Title: Does polycentricity fit? Linking social fit with polycentric governance in a large-scale
marine protected area

Leslie Acton,[a,b*] Rebecca L. Gruby, [b] and 'Alohi Nakachi[c]

[a]Division of Coastal Sciences, School of Ocean Science and Engineering
University of Southern Mississippi
Gulf Coast Research Laboratory
703 East Beach Drive
Ocean Springs, MS 39564

[b]Warner College of Natural Resources
Colorado State University
2545 Research Blvd.
Fort Collins, CO 80526

[c]Department of Natural Resources and Environmental Management
University of Hawai'i at Mānoa
2500 Campus Rd.
Honolulu, HI 96822

Contacts:
Leslie Acton: leslie.acton@usm.edu
Rebecca Gruby: rebecca.gruby@colostate.edu
'Alohi Nakachi: nakachia@hawaii.edu

*Corresponding author

Abstract

Scholars have theorized that polycentricity may produce benefits that promote effective, sustainable governance of complex social-ecological systems. Yet, little empirical research exists exploring whether and how these benefits emerge and what additional outcomes polycentric governance systems produce. This paper presents an empirical examination of Papahānaumokuākea Marine National Monument (PMNM), one of the longest-standing and largest marine protected areas in the world. Monument governance is structured as a polycentric system, including semi-autonomous decision-making groups and governance actors that interact across jurisdiction, geography, and decision-making levels. Through analysis of qualitative empirical data, we explore whether and how PMNM functions as theory predicts, with a particular focus on social fit and how it has evolved over time. Findings indicate that PMNM largely exhibits social fit for governance actors, and they add empirical support and additional nuance to theoretical understandings of functional polycentricity. Specifically, the case suggests additional contextual features that might promote social fit, including sufficient time and resources, clear communication and shared understanding, and socially astute and strategically savvy governance actors holding key governance positions. The article demonstrates that social fit can increase or decrease over time, and that different actors may perceive its presence and extent differently. These findings suggest avenues for additional research into how the enabling conditions of polycentric governance systems and the contextual features that enliven those systems in practice may interact and affect functionality and other outcomes.

1. Introduction

Scholars have increasingly drawn attention to polycentric governance systems that rely on hybrid governance structures as potential solutions to complex environmental problems (Oakerson and Parks 2011; Heikkila, Villamayor-Tomas, and Garrick 2018; E. Ostrom 2010). They theorize that polycentric systems may be more likely than other forms of governance to exhibit three benefits: adaptive capacity, institutional (both ecological and social) fit, and minimized risk of resource loss and governance failure through functional redundancy and institutional diversity (Carlisle and Gruby 2017). Carlisle and Gruby (2017) offer a theoretical model for a *functional* polycentric governance system, or a polycentric system that exhibits these benefits. The model describes the two key attributes of a polycentric system and seven enabling conditions that may increase the likelihood that one or more of the three theorized benefits will emerge (Table 1). Yet, few studies have empirically tested whether the theoretical relationships in this model hold up in practice (Biddle and Baehler 2019; Mudliar 2020; and Carlisle and Gruby 2018 are exceptions).

We address this gap through a study of the Papahānaumokuākea Marine National Monument (PMNM), a complex governance system that manages access to and activity within

the Northwest Hawaiian Islands and oceans surrounding them. Our analysis demonstrates that PMNM is a polycentric system jointly managed by agencies in two federal departments, the state of Hawaiʻi, and the Office of Hawaiian Affairs (OHA), with input from various state and non-state actors (Kittinger et al. 2011). It exemplifies hybrid governance in that it is co-managed, or blends state and community governance in decision-making (Lemos and Agrawal 2006). Established in 2006 by President Bush (Proclamation No. 8031) and expanded in 2016 by President Obama (Proclamation No. 9478), PMNM is one of the longest standing large-scale marine protected areas (LSMPAs) in the world. Its initial creation is credited with helping spur the global trend to establish LSMPAs (Christie et al. 2017), and proponents highlight it as a model for successful joint ecological and cultural governance (Kikiloi et al. 2017).

In this article, we focus on one proposed benefit of a functional polycentric system that has received little empirical attention: social fit. Social fit is the extent to which a governance system addresses people's diverse beliefs, norms, values and expectations in a social-ecological system (Epstein et al. 2015). It has been theorized as beneficial and merits specific attention because it has been shown to promote human well-being as well as the perceived legitimacy of governance systems (Turner et al. 2018; DeCaro and Stokes 2013). We show that PMNM largely exhibits social fit for governance actors and that some of the enabling conditions identified by Carlisle and Gruby (2017) can promote social fit's emergence. We advance theoretical understanding of polycentricity by 1) adding nuance to understanding of enabling conditions and interactions among them, and 2) proposing four contextual features of PMNM that contributed to social fit in practice.

This article also contributes to literature on LSMPAs. Following calls for greater attention to the human dimensions of MPAs and LSMPAs (Charles and Wilson 2009; Fox et al. 2012; R.L. Gruby et al. 2016), research on LSMPA governance, politics, and social dimensions and outcomes has increased rapidly in recent years (Gruby et al. 2017; Leenhardt et al. 2013; De Santo 2020; Richmond et al. 2019; Gruby et al. 2021) but remains limited. By engaging theory on polycentricity, we offer new insights into why the PMNM governance system is held up as a model of success while cautioning that functionality is never fully stable or settled.

2. Social fit: A theorized benefit of polycentric governance systems

Polycentric systems have been explored as a tool for addressing complex environmental problems (E. Ostrom 2010). V. Ostrom, Tiebout, and Warren (1961) introduced polycentric governance systems as those involving multiple, independent or semi-independent centers of decision-making that "take each other into account" through specific interactions and relationships (p. 831). Polycentric governance systems have been theorized to promote effective governance by distributing power among actors, spreading risk to minimize the potential for governance failure, and allowing institutional experimentation through diversity (E. Ostrom 2005). While not a panacea (Berardo and Lubell 2019), polycentricity can contribute to effective governance of common pool resources in particular places and contexts (Juerges, Leahy, and Newig 2018; Baldwin et al. 2018; Villamayolr-Tomas 2018).

Empirical studies of polycentric governance are still limited but increasing. In particular, scholars have begun investigating linkages between structure and function in polycentric governance systems (Heikkila, Villamayor-Tomas, and Garrick 2018). For example, Villamayor-Tomas (2018) demonstrates that water user associations in the Spanish irrigation sector exhibited

