche
c. A offrir aux amis/famille
d. Profitez-en / pour le plaisir

e. Pas d'autre travail disponible
f. Autre:_____

INFORMATIONS DÉMOGRAPHIQUES

33. Quelle est votre date de naissance?

34. Sexe: [ ] Masculin [ ] Féminin. [ ] Autre

35. Quelle est votre religion/église?

[ ] Catholique	[ ] Assemblée de Dieu	[ ] Ne sait pas
[ ] Méthodiste	[ ] Témoin de Jéhovah	[ ] Aucun
[ ] LDS	[ ] CCCAS	[ ] Autre:_____
[ ] Bahà'i	[ ] Adventiste du Septième Jour	[ ] Préfère ne pas répondre

36. Quelle est votre ascendance? (Cochez toutes les cases)

[ ] Tahitien	[ ] Autre Européen/US/NZ	[ ] Autre:_____
[ ] Insulaire non tahitien	[ ] Asiatique	[ ] Ne sait pas
[ ] Français	[ ] Africain	[ ] Je préfère ne pas répondre

37. Quel est le niveau d'études le plus élevé que vous ayez atteint?

[ ] Inférieur à l'école primaire	[ ] Université (4 ans)
[ ] École élémentaire	[ ] École supérieure
[ ] Lycée	[ ] Autre:_____
[ ] Collège communautaire (2 année)	[ ] Je préfère ne pas répondre

38. Connaissez-vous d'autres pêcheurs de votre village que nous devrions interroger, et accepteriez-vous de partager leurs noms et leurs coordonnées?

Nom:	Localisation:	Téléphone/email/Comment contacter:

39. Avez-vous des informations supplémentaires ou des commentaires que vous aimeriez partager?

APPENDIX D: 2022 FISHER SURVEY AND SEMI-STRUCTURED INTERVIEW QUESTIONS (FRENCH VERSION)

Présentation: Bonjour, je m'appelle_____ . Nous travaillons avec [UCSB/SDSU/Gump]. Nous sommes intéressés à comprendre le cadre de gestion marine dans le cadre du Plan de Gestion de l'Espace Maritime, ou le PGEM, ainsi que la participation locale et les perceptions du PGEM. Les informations recueillies à partir de cette enquête peuvent être utilisées pour éclairer la gestion des pêches à l'avenir, mais uniquement avec la coopération des communautés de pêcheurs locales. Vos réponses sont confidentielles.

Si vous avez des questions ou des préoccupations, veuillez contacter:
• Matt Lauer (chercheur principal)
• Jean Wencélius

Nous avons un certain nombre de questions à vous poser sur le PGEM et le lagon en général. Pour chaque question, veuillez choisir parmi les réponses fournies ci-dessous.

PERCEPTIONS SUR LA SANTÉ ET LA GESTION DU LAGON

1. Quels sont les plus gros problèmes du lagon?
   - [ ] Le PGEM
   - [ ] Surpêche
   - [ ] Récifs coralliens endommagés
   - [ ] Algues
   - [ ] La pollution
   - [ ] Déclin des populations de poissons
   - [ ] La population
   - [ ] Activités touristiques (e.g., jet skis, plongée sous-marine, nourrissage des requins, navigation de plaisance)
   - [ ] Manque d'application du PGEM
   - [ ] Changement climatique
   - [ ] Application inéquitable du PGEM
   - [ ] Personnes ne respectant pas la réglementation PGEM
   - [ ] Autre:_____
   - [ ] Je ne pense pas qu'il y ait de problèmes dans le lagon
   - [ ] Je ne sais pas

2. Depuis l'adoption du PGEM initial en 2004, comment l'état des ressources marines locales a-t-il changé?
    [ ] A considérablement empiré
    [ ] Est resté le même
    [ ] A légèrement empiré
    [ ] S'est légèrement amélioré
    [ ] S'est considérablement amélioré
    [ ] Je ne sais pas

3. Quel(s) est/sont le(s) moyen(s) le(s) plus efficace(s) de gérer le lagon? (Sélectionnez tout ce qui s'y rapporte)
    [ ] Impliquer la communauté dans la gestion
    [ ] Protéger les ressources du lagon
    [ ] Communication entre les groupes impliqués dans la gestion
    [ ] S'assurer que chacun respecte la réglementation
    [ ] Application équitable du PGEM
    [ ] Implémentation de rahui
    [ ] Contrôler les activités touristiques dans le lagon
    [ ] S'assurer que chacun respecte le lagon
    [ ] Autre:_____
    [ ] Je ne sais pas

RÉVISIONS PGEM

4. Êtes-vous au courant des révisions du PGEM?
    [ ] Oui [ ] Non

5. Dans le cadre du PGEM révisé, la municipalité a rencontré à plusieurs reprises des membres de la communauté de Moorea pour aborder les problèmes liés au PGEM original et les modifications proposées, qui ont été adoptées en septembre 2021. [*Afficher la carte des différentes zones sous le nouveau PGEM*] Sous le nouveau PGEM, il existe différentes zones dans le lagon avec des réglementations différentes.

    a. **Zones à vocation de protection de l'environnement *(en rouge sur la carte)*** *zones pour lesquelles la priorité de l'environnement est l'objectif principal. Toutes les zones spécifiques de cette catégorie n'interdisent pas la pêche. Mais quelques-unes d'entre elles voient des reflets jaunes et deux sont exactement comme les AMP précédentes (Aroa et Pihaena), deux sont plus petites (Ahi et Tiahura) et une nouvelle (petit cercle près du rivage du côté Haapiti - voir les zones rouges sur la carte).*

        i. Sur une échelle de 1 à 5, quelle sera selon vous l'efficacité de ces zones dans la gestion du lagon? (1 = pas efficace du tout, 5= très efficace)

