International Journal of the Commons
Vol. 11, no 1 2017, pp. xx–xx
Publisher: Uopen Journals
URL:http://www.thecommonsjournal.org
DOI: 10.18352/ijc.709

ISSN: 1875-0281

# Making the transition to co-management governance arrangements in Hawai'i: A framework for understanding transaction and transformation costs

Adam L. Ayers
University of Hawai'i at Mānoa, Department of Urban and Regional Planning, USA
alayers@hawaii.edu

John N. Kittinger
Conservation International, USA
jkittinger@conservation.org

Mark T. Imperial
University of North Carolina at Wilmington, Department of Public and International Affairs, USA
imperial@uncw.edu

Mehana B. Vaughan
University of Hawaii at Mānoa, Department of Natural Resource and Environmental Management, USA
mehana@hawaii.edu

**Abstract:** Co-management has shown great promise in achieving social and ecological goals worldwide. Despite its potential, significant challenges are faced during governance transformations shifting from traditional approaches to fisheries management to co-management systems. Several factors make Hawai'i an excellent opportunity to study the barriers associated with implementing co-management systems. Hawai'i implements many of the same types of regulatory and fisheries programs found elsewhere in the U.S., yet it also possesses a unique legacy of customary management systems. In addition, a legal pathway has existed for nearly two decades that allows communities to partner with the State of Hawai'i to co-manage nearshore coral reef fisheries. Despite the presence of this enabling legislation, extensive community interest in this approach across the archipelago, and

significant NGO/Foundation support, co-management implementation remains limited. This study uses a mixed methods approach that relies on semi-structured interviews and archival data sources to conduct an institutional analysis of transaction and transformation costs. These costs serve as barriers to co-management implementation. The study identifies several social and organizational barriers preventing co-management implementation including: governmental structure and operations; planning and administrative processes; organized opposition from special interests; and consensus building processes. The institutional analysis further reveals a wide range of transaction and transformation costs associated with this governance transformation that prevent adoption of co-management. We conclude by identifying some actions that can help reduce these implementation barriers to co-management transitions and prevent conservation stalemates.

**Keywords:** Co-management, common pool resources, community-based management, coral reefs, fisheries management, governance, institutional analysis, transaction costs

**Acknowledgements:** The authors would like to thank the interview respondents and practitioners that graciously shared their time and valuable experience with us. We would also like to thank the anonymous reviewers that provided valuable comments and insight on earlier versions of this manuscript.

## 1. Introduction

A variety of management approaches are available to govern coral reef fisheries, including centralized or bureaucracy-based management, privatization or devolution of property rights, market-based management, community-based management, co-management, and other hybrid approaches (Yandle and Dewees 2008; Yandle and Imperial 2009). Of particular interest in this study are collaborative governance strategies referred to as co-management (Armitage et al. 2009). Co-management entails shared management authority between the government and communities or user groups (Berkes 2010). It may also involve an iterative learning process with shared costs and benefits within the governance system (Pomeroy and Rivera-Guieb 2006). Co-management further provides the potential to tailor rules to local conditions, increase regulatory compliance, improve collaboration, and lead to greater stakeholder engagement and empowerment (Jentoft et al. 1998; Acheson 2003). Fisheries co-management can also promote conservation by improving data quality, reducing overcapitalization in fishing gear, promoting economic development, ensuring more equitable allocation decisions, sharing power, and reducing conflict (Pinkerton 1989; Pinkerton and Weinstein 1995). Co-management may increase the legitimacy of regulations in the eyes of resource users and improve the overall efficiency of the regulatory program over time (Pinkerton 1992).

However, the design and implementation of effective co-management systems involves significant institutional barriers, particularly when it involves transitioning from a system where regulatory control is centralized in a traditional bureaucracy. The academic literature identifies a range of barriers such as community-level resource overexploitation or co-option of local autonomy (Singleton 2000). Co-management progress may be halted by community failure (McCay and Jentoft 1998) or complicated by the size of the community or user group involved in collective action (Cinner et al. 2007). Social conflict may occur throughout co-management planning processes, which may complicate both planning and implementation (Castro and Nielsen 2001). Equity issues may also manifest in co-management during collective choice processes (Yandle 2003) or through unequal distribution of benefits (Cinner et al. 2012). Barriers may also include a government desire to control data or privatization policies that allow regulatory capture (Pinkerton 1999). Other underlying issues that may complicate or stymie co-management are uneven power relations (Taiepa et al. 1997; Nadasdy 2003); marginalization of different worldviews (Diver 2012), and cultural and ethnic diversity of stakeholders (Levine and Richmond 2014). Scholars have also posited that stewardship incentives may be misaligned when rights are not devolved to users (Wade 2007). Building co-management regimes in the developed world can be particularly challenging, due to: conflicting legal mandates and overlapping regulatory structures (Crowder et al. 2006); legal systems that prevent devolution of rights or local autonomy (Finkbeiner et al. 2015); or bureaucratic and political inertia (Pinkerton 1992). Co-management processes may also be encumbered by a lack of government capacity for collaborative management (Pinkerton et al. 2014); rent-seeking behavior (Imperial and Yandle 2005); and lengthy public planning processes where stakeholders have multiple opportunities to influence policymaking (Vaughan and Caldwell 2015). Given the barriers associated with co-management transitions, it is worth understanding how communities may overcome them. It is also important to understand why communities persevere in spite of them, particularly in highly developed contexts.