91 adaptive capacity, in part because the associations had autonomy, competition, and effective
92 institutions to guide and govern their interactions with other decision-making centers. Baldwin et
93 al. (2018) find that multiple, overlapping decision-making centers, incentives to cooperate, trust,
94 and formal and informal institutions encourage collective action in water governance in Kenya.
95 Others have demonstrated that polycentric governance alone is neither "good" nor "bad" (Thiel,
96 Blomquist, and Garrick 2019); the effectiveness of polycentric governance depends on the place
97 and context of a governance system (Berardo and Lubell 2019). Indeed, the structural stability of
98 governance systems that exhibit polycentric attributes can even serve to mask adverse outcomes
99 and decreasing effectiveness, as demonstrated in Australia's Great Barrier Reef (Morrison 2017).
100

| Attribute | Enabling Condition | Advantage: Enhanced Adaptive Capacity | Advantage: Good Institutional Fit | Advantage: Risk Mitigation/ Redundancy |
|---|---|---|---|---|
| Multiple, overlapping decision-making centers with some degree of autonomy | | X | X | X |
| | Decision-making centers employ diverse institutions | X | X | X |
| | Decision-making centers exist at different levels and across political jurisdictions | | X | X |
| | The jurisdiction or scope of authority of decision-making centers is coterminous with the boundaries of the problem being addressed | | X | |
| Choosing to act in ways that take account of others through processes of cooperation, competition, conflict, and conflict resolution | | X | X | |
| | Generally applicable rules and norms structure actions and behaviors within the system | X | | |
| | Decision-making centers participate in cross-scale linkages or other mechanisms for deliberation and learning | X | X | |
| | Mechanisms for | X | | |

| | | |
|---|---|---|
| accountability exist within the governance system | | |
| A variety of formal and informal mechanisms for conflict resolution exist within the system | X | |

Table 1. Theoretical Model of a Functional Polycentric Governance System (reproduced from Carlisle and Gruby (2017)); shaded column highlights attributes and enabling conditions associated with increased social fit

Scholars are beginning to develop and engage frameworks to structure comparable empirical studies that can build, test, and add nuance to generalizable theories of polycentric governance.  In addition to Carlisle and Gruby's (2017) contribution, Stephan, Marshall, and McGinnis (2019) outline eight key governance characteristics that scholars connect with polycentric governance systems and suggest potential measures for each. Researchers have begun to use these contributions to focus research and empirically test theoretical claims. For instance, Biddle and Baehler (2019) find that Flint, MI's water governance system failed to produce beneficial outcomes, despite exhibiting some of the enabling conditions in Carlisle and Gruby's (2017) model. Mudliar (2020) examines how power and power dynamics between decision-making centers interact with polycentric attributes, enabling conditions, and contextual features in Lake Victoria's fishery governance systems to both exclude lower-level actors from decision-making and centralize governance over time. Yet, few polycentricity studies have focused on social fit, a key component of institutional fit, in depth (although see Boakye-Danquah et al. 2018).

We address this gap by investigating whether and how social fit emerges in PMNM. We engage Carlisle and Gruby's (2017) model to situate this work in broader efforts to develop generalizable theory on polycentricity. Scholars have defined social fit in various ways, based on: whether governance institutions address resource users' psychological and social needs (Turner et al. 2018); the acceptance and perceived legitimacy of governance institutions (Meek 2013; DeCaro and Stokes 2013); and/or whether governance institutions reflect resource users' worldviews, values, goals, or beliefs (Aburto and Gaymer 2018; Briassoulis 2017). We define social fit using Epstein et al.'s (2015) criteria: 1) institutions align with stakeholders' values, beliefs, customs, and use patterns, 2) decision-making centers address stakeholder psychological needs and expectations, and 3) the governance system resolves conflicts, provides resources, and promotes social learning.

Recent scholarship examining polycentricity and social fit has revealed two key insights relevant for this study. First, while scholarship to date has often presented social fit as an inherent "good" or benefit to a system, the extent to which it is perceived as beneficial depends on the interests and goals of particular actors, which may vary (Briassoulis 2017). We therefore understand social fit on a continuum as it relates to particular groups, and we consider whether social fit constitutes a benefit of a functional polycentric system as an empirical question. Second, polycentricity scholars find that governance systems are dynamic and continuously evolving (Biddle and Baehler 2019; Carlisle and Gruby 2018; Thiel, Pacheco-Vega, and Baldwin 2019), suggesting their functionality is contingent on both institutional structure and contextual

factors (Morrison 2017; Thiel, Pacheco-Vega, and Baldwin 2019; Mudliar 2020). We look for additional factors outside of the model that may contribute to or limit social fit.

We use PMNM as a case study to empirically interrogate the links among the attributes and enabling conditions of a polycentric governance system and social fit as a theorized benefit of that system. First, we assess whether PMNM can be characterized as a polycentric system based on the two attributes of polycentricity. Kittinger et al. (2011) has characterized PMNM as a polycentric system; we sought to determine whether it had remained polycentric over time. Second, we analyze the extent to which PMNM exhibits the theorized enabling conditions for social fit. Third, we assess the social fit of PMNM using Epstein et al. (2015)'s three dimensions of social fit, and we discuss how the enabling conditions relate to PMNM's social fit. Lastly, we present four contextual features of PMNM that made the emergence of social fit possible, and we offer reflections and conclusions in the final section. Through this analysis, we aim to further the task of understanding polycentric governance in practice by using an empirical case to further test and refine polycentricity theory generally, and Gruby and Carlisle's (2017) model specifically.

3. The case: Papahānaumokuākea Marine National Monument

In June 2006, President Bush signed a presidential proclamation establishing the Northwestern Hawaiian Islands Marine National Monument, the largest MPA in the US at the time, through the American Antiquities Act. Native Hawaiian[1] cultural leaders soon renamed this culturally significant area the Papahānaumokuākea Marine National Monument, honoring the place where, according to the Native Hawaiian creation chant, the Kumulipo, life emerges and spirits return after death (Freestone et al. 2014). The naming "reemphasized the importance of the genealogical connection between people and nature as the foundation of Hawaiian tradition" (Kikiloi et al. 2017, 441). The area was established as a UNESCO World Heritage site in 2010, becoming the world's first cultural seascape. Finally, in 2016, President Obama expanded PMNM to include 1,508,870 square kilometers, and simultaneously elevated the Office of Hawaiian Affairs, a semi-autonomous public agency dedicated to promoting Native Hawaiians' well-being, to become a co-Trustee of PMNM.

PMNM includes the remote northwest Hawaiian islands and the surrounding oceans of the US exclusive economic zone (Kikiloi et al. 2017). With the exception of a military base and small field camps, the islands are uninhabited, and governance occurs mostly from afar, in Oʻahu (for reference, Nihoa, the closest island within PMNM, is located roughly 440 km from Oʻahu). This distance, as well as PMNM's strict limits on access to the area and resource extraction, mean that relatively few people outside of the military actually travel to PMNM. Those that do include researchers, Native Hawaiian cultural practitioners, educators, and others that hold required permits. Previous regulatory actions had already greatly reduced fishing before PMNM was established, and the final small bottomfish fishery ended in 2010, when the National Marine Fisheries Service (NMFS) bought back permits from any remaining fishermen (Kittinger et al. 2011).

Social fit refers to how well a governance system's structure and function fits with stakeholder expectations and norms. Yet identifying "stakeholders" for PMNM is not

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[1] Native Hawaiian refers to any person who can trace their Hawaiian ancestry prior to 1778 (42 U.S. Code § 3057k).