        1 2 3 4 5

    b. **Zones à vocation de pêche durable et équitable *(en vert sur la carte)*** *Ce sont les zones sous le contrôle des comités de pêche et de la DRM. Il n'y a pas de réglementation spécifique intégrée dans le PGEM révisé, mais les réglementations seront décidées par la concertation entre les comités de pêche et DRM et seront*

promulguées par un projet de loi distinct rédigé par DRM et signé par le ministre de l'Économie bleue. Leur zonage est très similaire aux AMP précédentes du PGEM d'origine.

i. Sur une échelle de 1 à 5, quelle sera selon vous l'efficacité de ces zones dans la gestion du lagon? (1 = pas efficace du tout, 5= très efficace)

1 2 3 4 5

c. **Zones à vocation de développement durable des activités** — *ces zones ne sont pas représentées sur la carte, mais elles réglementeront principalement les activités touristiques (et ne concernent pas la pêche)*

i. Sur une échelle de 1 à 5, quelle sera selon vous l'efficacité de ces zones dans la gestion du lagon? (1 = pas efficace du tout, 5= très efficace)

1 2 3 4 5

d. **Zones à vocation sécuritaire, environnementale et touristique (*orange sur la carte).*** *Ces zones sont essentiellement les deux AMP précédentes de Temae et Tiahura. La pêche est interdite sauf la pêche à la ligne et la pêche au filet 'ouma (pêche des chèvres juvéniles).*

i. Sur une échelle de 1 à 5, quelle sera selon vous l'efficacité de ces zones dans la gestion du lagon? (1 = pas efficace du tout, 5= très efficace)

1 2 3 4 5

6. Pensez-vous que le nouveau PGEM sera plus efficace dans la gestion du lagon que le PGEM original?
   [ ] Oui
   [ ] Non

7. Selon vous, quel(s) groupe(s) a(ont) eu le plus d'influence dans la décision des révisions du nouveau PGEM? (Sélectionnez tout ce qui s'y rapporte)
   [ ] Pêcheurs
   [ ] La commune de Moorea-Maiao
   [ ] Le gouvernement territorial de la Polynésie française
   [ ] France
   [ ] Scientifiques
   [ ] L'industrie du tourisme
   [ ] Les associations de protection de l'environnement
   [ ] Les associations culturelles
   [ ] L'association rahui
   [ ] Autre: _____
   [ ] Personne n'a eu d'influence sur la décision des revisions
   [ ] Je ne sais pas

8. Quel(s) groupe(s) bénéficie(nt) le plus des changements du nouveau PGEM? (Sélectionnez tout ce qui s'y rapporte)
   [ ] Pêcheurs
   [ ] La commune de Moorea-Maiao

[ ] Le gouvernement territorial de la Polynésie française
[ ] France
[ ] Scientifiques
[ ] L'industrie du tourisme
[ ] Les associations de protection de l'environnement
[ ] Les associations culturelles
[ ] L'association rahui
[ ] Autre:_____
[ ] Personne ne profite de ces changements
[ ] Je ne sais pas

INFORMATIONS DÉMOGRAPHIQUES

9. Quelle est votre date de naissance?_____

10. Genre: [ ] Homme [ ] Femelle [ ] Autre

11. Quelle est votre religion/église?

[ ] Catholique	[ ] Assemblée de Dieu	[ ] Ne sait pas
[ ] Méthodiste	[ ] Témoin de Jéhovah	[ ] Aucun
[ ] LDS	[ ] CCCAS	[ ] Autre:_____
[ ] Bahà'i	[ ] Adventiste du Septième Jour	[ ] Préfère ne pas répondre

12. Quelle est votre ascendance? (Cochez toutes les cases)

[ ] Tahitien	[ ] Autre Européen/US/NZ	[ ] Autre:_____
[ ] Insulaire non tahitien	[ ] Asiatique	[ ] Ne sait pas
[ ] Français	[ ] Africain	[ ] Je préfère ne pas répondre

13. Quel est le niveau d'études le plus élevé que vous ayez atteint?

[ ] Inférieur à l'école primaire	[ ] Université (4 ans)
[ ] École élémentaire	[ ] École supérieure
[ ] Lycée	[ ] Autre:_____
[ ] Collège communautaire (2 année)	[ ] Je préfère ne pas répondre

14. Combien de jours par semaine pêchez-vous?

[ ] Tous les jours	[ ] 2 à 3 fois par semaine.
[ ] 1x par semaine	[ ] Pas souvent

a. *À quand remonte la dernière fois que vous avez pêché?*_____

15. Quels engins de pêche utilisez-vous? (Sélectionnez tout ce qui s'y rapporte)

[ ] Rapporter	[ ] Haapua
[ ] Un fusil à harpoon	[ ] La ligne
[ ] Autre:_____	

16. Lorsque vous pêchez, le faites-vous habituellement
    [ ] Seule [ ] Avec des amis
    [ ] Avec famille [ ] Autre:_____

17. Comment décririez-vous l'état des ressources marines locales? (sélectionnez-en un)
    [ ] En très bonne santé [ ] Assez sain
    [ ] En bonne santé [ ] Pas sain

18. Connaissez-vous d'autres pêcheurs de votre village que nous devrions interroger, et accepteriez-vous de partager leurs noms et leurs coordonnées?

Nom:	Localisation:	Téléphone/email/Comment contacter:

19. Avez-vous des informations supplémentaires ou des commentaires que vous aimeriez partager?