Coral reef fisheries in Hawai‘i provide important cultural, traditional, recreational, and subsistence benefits to communities across the archipelago. However, coral reef fisheries in Hawai‘i are significantly impacted by climate change, overexploitation, disease, land-based pollution, and invasive species (Kittinger et al. 2012). Additionally, Hawai‘i reefs suffer from insufficient resources for management resulting in lack of capacity, insufficient data to inform management, and minimal enforcement of resource rules (Jokiel et al. 2011; Page et al. 2013). Unlike many coral reef fisheries, where commercial markets are a primary driver of exploitation (Cinner et al. 2013), over 90% of coral reef fisheries in the main Hawaiian Islands are caught by non-commercial fishers that consume their catch, share it with friends and family, or barter for goods with other island residents (Glazier et al. 2013; McCoy 2015; Kittinger et al. 2015). In response to decline in coral reef fisheries and increasing resource conflict in the early 1990s, many predominantly Native Hawaiian communities called for greater local involvement

in management, based upon customary values and historical marine tenure (Ayers and Kittinger 2014). After extensive community engagement and studies that revealed a high degree of rural dependence on resources for subsistence, the State of Hawai‘i created an institutional pathway whereby communities could partner with the State to co-manage coral reef fisheries for subsistence (Higuchi 2008). There is significant interest in co-management among Hawai‘i communities and a policy instrument has been available since 1994 that authorizes co-management via community-based subsistence fishing areas (CBSFAs). As of 2016 however, there is only one active CBSFA in Hawai‘i.

Institutional analysis is a useful tool to examine how institutions at multiple levels affect social-ecological interactions and program implementation. Institutions are defined as "humanly devised constraints that shape human interaction" (North 1990, 3) and include both *de jure* rules (rules of law) and *de facto* rules (shared norms or rules in use). Institutional analysis entails an analysis of the design elements and performance of institutions (Imperial 1999), including how institutional arrangements mediate interactions between people, organizations, and the environment in different settings (Ostrom 2011). In collective action policy situations, many implementation barriers are the product of the configuration and distribution of transaction and transformation costs within the governance system. Transaction costs include the expenses associated with gathering information, holding meetings, and negotiation, deliberation, and decision-making processes. Transaction costs may be separated between planning (*ex ante* costs) and governance activities (*ex post* costs) (Abdullah et al. 1998). *Ex ante* transaction costs associated with implementing natural resource co-management include information gathering about key social-ecological, governance system, and stakeholder attributes (Ostrom 2009). Redistributing property rights components, operationalizing negotiated agreements, and implementing new regimes are sometimes referred to as *ex post* transaction costs. These *ex post* transaction costs may also be thought of as transformation costs. Transformation costs are often synonymous with production costs (the costs of turning inputs into outputs) but also the implementation costs associated with changing citizen preferences, developing new revenue streams, monitoring performance, regulating patterns of use, enforcing compliance with revenue streams, and procuring inputs (Ostrom et al. 1993).

Several scholars have used a case study approach to identify barriers to fisheries co-management (Prystupa 1998; Pinkerton 1999; Pomeroy et al. 2001; Levine and Richmond 2014) and a transaction costs approach has been employed to empirically examine the frictions of participatory and collaborative governance arrangements in fisheries (Turner and Weninger 2005; Kuperan et al. 2008). This research differs from other case studies in that it examines the key social and organizational barriers that occur in a co-management case study, then extends this analysis by identifying and categorizing the transaction and transformation costs encountered during the transition to co-management governance systems. Identifying transaction and transformation costs can help community leaders,

government officials, and resource managers change the configuration of costs and benefits to facilitate transitions to co-management systems. Further, this study considers why Hawai‘i communities would choose to pursue co-management given the multiple layers of barriers and costs.

We examine three cases where Hawai‘i communities have partnered with the state for subsistence fishing areas, documenting key social and institutional barriers to implementation. We focus on the attempt to transition to co-management governance systems in three fishing communities across the Hawaiian archipelago: Hā‘ena on the island of Kaua‘i, Mo‘omomi on the island of Moloka‘i, and Miloli‘i on Hawai‘i Island. The case analysis was guided by three research questions: What are the barriers encountered in transitioning to a co-management governance system in Hawai‘i? What transaction and transformation costs are associated with the transition to co-management systems? How are these costs distributed within the system?