183 straightforward, given limited in-person engagement with the place coupled with the vast scope
184 of people with possible interest in PMNM (one might include interested Hawaiians, interested
185 US residents, or anyone interested in PMNM management worldwide). We argue that
186 governance actors represent the stakeholders with the most direct, active engagement in PMNM.
187 We define governance actors broadly as people engaged in decision-making processes for
188 PMNM management, including both direct decision-makers as well as those with advisory or
189 supporting roles to decision-making centers. This includes all permit holders with access to
190 PMNM; many of them work directly in government agencies, and all engage with governance
191 processes through permitting system requirements. Thus, "governance actors" include the
192 primary in-person users of PMNM. Additionally, many past and potential future user groups that
193 currently lack access to PMNM are represented in PMNM's governance system (e.g. fishermen).
194 Note that these actors hold multiple, distinct worldviews and histories, situated in Western and
195 Native Hawaiian cultural contexts.
196    The research for this paper emerged from *[name removed for review]* and *[name*
197 *removed for review]*'s participation and leadership in the Community of Practice for human
198 dimensions of LSMPAs and its call for increased research on LSMPA governance (Christie et al.
199 2017). We selected PMNM because it is generally regarded as a model for biocultural
200 conservation areas. Here, we build on existing human dimensions scholarship on PMNM to
201 understand how its governance evolved over time (e.g. Kittinger et al. 2011; Freestone et al.
202 2014; Kikiloi et al. 2017; MacKenzie and Tanaka 2015).
203
204    4.   Methods
205
206    This project included two phases. First, we engaged key PMNM managers, stakeholders,
207 and members of the LSMPA Community of Practice early in the research design process. These
208 conversations informed our research questions and data collection methods to ensure that they
209 were appropriate and useful for PMNM. Second, data collection consisted of 44 semi-structured
210 interviews with PMNM governance actors, document collection, and participant observation at
211 PMNM-related meetings and events. Interviewees included governance actors described above:
212 current and past government and semi-government agency employees; advisory group members;
213 PMNM permit holders; non-government organization representatives; researchers; and members
214 of the public who engaged in PMNM management. We conducted participant observation at a
215 Reserve Advisory Council (RAC) meeting, PNMN outreach events, and a tour of the
216 Mokupāpapa Discovery Center. Data were collected by *[name removed for review]* and *[name*
217 *removed for review]* in Hawai'i (on O'ahu and the island of Hawai'i) during May-July of 2018.
218 Additional interviews were conducted remotely in 2018 and 2019.
219    Data collection and analysis for the project occurred iteratively and included deductive
220 and inductive processes (Glaser and Strauss 2009; Bernard 2006; Charmaz 2014). Our interview
221 guide was informed by Carlisle and Gruby (2017), Epstein et al. (2015), and broader
222 polycentricity and social fit literatures. We adjusted data collection methods as insights arose,
223 addressing new themes during interviews and exploring new document sources. We transcribed
224 interviews and coded data iteratively using QSR NVivo software. We relied predominantly on
225 interview data to identify rules-in-use and perceptions of how management activities align with
226 belief systems and cultural norms of governance actors.
227    We describe each attribute, enabling condition, and dimension as present, mostly present,
228 somewhat present, or absent in PMNM, recognizing that "polycentric governance can be

understood as an intrinsically dynamic process embedded within a contingent type of structure that is difficult to capture in single measures" (Stephan, Marshall, and McGinnis 2019, p. 44). The descriptors provide a simplified heuristic of a complex reality; none of the attributes, enabling conditions, dimensions, and features are completely present or absent all of the time (Briassoulis 2017; Carlisle and Gruby 2018). "Present" indicates that the feature in question was observed in PMNM with no apparent weaknesses or limitations; "mostly present" indicates that the feature was broadly present but with minor weaknesses or limitations; "somewhat present" indicates that the feature was observed in PMNM, but with significant limitations or weaknesses; "absent" indicates that the feature was not observed in PMNM. To assign these descriptors, we qualitatively coded interview data according to the descriptors for each feature, and we triangulated this analysis with policy documents and/or field notes as appropriate. All of these descriptors necessarily refer to the PMNM governance system before and/or at the time of research. Given the inevitable effects of institutional change, we also indicate broad changes in social fit dimensions over time.

## 5. Linking a polycentric system and social fit
### 5.1 PMNM as a polycentric system

| Acronym | Full Name |
|---------|-----------|
| PMNM | Papahānaumokuākea Marine National Monument |
| OHA | Office of Hawaiian Affairs |
| FWS | Fish and Wildlife Service |
| NOAA | National Oceanic and Atmospheric Administration |
| SEB | Senior Executive Board |
| MMB | Monument Management Board |
| ONMS | Office of National Marine Sanctuaries |
| NMFS | National Marine Fisheries Service |
| CWG | Cultural Working Group |
| PWG | Permit Working Group |
| RAC | Reserve Advisory Council |

Table 2. Acronyms used in Papahānaumokuākea Marine National Monument governance

### 5.1.1 Polycentricity Attribute 1: Present

Two attributes characterize a polycentric governance system (Carlisle and Gruby 2017; V. Ostrom, Tiebout, and Warren 1961). PMNM exhibits the first attribute, which holds that the governance system includes "multiple, overlapping decision-making centers with some degree of autonomy" (p. 6). Figure 1 is a simplified representation of PMNM's governance structure. It is jointly managed by four co-trustees, each represented on a Senior Executive Board (SEB) that oversees and addresses disputes that arise from the Monument Management Board (MMB). The MMB wrote and implements the Monument Management Plan, overseeing permit applications, enforcement, research and monitoring, and operations, among other things.

260    These seven government agencies and the MMB itself each constitute decision-making
261 centers. A decision-making center is any group or unit with power to decide on, enact, or enforce
262 rules and norms related to governance (Carlisle and Gruby 2017). The MMB's legal mandate to
263 manage PMNM overlaps with the agencies' jurisdictional authorities over particular spaces and
264 activities within PMNM. While the MMB has autonomy to make governance decisions related to
265 PMNM, representatives must ensure that governance decisions comply with their respective
266 agency's mandates, responsibilities, and norms. Some management tasks are delegated to
267 working groups, which also constitute decision-making centers. For instance, the Permit
268 Working Group (PWG), which is composed of representatives from the seven MMB agencies,
269 has autonomy to carry out permit processing and management and interacts with user groups
270 travelling to PMNM. Finally, supporting actors, while not decision-making centers themselves,
271 provide decision-making centers with critical information. PMNM's advisory bodies, such as the
272 RAC and the Cultural Working Group (CWG), provide expert input to decision-makers and
273 represent key avenues for community stakeholders to participate meaningfully in PMNM
274 governance.
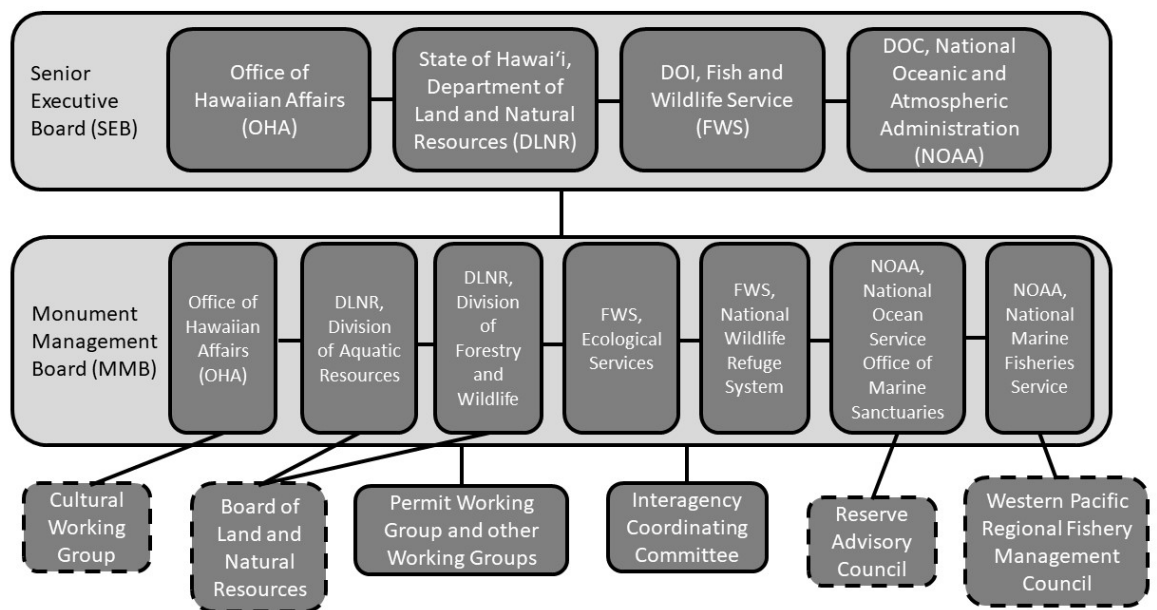


275
276 Figure 1. PMNM's governance system. Solid rectangles indicate a decision-making center and
277 dashed rectangles indicate a critical supporting actor.
278
279    5.1.2    Polycentricity Attribute 2: Present
280
281    PMNM also exhibits the second attribute of a polycentric system, which holds that
282 decision-making centers "act in ways that take account of others through processes of
283 cooperation, competition, conflict, and conflict resolution" (Carlisle and Gruby 2017, 8). Lines
284 connecting decision-making centers and supporting actors in Figure 1 represent the relationships
285 through which these processes occur. The permitting system for PMNM access exemplifies this
286 attribute. Though military, law enforcement, and emergency personnel are exempt, researchers,

287 Native Hawaiian cultural practitioners, educators, and others must complete a rigorous
288 permitting process to access PMNM. The permit review process necessitates review and/or
289 approval by multiple working groups and the MMB agencies. Many applicants are themselves
290 members of the agencies that constitute the MMB. This interconnectedness between agencies,
291 applicants, and decision-making centers encourages permit holders to coordinate their activities.
292 For example, researchers and Native Hawaiian cultural practitioners coordinate some of their
293 permits and trips to PMNM, sharing boat space and time to carry out research and cultural
294 practices. Interviewees noted that these shared experiences allow users to learn from one another
295 and enrich one another's understanding and appreciation of the place and their relationship to it
296 (see Kikiloi et al. 2017).
297       The Fish and Wildlife Service (FWS), National Oceanic and Atmospheric Administration
298 (NOAA), and the State of Hawai'i each have jurisdiction over specific terrestrial and marine
299 areas within the PMNM; whether they overlap and what that means if they do is still a source of
300 conflict. Yet, interviewees described how, through coordination based on mutual trust and
301 understanding, the agencies have established avenues to co-manage these areas through the
302 MMB, often by allowing the agency with legal jurisdiction to guide decision-making. Though
303 OHA does not have legal jurisdiction over the governance of a specific geographic area, MMB
304 members offer similar deference to OHA's guidance in decisions related to cultural aspects of
305 PMNM governance. Despite conflicting understandings of jurisdiction in some areas, a norm of
306 coordinating rather than asserting authority has emerged. One MMB member explained, "The
307 jurisdiction is messy, really messy…So, we've all agreed to disagree and jointly [make
308 decisions] because it's been too messy not to" (Interview L3XM).
309       In summary, PMNM is a polycentric system. Next, we investigate whether and how it
310 exhibits the enabling conditions that are theorized to facilitate social fit.
311
312     5.2 Enabling conditions to achieve social fit in PMNM
313
314     5.2.1   Social Fit Enabling Condition 1: Present
315
316       Carlisle and Gruby (2017) describe four enabling conditions, or structural features of a
317 polycentric governance system, that may increase the likelihood that the system will exhibit
318 social fit. Enabling Condition 1 states that decision-making centers in the governance system use
319 diverse institutions. Scholars have posited that diverse, semi-autonomous decision-making
320 centers will likely experiment with multiple institutions, providing the opportunity for
321 institutions that best fit the needs of a given social context to emerge and adapt as that context
322 changes (E. Ostrom 2010).
323       The PMNM governance system exhibits Enabling Condition 1. We found both *de jure*
324 and *de facto* institutional diversity that facilitated coordination among the agencies represented
325 on the MMB. These agencies exhibit distinct cultures and use distinct rules and norms to carry
326 out their legal mandates. Interviewees explained that conflicts over these differences emerged
327 between agencies soon after PMNM was initially created, when they were producing the
328 management plan (see Kittinger et al. 2011 for additional details). To address legal conflicts,
329 attorneys from the different agencies met repeatedly to ensure that co-trustee management
330 practices established in the management plan could be carried out legally. MMB members also
331 established informal norms to strengthen interpersonal and inter-agency trust and increase
332 overall efficiency. They began recording and revisiting decisions made during meetings to avoid

333 re-hashing previously accepted outcomes, and they agreed to bring disagreements and
334 interpersonal conflicts to the MMB directly, rather than sending concerns up the chain of
335 command.
336     One area identified by some interviewees as needing more institutional diversity, or at
337 least flexibility, is the permit system to access PMNM. They assert that the process is inefficient,
338 confusing, and too strict. Others, however, noted that while the permit system is strict, new
339 norms and creative options for gaining access to PMNM have emerged to address these issues.
340 An ongoing controversy over NOAA mandated shark culling for monk seal management offers
341 an example, given sharks' cultural and spiritual significance in Native Hawaiian belief systems.
342 NMFS has repeatedly included a shark culling program in its management plan for monk seal
343 protection in PMNM, a practice strongly opposed by many in the CWG. Interviewees noted that,
344 despite unresolved disagreement, the CWG, NMFS, and other MMB agencies have put forth
345 immense effort to understand one another's viewpoints and attempt to address one another's
346 needs and interests (e.g., through including a cultural practitioner to oversee and guide the
347 culling process as part of the permit). This conflict exemplifies how differences in Native
348 Hawaiian and Western worldviews create tension in PMNM; yet, the governing structure in
349 place allows for ongoing communication, collaboration, and institutional innovation. Given this
350 institutional innovation to address seemingly inflexible regulations in practice, we categorize
351 Social Fit Enabling Condition 1 as present.
352
353     5.2.2    Social Fit Enabling Condition 2: Mostly present
354
355     The second enabling condition that may promote social fit states that cross-scale linkages
356 allowing for learning, information flow, and cooperation should exist across decision-making
357 centers. The PMNM governance system exhibits this enabling condition through linkages across
358 jurisdiction, governance level, and geographical space. For example, the MMB provides a forum
359 for federal agencies, state agencies, and OHA to deliberate and coordinate management across
360 their different jurisdictional mandates. Disagreements over management decisions at the MMB
361 level can be elevated to the SEB or to staff in Washington, DC with greater authority. To avoid
362 inefficiency and frustration, however, MMB members learned to use this option to elevate only
363 as a last resort. Groups at lower governance levels, such as the PWG, provide additional avenues
364 to address conflict. PWG members, who often have less authority within their respective
365 agencies than MMB members, can discuss day-to-day management issues, find ways to resolve
366 them practically, and elevate questions or discrepancies to their agency superiors without making
367 conflicts personal.
368     Some interviewees, while noting that these cross-scale linkages were generally present
369 and effective, identified two areas where mechanisms to promote learning could be strengthened
370 in the PMNM governance system: cross-cultural understanding and temporal linkages.
371 Governance actors enact institutions to ensure that Native Hawaiians, as well as their cultural
372 practices, worldviews, and values are woven into all governance areas and decision-making for
373 PMNM (Kikiloi et al. 2017). Yet, some interviewees assert that more can be done to fully
374 manage PMNM cross-culturally. For example, some longer-standing governance actors note that
375 insufficient efforts to teach newer MMB and Working Group members the institutional and
376 relational history, or genealogy, of PMNM's governance and cultural significance have resulted

in inadequate cross-time linkages. Previous arguments over inter-agency misunderstandings and management practices continue to emerge.