## 2. Background

Hawai‘i, though part of the United States, maintains a unique legacy of customary management. Prior to western contact, resource management decisions were made at the local level by knowledgeable *konohiki* (resource administrators or land agents) of the local *ali‘i* (chief) in consultation with expert fishers and *maka‘āinana* (land tenants). Sophisticated tenure arrangements once managed resources for a highly populated and politically complex society in pre-contact times (Beamer and Duarte 2006; Kirch 2010; Beamer 2014; Gonschor and Beamer 2014; Vaughan and Ayers 2016). Although marine resources are depleted well below historical levels (Friedlander et al. 2014; Kittinger et al. 2015; Nadon et al. 2015), fishing and gathering remain socially and culturally significant, while providing an important component of food security for many Hawai‘i residents (Vaughan and Vitousek 2013; Kittinger et al. 2015). Coral reef fisheries depletion in many areas can in part be attributed to a departure from local level, culturally rooted, and place-based regulations to ineffective centralized management.

Contemporary coral reef fisheries in Hawai‘i are managed by multiple overlapping jurisdictions that may be characterized as polycentric governance. Although the State of Hawai‘i Department of Land and Natural Resources (DLNR) and its divisions retain management authority for coastal areas out to three miles, several federal regulatory agencies and statutory authorities apply within state waters. For instance, the National Oceanic and Atmospheric Administration manage resources such as Green Sea Turtles (*Chelonia mydus*), Monk Seals (*Monachus schauinslandi*), and Spinner Dolphins (*Stenella longirostris longirostris*). The Endangered Species Act protects Monk Seals. The Marine Mammals Protection Act protects Spinner Dolphins and other marine mammals. Additionally, the Coastal Zone Management Act guides shoreline management, while the Environmental Protection Agency monitors air and water pollution entering streams, rivers, and the ocean. While many overlapping centers of authority exist

in Hawai‘i coral reef fisheries, this study is primarily focused on state-level, centralized or bureaucracy-based management through the DLNR. The DLNR is the only agency that communities may formally partner with to co-manage coral reef fisheries in Hawai‘i.

Since existing management approaches have proven ineffective at preventing resource depletion and managing conflict in many areas, there is increasing support in many communities to return to culturally based regulations and local-level management (Ayers and Kittinger 2014). Community-based subsistence fishing areas (CBSFAs) are the primary state-level management designation that has gained traction among Native Hawaiian fishing communities. CBSFAs allow communities to partner with the Hawai‘i Division of Aquatic Resources (DAR), within the Department of Land and Natural Resources (DLNR) to devise rules based upon “the customary and traditional Native Hawaiian uses of renewable ocean resources for direct personal or family consumption or sharing” (Higuchi 2008, 218). The CBSFA legal pathway was created in 1994 following lobbying by several Native Hawaiian communities and a scientific study that showed significant dependence on subsistence activities such as fishing on the island of Moloka‘i (Matsuoka et al. 1994). As a result, legislation created a pilot project to designate a CBSFA in two adjoining bays, Mo‘omomi and Kawa‘aloa, on the Northwestern coast of the island of Moloka‘i. The nearby Ho‘olehua Hawaiian Homestead Community relies heavily upon marine resources from the area for sustenance. These resources are threatened by recreational and commercial fishing boats from the nearby islands of O‘ahu and Maui, leading to conflict with Moloka‘i residents (Ayers and Kittinger 2014). The Mo‘omomi Pilot Project ended in 1999 when the DLNR chose not to renew an expanded community management area for permanent designation. While two dozen Hawai‘i communities over the past 20 years have expressed interest in crafting CBSFAs, the Mo‘omomi Pilot Project represented the only CBSFA in Hawai‘i until 2015 when Hawai‘i’s governor approved rules for a CBSFA in Hā‘ena, Kaua‘i. Passage of these rules followed nearly a decade of community-level planning and negotiations with DNLR after Hā‘ena was designated a CBSFA via state legislation in 2006. Miloli‘i on Hawai‘i Island was also designated a CBSFA via State-level legislation in 2005, but the State of Hawai‘i has yet to approve rules or management for the Miloli‘i CBSFA. Figure 1 presents a map of these areas and their respective islands.

## 3. Methods

The institutional complexity, ethnic diversity, and legacy of customary management, combined with the ongoing efforts of three different Hawai‘i fishing communities make Hawai‘i an ideal locale to examine barriers to co-management implementation. This study employed a mixed method research design (Tashakkori and Teddlie 2003) that relies on qualitative analysis of data from key respondent interviews ($N$=18) and archival data sources such as meeting minutes, legislative testimony, management plans for co-management areas, stock assess-