Given that interviewees consistently described the presence and usefulness of cross-scale linkages in the system overall, we consider these weakness minor and describe this enabling condition as mostly present. Yet, we highlight this opportunity for governance system improvement here because understanding genealogy, or foundational stories and history, is central to Native Hawaiian worldview(s), and, more broadly, cross cultural understanding. Some interviewees described this lack of attention to genealogical teaching, and subsequent inability to learn from the past, as a missed opportunity. Polycentricity scholars have noted that, while informal institutional linkages may increase flexibility, efficiency, and trust (Baldwin et al. 2018), they may prove unstable, and thus insufficient over time (Ostrom, Tiebout, and Warren 1961). The erosion of genealogical teaching in PMNM may have occurred because of an over-reliance on informal norms, rather than more formal mechanisms, to pass historical knowledge to new governance actors.

### 5.2.3   Social Fit Enabling Condition 3: Present

The third enabling condition calls for decision-making centers to exist at different levels (to include different strengths and capacities) and across political jurisdictions (to ensure governance of issues that span individual jurisdictions). The PMNM governance system exhibits both aspects of this enabling condition. As detailed earlier, the SEB and MMB make overarching governance decisions for PMNM, and their members represent agencies whose jurisdictional authority covers PMNM's ecological and cultural resources. Federal governance actors for NOAA and FWS in Washington, DC have an even broader purview of all national monuments and conservation areas. Working groups, agency employees, and permit holders carry out specific, day-to-day functions, both on Oʻahu and in PMNM. Regular meetings through groups such as the RAC, the CWG, the Board of Land and Natural Resources, and the Western Pacific Regional Fishery Management Council also provide linkages to maintain communication and rapport between governance actors and the public.

Similar to concerns noted in Enabling Condition 2, some interviewees expressed concern that cultural integration had not occurred across all agencies and governance levels. While OHA, the CWG, a position devoted to Native Hawaiian culture in NOAA's Office of National Marine Sanctuaries (ONMS), and designated Native Hawaiian seats on the RAC ensure continued participation in PMNM governance by Native Hawaiians, there is no overarching body devoted to ensuring that multi-cultural worldviews are woven throughout PMNM governance. Other interviewees argue that OHA, as PMNM's Native Hawaiian cultural expert, is recognized as having some authority in all aspects of PMNM governance[2]. Despite these opportunities to strengthen understanding and coordination across worldviews, the PMNM governance system meets the requirements of Enabling Condition 3 as it is currently written.

### 5.2.4   Social Fit Enabling Condition 4: Somewhat present

[2] The identity of OHA in Hawaiʻi generally, and its ability or authority to represent or offer expertise of the Native Hawaiian community specifically, remains contested among Native Hawaiians (Andrade 2016).

The final enabling condition holds that "the jurisdiction or scope of authority of decision-making centers is coterminous with the boundaries of the problem being addressed" (Carlisle and Gruby 2017, p. 18). PMNM covers a vast geographic area, including the Northwest Hawaiian Islands and their surrounding oceans. Interviewees noted that, from an ecosystem-based management perspective, its large size can be understood as a benefit. Further, by encompassing all of the Northwest Hawaiian Islands, it protects a place of great significance in Native Hawaiian culture (Kikiloi 2010). However, the goals stated in PMNM's mission statement include "strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian culture, and heritage resources." The boundaries created both in 2006 and with the expansion to the EEZ in 2016 are not based on ecological, Native Hawaiian cultural, or heritage aspects; they are based on state-based territorial politics and histories. Some interviewees further noted that PMNM's boundaries do not address major threats to ecological resources, such as climate change and marine pollution. Thus, Enabling Condition 4 is only somewhat present in PMNM.

5.3 Social fit of the PMNM governance system

The previous sections establish PMNM as a polycentric system that exhibits the four enabling conditions for social fit, at least to some extent. Next, we investigate the extent to which PMNM exhibits social fit. We use the three dimensions of social fit defined by Epstein et al. (2015) to examine the case through the information and perceptions of interviewees. We highlight one or more of the enabling conditions in parentheses to signify that the presence of that enabling condition supported the emergence of a particular social fit dimension. We conclude that Social Fit Dimensions 1 and 3 were mostly present, and Dimension 2 was somewhat present in PMNM. Overall, PMNM mostly exhibits social fit for governance actors as defined by Epstein et al. (2015).

5.3.1   Social Fit Dimension 1: Mostly present, grew over time

The first dimension of social fit addresses the extent to which rules and norms fit with "patterns of resource use, as well as interplay with the values, beliefs and social customs of affected groups" (Epstein et al. 2015, p. 37). Though Epstein et al. (2015) refer to those rules and norms that govern direct resource use, our analysis focuses on the rules and norms that govern decision-making. Overall, interviewees indicated that rules and norms related to decision-making do fit with their values and customs. Yet, many interviewees reported that the governance system that emerged and existed for the 2-3 years immediately following PMNM establishment (2006 – '08) did not exhibit this dimension of social fit (see Kittinger et al. 2011 for additional detail). Limitations and inefficiencies due to differences in agency cultures and norms emerged as a recurring theme. For example, NOAA manages protected areas by creating regulations that prohibit or limit specific activities; the FWS, on the other hand, typically bans all activity in a protected area, then crafts regulations about which specific activities to allow. These different management approaches led to misunderstanding and conflict during early management negotiations, when MMB members were attempting to figure out co-management between federal, state, and semi-government agencies for the first time. Thus, having decision-making

462 centers that spanned political jurisdictions (Enabling Condition 3) actually served to limit this
463 dimension of social fit in PMNM.
464       Over time, however, governance actors developed rules and norms to address conflict and
465 alleviate tension. Cross-scale linkages between the SEB and the MMB, and between the PWG
466 and the MMB, provided conflict resolution mechanisms (Enabling Condition 2). With
467 experimentation through institutional diversity, the MMB created new rules and norms to allow
468 members to "hash things out", such as recording all management decisions in writing and
469 addressing disagreements directly (Enabling Condition 1). Interviewees noted that, while these
470 new rules and norms may seem time-consuming, they ensure that everyone understands how and
471 why decisions are made, a key component of successful co-management. Many interviewees also
472 described how OHA representatives encouraged *aloha* (a spirit of love and compassion) in inter-
473 agency interactions and continuously re-directed focus from agency-specific goals and norms to
474 the broader goal of caring for Papahānaumokuākea, the place. One interviewee described the
475 shift toward mutual understanding: "We started to understand each [agency's] culture a little bit.
476 And each other as individuals" (Interview 8BIX).
477       While interviewees indicated that, overall, rules and norms fit with governance actors'
478 customs, values, and beliefs, a few exceptions emerged that led us to describe this social fit
479 dimension as "mostly present." For example, managers in the FWS are typically reassigned to a
480 new position every two years; this relatively high turnover rate has led to gaps in institutional
481 memory, particularly with insufficient teaching about PMNM's genealogy and context for new
482 MMB and Working Group members. Some interviewees also described the effort and time
483 needed to gain access to PMNM through the permitting system as excessive. While these
484 descriptions do not necessarily indicate a lack of institutional diversity (see explanation in
485 Section 5.2.1), they do reflect a weakness in the permitting system's fit with the customs and
486 values (e.g., efficiency) of some governance actors.
487
488     5.3.2   Social Fit Dimension 2: Somewhat present, grew over time
489
490       The second dimension of social fit "is concerned with the appropriateness of rulemaking
491 processes given the expectations and psychological needs of stakeholders" (Epstein et al. 2015,
492 p. 37). This dimension focuses on how well decision-making processes fit with governance actor
493 expectations about how decisions should be made and who should be involved in making them.
494 Interviewees specifically discussed both interactions between agencies in decision-making and
495 whether decision-making processes appropriately reflect multiple worldviews and cultures. This
496 dimension is somewhat present in PMNM's governance system, and, similarly to Social Fit
497 Dimension 1, it grew over time.
498       As noted above, early MMB decision-making processes proved tense as agencies
499 negotiated different values, norms, and policy interpretations in a compressed time. The
500 continual conflict and tension did not fit with governance actor expectations; interviewees
501 reported that they needed more time and support to effectively create a new governance system.
502 One interviewee described these early meetings:
503
504     "I would go into work in the morning with just knots in my stomach – what is
505     going to happen today?...It was awful…Walking out of meetings. Hands up in the

air, you know. There's no use in even carrying on conversations, it was very difficult." (Interview CX6T)

Over time, however, MMB members built trust and relationships through improved communication and conflict resolution mechanisms (Enabling Conditions 1 and 2). Many interviewees reported that, despite early tension, current and recent governance actors generally value the shared management across agencies (Enabling Condition 3) and believe that working together produces better governance outcomes for PMNM than working apart. While this dimension of social fit has improved over time, some interviewees noted that tensions in the MMB remain. This was attributed in part to high personnel turnover and insufficient genealogical teachings (limitations in Enabling Condition 2). Additionally, power imbalances emerged when some agencies were allocated more resources for PMNM management than others (Kittinger et al. 2011). While some interviewees described the benefits of this asymmetry (see Social Fit Dimension 3), others noted increased distrust and resentment between governance actors as some agencies were perceived to have power over others.

Another theme highlighted by interviewees is the extent to which decision-making processes for PMNM management address and reflect both Western and Native Hawaiian worldviews held by governance actors (see Aburto and Gaymer 2018 for another ocean-specific example). Though PMNM was created by the US government through a predominantly Western ontological framework, some interviewees reported an expectation that PMNM management would also reflect a Native Hawaiian ontology, given the importance of the Northwest Hawaiian Islands in Native Hawaiian belief systems, the key role of Native Hawaiians in promoting their protection, and the prominence of the cultural component of this protection in the Presidential Proclamation. Interviewees explained how Native Hawaiian worldviews are reflected in some aspects of decision-making. For example, naming the place itself Papahānaumokuākea and the CWG's role of naming new species discovered in PMNM reflects the significance of naming in Native Hawaiian culture (Kikiloi et al. 2017). PMNM management practices have also been updated to better reflect Native Hawaiian worldviews over time, demonstrating the importance of institutional diversity (Enabling Condition 1) and learning (Enabling Condition 2). For example, elevating OHA to the level of Co-Trustee in PMNM's management structure addressed the expectations of many government actors that OHA's significant role in collective management to date should be formally elevated and codified. This elevation gives OHA, a semi-autonomous public agency representing indigenous people's interests, equal standing with federal and state agencies over the management of a space for the first time. Though OHA cannot sign off on permits to access PMNM because it lacks legal jurisdiction, interviewees noted that the other three co-Trustees seek OHA's approval informally, a norm which demonstrates the agencies' mutual respect and builds trust.

Some interviewees reported that, while progress has been made to include key aspects of Native Hawaiian worldviews into PMNM management, there is still insufficient understanding and inclusion of the multiple ontologies held by PMNM governance actors. For example, the CWG reviews all permit applications to access PMNM. While their input has become a key part of the MMB's decision-making over time, ultimate authority still lies with the MMB and agencies with specific legal mandates. Yet, interviewees also explained that, while their frustration continues, these issues were expected because the PMNM management system was created within a Western governance system based on a Western worldview. PMNM was created within the US national governance system, which illegally overthrew the Hawaiian Kingdom

over a century ago (MacKenzie and Tanaka 2015). This history creates ambiguity between the established Hawaiian Kingdom legal system and the US legal system; yet, general deference to the US laws and governance system remains. One interviewee explained the continuous attempts to infuse Native Hawaiian worldviews and culture into PMNM management,

> "If you grow up as a Native Hawaiian in Hawai'i, and you have any sense of your history and culture…you live in a duality. And we are living right now, this is a façade. Under international law, we are illegally occupied…So, in that context, it's not that weird [to operate within two, sometimes conflicting, worldviews]...We said, we need to put this cultural principle into law…[through] little attempts at reclaiming little bits of management influence" (Interview VM32)

While these continued frustrations met some interviewees' expectations given the Western context in which PMNM was created, this quote illustrates their continuing push to better meet the psychological needs of those operating with a Native Hawaiian worldview.

### 5.3.3 Social Fit Dimension 3: Mostly present, grew over time and starting to erode

The third dimension of social fit addresses the extent to which rules and norms, or institutions, enable governance actors to leverage the various roles, abilities, and resources of decision-making centers at different governance levels (Epstein et al. 2015). A governance system demonstrates this dimension of social fit if it is able to "resolve conflicts, produce public goods, build redundancies, and more generally, develop conditions conducive to social learning" (p. 37). This dimension requires that Enabling Conditions 1-3 are met, as they provide the scaffolding to allow conflict resolution, production of public goods, and social learning. This research revealed that PMNM mostly exhibits Dimension 3, but interviewees note that this dimension of social fit has changed across time; effective institutions took time to emerge, and, at the time of data collection, those institutions had begun to erode.

PMNM governance actors regularly use the distinct authorities held by decision-making centers at different governance levels to resolve conflict. In addition to the MMB's use of the PWG and the SEB to address issues at different decision-making levels (see Section 5.2.2), interviewees noted that boat operators, researchers, and cultural practitioners who access PMNM together have built rapport through their trips to PMNM; this rapport has "trickled up" to ease tension between agencies. Agencies also leverage their different capacities, expertise, and financial resources to collectively achieve PMNM's goals. For example, NOAA has funded PMNM positions within the State of Hawai'i, OHA has contributed expertise and connections to the Native Hawaiian community to other agencies, and agency representatives already conducting research in PMNM carry out research and management tasks for other co-managing agencies. This sort of collaboration and mutual support emerged over time, with trust-building through continual interaction and learning about agency-specific cultures. Note, however, that while some decision-making centers have established mechanisms to ensure that Native Hawaiians hold paid positions and key decision-making roles, this mandated commitment to the inclusion of Native Hawaiian worldview(s) is not shared across all agencies represented on the MMB. This limits the system's potential for broadly shared learning and understanding; given this limitation, we describe Social Fit Dimension 3 as mostly present.