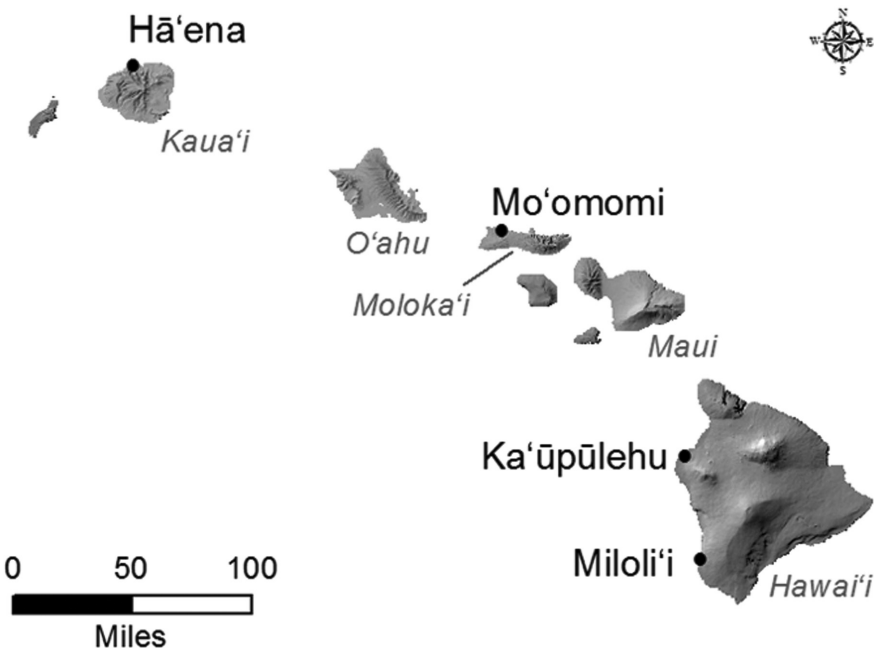


*Figure 1: Map of Hawai‘i co-management areas referenced in this study.*

ments, and other documents to identify institutional barriers associated with the transition to co-management systems. The authors also draw upon years of ongoing ethnographic data and interviews collected during the planning for the only actively co-managed area in Hawai‘i (Vaughan and Caldwell 2015). The authors also reference a policy analysis of the State of Hawai‘i administrative rulemaking process (Kittinger et al. 2012).

We analyzed data from two years of informal meetings (March 2010–May 2012) with participants involved in the planning and implementation of these co-management areas in Hawai‘i, and identified a core set of individuals that we interviewed using purposive sampling (Maxwell 1998). After several interviews were completed, snowball or chain referral sampling (Noy 2008) was then used to identify additional key respondents knowledgeable about efforts to develop and implement CBSFAs until we determined that we reached data saturation. In other words, we noticed that respondent responses began to mirror one other and no new themes were being discovered (Bernard 2013). Interviews were semi-structured; respondents answered the same questions but the interviewer remained open to new conversation threads (Patton 2002). Interview questions are provided in the Appendix. A breakdown of the interviewees and their sectors is provided in Table 1. Although interviewees are separated by sector, the lines between sectors are often blurred due to the cross-sectoral nature of the Hawai‘i marine resource

*Table 1: Total number of completed interviews by sector (N=18).*

| Interviewee sector | Total |
|---|---|
| State government | 6 |
| NGO/Foundation | 4 |
| Community | 3 |
| Federal Government | 2 |
| Academia | 2 |
| Consulting | 1 |

planning community. A total of eighteen interviews were recorded, transcribed, and iteratively coded. Using NVivo 9 QDA software, strings of text were selected and organized by theme as patterns emerged from the data (Miles and Huberman 1994; Bernard and Ryan 2009). The iterative coding process was used to categorize the barriers and their sub-themes. Some respondents identified more than one barrier and this was reflected in the sub-themes below the general institutional barriers in Table 2. However, there was no double counting. The total respondents in the right column of Table 2 reflect the total number of unique respondents mentioning sub-themes within each general institutional category.

These qualitative data on barriers were then analyzed along with archival and ethnographic data sources to identify the transaction and transformation costs associated with transitions to co-management systems in Hawai‘i. We used the

*Table 2: Barriers to fisheries co-management implementation in Hawai‘i coral reef fisheries, (N=18).*

| Barrier | Total respondents mentioning theme |
|---|---|
| Agency relations, capacity, and operations | 17/18 |
| – Organizational culture resistant to change (10/18) | |
| – Lack of enforcement and management capacity (8/16) | |
| – Institutional design flaws (5/18) | |
| – Lack of trust in government (7/18) | |
| Planning and decision-making process requirements | 13/18 |
| – Administrative rulemaking process too long and onerous (9/18) | |
| – Requirements for site assessment, administrative process, plan development difficult to meet (7/18) | |
| – Ambiguous enabling legislation (7/18) | |
| Organized opposition from special interest groups | 10/18 |
| – Organized interests oppose any fisheries regulation (10/18) | |
| – State government support dwindles under any opposition (3/18) | |
| – Communities disenfranchised by organized lobbying efforts (1/18) | |
| Consensus building | 10/18 |
| – Stakeholder factions and diversity complicate consensus-building (9/18) | |
| – Insufficient outreach and resources to build consensus (5/18) | |
| – Difficult to continually engage community members (2/18) | |

IAD framework to organize this analysis. The IAD framework includes a categorical set of factors and variables relevant to the study of institutional change, and functions as a diagnostic tool to examine how events, institutions, layers of interactions, and outcomes may be logically related over time (Ostrom 2005, 9; McGinnis 2011, 169). Our approach to the analysis of transaction costs and transformation costs builds upon the institutional analysis and design (IAD) Framework developed by Elinor Ostrom (2005) and her colleagues (Ostrom et al. 1993; Imperial 1999; Imperial and Yandle 2005) by developing a transaction and transformation costs framework that can be used to examine cost configurations at different stages of the policy process.

## 4. Results

### 4.1. Barriers to co-management in Hawai‘i

The first stage of the qualitative analysis focused on identifying the barriers associated with formal adoption and implementation of CBSFAs across our three study sites. Respondents identified four general social and institutional barriers to co-management implementation in Hawai‘i:

- agency relations, capacity, and operations;
- planning and decision making processes;
- organized opposition from special interest groups; and
- consensus building processes.

The four primary barriers and their sub-themes identified by key respondent interviews are presented in Table 2. Examples of quotes that provide additional support for the identification of these social and institutional barriers are provided in Table 3.

#### 4.1.1. Agency relations, capacity, and operations

Nearly all interview respondents (17/18) identified *agency relations, capacity, and operations* as a barrier to co-management implementation in Hawai‘i. This barrier includes four subthemes: organizational culture resistant to change; lack of enforcement and management capacity; institutional design flaws, and lack of trust in government. Interviewees reported that the state resource management agency tasked with managing coral reef fisheries, the DAR, is resistant to change and possesses an organizational culture that promotes resource extraction despite observed fisheries declines. Some respondents attributed this to the DAR's historical legacy when it was originally founded several decades earlier as the Division of Fish and Game (Walker 1978). Respondents also cited a lack of regulatory enforcement and management capacity leading to a *de facto* unregulated, open access property arrangement for most areas (see Tables 2 and 3). Overall, low funding levels and a lack of collaborative expertise hampers DLNR management

*Table 3: Selected quotes from interview respondents, coded by subthemes, and organized under general barriers to co-management of coral reef fisheries in Hawai'i (N=18).*

| Barrier | Exemplar quotes |
|---|---|
| Agency relations, capacity and operations (17) | "We've done too many unfunded mandates. The Legislature has not come to the table… Where is the will? There's a lot of lip service… Look at our budget – one-half of 1% of the state's budget." (*Lack of enforcement and management capacity)* |
| | "Yes it is. Just an aside on this, in some respects Hawai'i is very much behind a lot of areas in the Pacific just in terms of having really effective nearshore fisheries management. We're almost like the fourth world here, not even the third world. If you look at what we consider third world countries and you look at their marine resource stuff, and you're like whoa, they're doing that? And they don't allow that?" (*Institutional design flaws*) |
| | "I think we could do more with what we have, but it takes leadership [within the agency]. And that's the key. Right now there's none so people are off doing their own little thing. There's no concerted effort to focus on various things. If we had an administrator that said 'Hey, Hā'ena is moving a long ways, they've got to get this going, you and you and you need to go over there and work with the community, and help come up with some drafts and let's move forward with creating those rules, then it would get done right?' But nobody is doing that right now and as far as I can tell, there's no light at the end of tunnel, not in the near term anyway." (*Organizational culture resistant to change*) |
| | "Unfortunately right now it's a lack of institutionalized enforcement, it's just a free for all." *Lack of enforcement and management capacity)* |
| | "And in the other side, there hasn't been a willingness for anyone in DAR to participate – no one in DAR wants to participate. There's that whole dynamic. I don't know how you crack that nut. "(*Lack of trust in government*) |
| Planning and decision-making process requirements (13) | "It's a long process. It's two or three years just to go through the process. I've been explained the process. I'd like to have it figured out…At some point I'll figure out institutionally, you know, it has to go the attorney general, then it waits six months…" (*Administrative rulemaking process too long and onerous*) |
| | "I think the original legislation I take issue with because I think there's lack of clarity, a lack of definitions in what they're requiring, what they're asking. It just says to work with the department…There's such a range, well I'm working with you by providing you with this management plan or am I working with you by inviting you to every single community meeting? There's no layout…" (*Ambiguous enabling legislation*) |
| | "As far the other communities that could go through the Land Board and not actually have to have their own statute, because that is an option, I think that goes back to a lack of a clear process. There might be communities that are interested but it's a difficult process to navigate because it hasn't even been set officially by DLNR, and also it says you have to have a management plan. They are probably going to need support to do these things. And so on that end, there needs capacity and on the state end it's been five years budget cuts and staffing cuts, so it's very difficult..." (*Administrative rulemaking process too long and onerous*) |