Governance actors generally agreed that creating mechanisms to resolve conflict and facilitate cooperation benefitted the system as a whole (Enabling Conditions 1 and 2). As one interviewee explained, "Some of these issues [between agencies] either had to be resolved or [we] had to agree to disagree… I think that all the different agencies recognized that none of them had the resources individually to be able to manage that area" (Interview QS2T). Despite this recognition, the system's ability to effectively manage PMNM had fallen at the time of data collection. Interviewees noted that the erosion of institutional memory (minor weakness in Enabling Condition 2) and general decreases in federal support and resources have stunted learning and opportunities to adapt by experimenting with new rules and norms. For instance, decreases in support left previously well-funded agencies, such as the ONMS in NOAA, less able to coordinate with, and at times offer resources and support to, other agencies. Interviewees argue that these changes have, in part, followed presidential administration changes, making long-term planning difficult as the potential that they may change again remains.

| Definitions | Presence | Example(s) |
|---|---|---|
| **Polycentricity Attributes** | | |
| Attribute 1: Multiple, overlapping decision-making centers with some degree of autonomy | Present | The MMB is a semi-autonomous decision-making center that includes representatives of seven federal, state, or semi-autonomous public agencies, each of which constitutes a distinct decision-making center with autonomy |
| Attribute 2: Choosing to act in ways that take account of others through processes of cooperation, competition, conflict, and conflict resolution | Present | Activities conducted in PMNM require a permit. Permit holders, including some decision-making centers, often coordinate activities and resources to increase success and efficiency |
| **Social Fit Enabling Conditions** | | |
| Enabling Condition 1: Decision-making centers use diverse institutions | Present | Agencies exhibit distinct cultures, and use distinct rules and norms to carry out mandates |
| Enabling Condition 2: Decision-making centers participate in cross-scale linkages or other mechanisms for deliberation and learning | Mostly Present | There are linkages across jurisdiction, governance level, and geographical space that allow for deliberation, collaboration, and learning; cross-cultural understanding and informational linkages over time could be strengthened |
| Enabling Condition 3: Decision-making centers exist at different | Present, as | Members of the SEB and MMB consist of individuals in the federal government, |

| | | |
|---|---|---|
| levels and across political jurisdictions | currently written | state government, and OHA |
| Enabling Condition 4: The jurisdiction or scope of authority of decision-making centers is coterminous with the boundaries of the problem being addressed | Somewhat present | PMNM covers a vast area that allows for holistic ecosystem-based management. However, the boundaries are not based on ecological, Native Hawaiian cultural, or heritage aspects. |
| **Social Fit Dimensions** | | |
| Dimension 1: Institutions fit with patterns of resource use, as well as interplay with the values, beliefs, and social customs of affected groups | Mostly Present, grew over time | Rules and norms guiding PMNM's governance mostly align with the values and norms of governance actors; inter-agency tension in the early governance system was alleviated over time |
| Dimension 2: Decision-making centers account for the expectations and psychological needs of stakeholders | Somewhat present, grew over time | Agencies in PMNM's governance have different worldviews, values, norms, and policy interpretations, and these differences create tension and conflict; over time, greater collaboration and communication created opportunities for better governance outcomes, though tension resulting from ontological differences remain |
| Dimension 3: Governance system resolves conflicts, provides resources, and promotes social learning | Mostly Present, grew over time and starting to erode | The MMB uses decision-making centers at different levels, such as the SEB and the PWG, to resolve conflicts and promote institutional innovation and learning; institutions to support this grew over time and have begun to erode with decreasing resources and limited genealogical teaching and learning |

**Table 3.** Polycentricity and social fit (from Carlisle and Gruby (2017) and Epstein et al. (2015)) in PMNM

5.4 Contextual features to promote social fit

We have shown that the PMNM case provides empirical evidence supporting the links between Enabling Conditions 1-3 and the emergence of social fit in Carlisle and Gruby's (2017) model. In this section, we propose four contextual features that supported PMNM in achieving social fit: sufficient time to develop mechanisms to effectively cooperate, communicate, and manage conflict; the 'match' between individual personalities and the governance positions they

hold; consistent and sufficient resources to sustain effective governance processes; and clear communication and shared understanding of diverse actor beliefs, values, norms, and goals. While the enabling conditions refer to structural aspects of the governance system (e.g. decision-making centers and their relationships and interactions), contextual features refer to characteristics of and relationships between the particular people, place(s), and histories that enliven a governance system and relate to how it performs (see Mudliar (2020)). In theoretical terms, we posit that these contextual features contribute to, and may be necessary to ensure that, Enabling Conditions 1-3 facilitate the emergence of social fit as theorized.

The first contextual feature suggested by the PMNM case is sufficient time for the governance system to develop attributes necessary to achieve the three dimensions of social fit. To address early conflicts, governance actors had to identify issues, experiment with diverse rules and norms to address them (Enabling Condition 1), and adjust those rules and norms as needed to effectively cooperate and eventually build trust (Enabling Condition 2). Each of these steps took time. Time also allowed the emergence and replacement of specific governance actors and governance roles, which encouraged new ideas for facilitating co-management. Some interviewees, however, noted that personnel turnover over time also contributed to an erosion of both institutional memory and a collective sense of connection to the place. Thus, PMNM suggests that time for institutional innovation should be coupled with continued genealogical teaching to retain and continuously build lessons learned and trust.

Another contextual feature that interviewees highlighted is having particular people in the specific governance roles that enable them to contribute to effective governance. Bodin (2017) similarly argues that effective collaborative networks are built on "the interplay between the overall structure of the network, the characteristics of its actors, and the network positions that they occupy" (p. 6). For PMNM, interviewees noted that each governance role benefitted from different actor characteristics. As one interviewee explained, "You had to have the right set of individuals in the room at the right moment for this to have ever come together…Everybody had to do a little bit around the edges to make this work" (Interview JJMT). For instance, agency leaders needed to advocate for resources, push to achieve particular goals, yet listen and compromise when needed. Working groups benefitted from members who could let go of inter-agency issues that arose in the MMB to enable efficient on-the-ground management at different governance levels (Enabling Condition 3) and conflict resolution (Enabling Condition 2) to occur. Strategic advisory group members were able to affect key decision-making despite a lack of formal authority; other socially astute governance actors have helped translate, connect and, at times, bridge cultural and worldview differences between Native Hawaiians and non-Hawaiians (using new rules and norms available through Enabling Condition 1).