*Table 3: (continued)*

| Barrier | Exemplar quotes |
|---|---|
| Organized opposition from special interest groups (10) | "And one of the things unfortunately about government at least on the state level is it's almost axiomatic if somebody almost in the singular is strongly enough opposed to something, government wilts. And certainly if you get an organized group of people, even though you maybe have lots of people in favor of it that are not in somebody's face and maybe it's obvious that it's the right thing to do, it doesn't take much to make government back off." (*State government support dwindles under any opposition*) |
| | "Well, I mean, just the Hā'ena rules in particular, when they were going through the legislature, we had a bunch of commercial/recreational operators, boating recreational operators from Maui show up and testify against the Hā'ena bill you know, because they were afraid of the precedent it was setting to give community members a say in regulating commercial activities." *(Organized interests oppose any fisheries regulation)* |
| | "I think some of these rights to fish groups are very… against community-based fisheries." *(Organized interests oppose any fisheries regulation)* |
| | "You've got a real strong advantage in that most fishermen in Hawai'i, most people that have any traditional roots will not try to tell another community what to do, what not to do. That's your place, you do what you want to do. But there is a commercial fishing lobby in Honolulu that will show up to any hearing at any site and argue against it just on the basis of the constitutional right to fish and that is usually a problem although I think that can be overcome." *(Organized interests oppose any fisheries regulation)* |
| Consensus-building (10) | "I think you know, Miloli'i is a good example of where there was not a community that was on the same page, even though they had the legislation… I think to think that you'll have a community that is 100% on the same page is foolish, it will not happen. But I think you can hope for a large percentage of buy-in and a good process and you've vetted it." (*Stakeholder factions and diversity complicate consensus building)* |
| | "The community members often don't get consensus." *(Insufficient outreach and resources to build consensus)* |

capacity. Interview respondents explained that many DLNR positions go unfilled when employees retire and most DAR employees do not have the training or the skillset to work with communities. Other interview respondents described institutional design flaws. These include issues such as fishing regulation uniformity across the main Hawaiian Islands, despite local variance in abundance and spawning across the archipelago (Schemmel 2014). Other respondents cited an overall lack of trust in government to manage resources effectively or partner in good faith.

### 4.1.2. Planning and decision making process requirements

A majority of interview respondents (13/18) also identified the *planning and decision making process requirements* as an important barrier preventing co-management implementation. In particular, respondents referenced three sets of problems associated with planning and decision making process requirements: an administrative rulemaking process that is long and onerous; requirements for site assessment and administrative process that are difficult to navigate, requirements for plan development that are difficult to meet; and ambiguity in the enabling legislation. See Ayers and Kittinger (2014) for additional discussion of this process. Legislation authorizing the State of Hawai‘i’s co-management process requires community organizations to develop a management plan that provides an overview of funding and enforcement methods, evaluation and monitoring processes, and it must assess how rules for the area may interfere with boating, navigation, and public recreation (Hawai‘i State Legislature Act 271 1994). Accordingly, these plans have the potential to affect a wide range of economic interests. Respondents frequently cited the burden of these activities as a major barrier for communities. For example, communities such as Hā‘ena do not often possess the expertise necessary to frame and conduct scientifically rigorous baseline data collection and monitoring activities. The State of Hawai‘i also privileges data gathered via western scientific methods over customary monitoring activities, which further challenges Hawai‘i communities.

Respondents also described barriers associated with the co-management legislation, which is ambiguous in key areas relevant to the establishment of co-management. For example, the legislation does not define community, which places the burden on a community to define the relevant stakeholders for a community-based subsistence fishing area, creating ambiguities about the factors relevant to inclusion and whether community engagement processes are sufficient. Hā‘ena likely exceeded documentation requirements for their planning process by recording dates and attendance for over 60 community meetings over nearly 10 years (Vaughan and Caldwell 2015). Later on, this documentation proved valuable when organized special interests unsuccessfully claimed that they had not been consulted. In contrast, Miloli‘i held extensive planning meetings, but only among a small group within the community. Other groups within the Miloli‘i community did not provide input prior to a public meeting and many community members were blindsided by a proposal to eliminate small-scale commercial fishing. Neither Hā’ena nor Miloli‘i were given explicit guidance by the state on how to engage stakeholders or the public. One community, Hā‘ena, exceeded engagement requirements, while Miloli‘i did not do enough to engage the community. Both Hā‘ena and Miloli‘i engaged the public adequately, except Hā‘ena may have learned from Miloli‘i’s experience. Much of this process-related ambiguity was resolved in late 2014 when the DLNR approved a clear, step-by-step procedural guide for CBSFAs (Zanre 2014). This manual reduced the legislative ambiguity by clearly delegating state and community responsibilities for data collection from pre-proposal through rulemaking.

#### 4.1.3. Organized opposition from special interest groups

Organized opposition from special interest groups was listed by 10 of 18 interviewees as a major barrier to Hawai‘i co-management. Our analysis identified several subthemes, including: organized interests that oppose any fisheries regulation; state government support dwindles under any opposition; and community disenfranchisement from organized lobbying efforts (Table 2). These interview data are further supported by legislative testimony submitted in opposition to proposed co-management areas in Hā‘ena, Kaua‘i and Miloli‘i on Hawai‘i Island. In the case of Hā‘ena, several commercial tour operators from the island of Maui submitted testimony against the proposed co-management area due to the precedence it may set later for their businesses on their island. Representatives from a well-organized commercial fishing lobby also testified against Hā‘ena at public hearings before the rules became law. Respondents explained how state government support for co-management dwindles under any opposition, particularly if the opposition is vocal and consistent. Still, the Hā‘ena co-management area passed because public support was overwhelmingly positive – over 99% of written and oral testimony collected during public meetings and hearings supported establishing the area (Vaughan and Caldwell 2015).

#### 4.1.4. Consensus building

Consensus building was identified by 10 of 18 respondents as a key challenge to co-management in Hawai‘i. Under the broader category of consensus building, respondents cited: stakeholder factions and diversity within communities complicate consensus building; a lack of community outreach and resources to build consensus; and, difficulties encountered when continually engaging community members. Several interview respondents referenced Miloli‘i as an example of incomplete consensus around a rules package. In Miloli‘i, one segment of the community worked with a local legislator and they were successful in attaining a permanent CBSFA designation for their area. However, once their proposed rules were available for public comment it became evident that there was not adequate consensus within the community around several of the rules (see Table 3). According to one respondent who attended a public meeting where draft rules were presented to the Miloli‘i community: “they relied too much on one or two individuals…they hadn’t vetted it in the community.” Another respondent explained that even though full buy-in from all community members and factions may not be possible in Miloli‘i or elsewhere: “I think you can hope for a large percentage of buy-in and a good process and you’ve vetted it.” In Miloli‘i, inadequate attention to building consensus in the years after their legislative designation led to inaction on a management plan or rules for their adjacent co-management area. Although Miloli‘i retains its CBSFA status on paper, no management plan or rules have been approved by the state in the eleven years since it was legislatively established.

### 4.2. Transaction costs

We next focused our analysis on the transaction costs associated with the co-management arrangements in Hawai‘i by drawing upon data from key respondent interviews, previous research in Hā‘ena, Kaua‘i (the only active co-management area in Hawai‘i), and public testimony. The institutional analysis and design (IAD) framework identifies three primary categories of transaction costs: information costs; coordination costs; and strategic costs (Ostrom et al. 1993; Imperial 1999). The results of our analysis of the transaction and transformation costs of co-management and centralized management are summarized in Table 4.

#### 4.2.1. Information costs

Information costs include the costs of gathering and organizing place-based information and scientific data (social and biophysical). In Hā‘ena, information costs included developing baseline data through resource monitoring activities and community interviews, including a catch per unit effort (CPUE) survey, and analysis of human uses and spatial conflicts. The Hā‘ena community also engaged stakeholders in informal meetings and performed public education and outreach via the Makai Watch program (a community-state collaboration whereby community members educate the public on marine fisheries and document rule noncompliance). Hā‘ena community members often provided food for informal meetings, publicized public hearings, drafted testimony for supporters, and conducted petition drives to collect support. The Hui Maka‘āinana o Makana, a Hā‘ena community organization, performed or organized all of these activities with assistance from a local nonprofit organization, Kua‘āina Ulu ‘Auamo (KUA). The government did not gather any temporal or place-specific information. As with this example, it is typical for the community to absorb the costs of these activities. The Hā‘ena co-management area rules included a small no-take area sheltered by the

*Table 4: Comparative Performance of Institutional Arrangements Related to Coral Reef Fisheries Management Costs (Transformation and Transaction costs) in Hawai‘i, (adapted from Ostrom et al. (1993).*

| | Co-management | Centralized management |
|---|---|---|
| *Intermediate performance criteria, provision costs* | | |
| Transaction costs | | |
| Coordination costs | High | Low |
| Information costs | | |
| Time and place | High | High |
| Scientific | High | High |
| Strategic costs | | |
| Free riding | Med | High |
| Rent seeking | High | High |
| Corruption | N.A. | N.A. |
| Transformation costs | High | High |

fringing coral reef to protect a juvenile spawning habitat. At first, the DLNR did not accept community claims about the area's importance as a nursery, despite generations of observational data and customary knowledge gathered by local fishers and community members. The community was required to commission a scientific study by coral reef ecologists that confirmed community claims before the DLNR allowed the area to remain a part of the rules package (Friedlander et al. 2013; Vaughan et al. 2016). Thus, the burden was on the community to gather scientific information about their area.

#### 4.2.2. Coordination costs

Coordination costs refer to all costs associated with planning and implementing a co-management regime, including time, capital and personnel costs. In Hawai'i, costs were expended to plan, negotiate agreements, monitor compliance, and enforce regulations. Due to low funding and administrative capacity at the state level, communities were forced to absorb many of the coordination costs for co-management in Hawai'i. Fortunately, the non-profit sector including non-governmental organizations (NGOs) and foundations helped communities absorb these costs by providing human and financial capital investments in community coordination processes. Respondents from multiple sectors cited a lack of capacity at the state level as a major barrier. Until 2012, when the locally based Harold K.L. Castle Foundation funded a co-management planner position, there were no employees at the state level responsible for working with communities to support the development of co-management governance arrangements. This position, along with support from several local NGOs, including KUA, The Nature Conservancy, and Conservation International Hawai'i, provided community assistance for planning, community organizing, developing rulemaking proposals, engaging with government officials and other planning activities. These bridging and brokering roles represent a significant portion of the coordination costs for transitioning to a co-management system in Hawai'i.