The third contextual feature suggested by the PMNM case is consistent access to governance resources. Governance resources include not only financial resources, but also expertise, space, knowledge, equipment and tools, and personnel. For example, interviewees indicated that members of OHA and the CWG provided financial resources, cultural expertise, tools for effective communication and visioning, cultural practices, historical knowledge, and other resources to the PMNM governance system. PMNM was able to take advantage of these resources because it exhibits Enabling Conditions 1 and 2. This contextual feature also connects specifically to Social Fit Dimension 3 in that, to effectively leverage governance resources, those resources must be available. Similar to other contexts (see Biddle and Baehler 2019; Morrison et al. 2019), resource distribution and access and related issues of power across governance actors played a key role in how governance resources contributed to social fit in PMNM. For example,

666 agency funding has changed over time: while the ONMS in NOAA had substantial funding in
667 the early years of PMNM, their funding has fallen recently, while OHA's funding resources have
668 grown. These changes are not necessarily positive or negative, but they can change inter-agency
669 and inter-actor relationships and dynamics.
670      The final contextual feature suggested by the PMNM experience is clear communication
671 and shared understanding of the diversity of actors' values, beliefs and norms. These include
672 underlying philosophies and value systems about governance as well as norms of interaction.
673 Thiel and Moser (2019) argue that actor and community heterogeneity and its relationship with
674 polycentric governance and performance remains under-researched and undertheorized. In
675 PMNM, despite early conflict based on inter-agency differences and misunderstandings,
676 interviewees reported that identifying and clarifying the roots of actor differences allowed
677 productive conversation, compromise, and cooperation to emerge (Enabling Conditions 1 and 2).
678 Interviewees also discussed the importance of developing and continually articulating shared
679 goals. For instance, many of them indicated a broadly shared goal of making co-management
680 between such a variety of entities work; this stemmed from a collectively developed value of the
681 place, Papahānaumokuākea, as more important than the specific interests of an individual person,
682 agency or group. This shared value emerged over time with leadership and encouragement from
683 OHA. It has prompted rules and norms that better recognize and prioritize social fit of the whole
684 governance system over aligning with the expectations of particular actors or agencies.

686 6. Discussion and Conclusions

688     We have demonstrated that PMNM is a polycentric governance system that has exhibited
689 some degree of social fit for governance actors over time. Three of the four enabling conditions
690 were present or mostly present in PMNM, and their presence generally promoted the emergence
691 of social fit for governance actors, which supports the relationships theorized in Carlisle and
692 Gruby's (2017) model. As one enabling condition was only somewhat present, the case also
693 supports their assertion that not all of the social fit enabling conditions need to be present for a
694 governance system to produce some degree of social fit.  We further highlight the importance of
695 context; we identified four contextual conditions that mattered for the emergence of social fit in
696 PNMN. Finally, the PMNM case demonstrates that social fit is not static; it can build or erode
697 over time.
698      This article suggests three contributions to the functional model of polycentricity. First,
699 rather than enabling the emergence of social fit, the inclusion of multiple agencies with different
700 jurisdictions and mandates (Enabling Condition 3) in fact limited the emergence of social fit in
701 the early years of PMNM. This demonstrates that the presence of an enabling condition can
702 hinder governance functionality in practice, depending on context; in this case, Enabling
703 Condition 3 served as a "limiting" condition for Social Fit Dimension 1 in those early years.
704 Note, however, that this does not imply that Enabling Condition 3 limited the functionality of the
705 governance system overall; indeed, other dimensions of social fit may not have emerged over
706 time without this enabling condition. Second, interactions between enabling conditions can
707 influence whether and how governance functionality emerges. The existence of institutional
708 diversity (Enabling Condition 1) and cross-scale linkages between decision-making centers that
709 address conflict (Enabling Condition 2) helped resolve these early inter-agency tensions – for
710 example, new institutions emerged in the joint permitting system that addressed conflict and
711 increased social fit. Third, decision-making centers should span not only governance level and

geographic jurisdictions, but also different worldviews and cultures. This is supported empirically in this case by the key role of OHA in facilitating the emergence of social fit. Aburto and Gaymer's (2018) work also supports this assertion, as they similarly found that mismatches in worldviews between Rapanui fishing communities and the creators of governance institutions in mainland Chile contributed to a lack of social fit in fisheries governance. Thus, we propose broadening Enabling Condition 3 to reflect this important dimension.

The PMNM case also highlights four contextual features that were important to social fit. A governance system's context and history influence the effectiveness of polycentric governance (Morrison 2017; Mudliar 2020); the contextual features proposed in this paper offer a step toward specifying what aspects of context need research attention. We hope that this specificity provides governance actors working with LSMPAs and other polycentric systems with concrete insights into what has facilitated and limited social fit elsewhere. It is important to note, however, that, while each of the proposed contextual features support, and might even promote, the emergence of social fit, they do not cause or guarantee it. Further, while the relative importance of enabling conditions vs. contextual features for how polycentric governance systems evolve and function cannot be determined from one case study, future research may shed light on whether trends exist.

The temporal dynamics of social fit in the PMNM case demonstrate that social fit can change over time. This finding aligns with other scholarship demonstrating that polycentric governance structures, performance, and outcomes are dynamic (Morrison et al. 2019; Biddle and Baehler 2019; Thiel, Pacheco-Vega, and Baldwin 2019). This finding also has implications for established and future LSMPAs. If social fit does not immediately emerge, it can and may, given time and the right conditions. Yet, PMNM also suggests that social fit is unstable and can erode over time; as governance resources decrease, the ability to maintain connection, trust and coordination between decision-making centers can decrease as well (see discussion of Social Fit Dimension 3).

More broadly, our analysis provides an empirical example of how social fit emerges through a particular form of hybrid governance: co-management. Scholars have called for a greater empirical focus on co-management and other hybrid forms of governance (Lemos and Agrawal 2006; Rana and Chhatre 2017), and PMNM offers insights into how the attributes and features of a polycentric governance system facilitate effective co-management. Though PMNM's governance structure was created through a seemingly top-down presidential proclamation, much of the effort and advocacy to establish protection came from the public, particularly from Native Hawaiians (Kikiloi et al. 2017). The autonomy afforded to the MMB and other decision-making centers to craft governance rules and norms that best fit community needs and expectations allowed social fit to largely emerge. Non-government community governance actors in advisory bodies such as the RAC and the CWG add not only context and legitimacy to decisions but contribute resources and relationships that strengthen shared understanding and improve social fit. Decision-making centers' continual meaningful engagement with these advisory bodies, as well as the elevation of OHA to co-Trustee, have provided structure for enhancing coordination of goals and shared understanding and have given greater authority to often marginalized voices within the state governance system. Yet, as discussed previously, limitations to social fit remain because of the incomplete reflection of Native Hawaiian worldview(s) in PMNM governance.

Finally, Bruns (2019) rightly asserts that the design of polycentric governance systems is inherently political and power-laden. Assessing social fit offers an avenue to investigate the

extent to which the governance system "fits" with the interests and values of those most impacted by the system in practice, rather than focusing solely on the structure and the potential it offers for achieving theorized benefits. While both exercises are important, the PMNM case calls for greater attention to empirical examinations of polycentric governance in practice, enlivened by particular places, people, histories, and relationships, to further understanding of how polycentric governance systems relate to social-ecological systems and outcomes. In other words, while the presence of the enabling conditions in polycentric governance systems may facilitate the emergence of social fit, they do not guarantee it. Questions about who enlivens the governance structure, with what resources, time limitations, knowledge and power dynamics may prove just as important (Mudliar 2020). This reality highlights a continuing challenge of studying polycentric systems: they are complex and multi-layered, and aspects like social fit represent just one facet of a functional polycentric system. Further research is needed to determine how social fit relates to outcomes of polycentric governance and under what circumstances a polycentric system can become functional.

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