#### 4.2.3. Strategic costs

Strategic costs refer to the costs that result when individuals or organizations exploit information asymmetries, power relations, political influence, or financial advantages to capture resource benefits. Strategic costs include free riding, rent seeking, shirking, social loafing, and corruption. Our analysis reveals several examples of strategic costs associated with making the transition to co-management governance systems. A lack of institutionalized enforcement means that many fishing areas across Hawai'i have become *de facto* open-access (an absence of defined property rights), which encourages free riding behavior. For example, a 2012 creel survey in a West Maui herbivorous fish no-take area found that nearly 20% of reported catch included restricted herbivore reef fish (Friedlander et al. 2012). In terms of rent-seeking behavior, respondents described how organized fishing interests actively work against co-management planning efforts by lobbying politicians, co-opting public meetings, and using their process-related

knowledge to subvert community-led initiatives. For example, organized fishing interests heckled crowds and decision makers at public meetings, filed petitions to delay an administrative decision, and lobbied new legislators in an attempt to block approval of rules. Respondents frequently reported that organized interests opposed any rules changes despite documented resource depletion across the Hawaiian archipelago (Friedlander and DeMartini 2002; Kittinger et al. 2011; Nadon et al. 2015). To overcome strategic costs, community members raised public awareness, lobbied legislators, and encouraged citizens to support their proposals. These actions were critical for the Moʻomomi, Miloliʻi, and Hāʻena communities to initially achieve their co-management area designations. There is no data to indicate that corrupt activities affected co-management or centralized fisheries management in Hawaiʻi.

The distribution of these transaction and transformation costs is summarized in Table 4. The ordinal scale of 'Low', 'Med' for medium, and 'High' for co-management and centralized management was assigned based upon descriptive, qualitative assessments of the individual aspects of each cost and are not a precise calculation of transaction and transformation costs. Our assessments are made based upon interview data, analysis of archival documents, participant observation of public meetings, and ethnographic work in Hāʻena. A 'Low' ranking describes costs and activities that are currently accounted for in the regulatory regime. In other words, funds are allocated to this task and staff members currently work to complete this as part of their work plans. A 'Med' or medium ranking describes some extra costs incurred outside of the current regulatory regime or activities. For example, a ranking of 'Med' for the free riding subcomponent of strategic costs describes extra costs that must be accounted for to reduce free riding by the community or the state, such as monitoring and incident reporting to report rules violations. A 'High' ranking describes significant costs, such as extensive longitudinal scientific studies, multiple public meetings, or several new full-time positions. The rankings reported for centralized management consider costs that have already been absorbed within the system.

### 4.3. Transformation costs

The transformation process has been widely studied by resilience and management scholars. In these fields, transformation is a process that brings together critical social elements to drive adoption of new behavioral pathways (Olsson et al. 2014). New pathways may lead to structural changes such as management transitions (Rotmans et al. 2001).

In institutional analysis, transformation costs include the costs of changing citizen preferences about governance arrangements, such as co-management transitions. During the planning process, this includes the cost of changing citizen preferences using consensus-building processes. During the policy design stage it includes costs associated with funding the transformation and implementation of the new governance system. During the policy implementation stage it includes

the costs to monitor performance, regulate patterns of use, and to enforce rules. It is important to note that the perceived costs are in many ways just as important as the actual costs. Moreover, there may be benefits (or perceived benefits) associated with the governance transitions as well. Consequently, the combination of these costs and benefits is what can create significant barriers to making the transition to a new governance arrangement.

Until the Hā‘ena rules were signed into law on August 2015, the archipelago had just one pilot project at Mo‘omomi on Moloka‘i, which has yet to be made permanent. Designation of just one co-management area in 21 years despite the presence of legal mandate and at least two dozen highly engaged communities pushing to be designated provide some evidence of the barrier that high transformation costs present to co-management transitions in Hawai‘i. Our analysis reveals a number of transformation costs. Respondents cited the lack of governmental support for coordination, site assessment, and information gathering, high strategic costs brought on by organized special interest groups, and an arduous and complicated administrative rulemaking process (Kittinger et al. 2012) as impediments to making the transition to co-management systems. Resource rules for centralized management and co-management must both pass through the Hawai‘i administrative rulemaking process to become law, which may take up to six years, depending on the complexity of the proposed rules. For example, rules for recently revised bag and size limits for reef fish on Maui took a total of six years (a centrally managed area), while the Hā‘ena co-management rules took four years. No matter how small, any new (or amended) rules must revisit the administrative rulemaking process. It took a highly engaged ten year effort by the Hā‘ena community, active support by a local NGO (KUA), and a significant, multiyear funding investment in a state-level planning position by a local foundation (H.K.L. Castle Foundation) dedicated to co-management to overcome high transformation costs, and achieve a permanent CBSFA.

## 5. Discussion

Despite the presence of enabling legislation, extensive community interest across the archipelago, and significant support from nonprofit and philanthropic groups, implementation of fisheries co-management remains limited in Hawai‘i (Ayers and Kittinger 2014). Our analysis suggests several key barriers that impede wider adoption of this management approach as well as key transaction and transformation costs, which we have organized using the IAD framework. Based on these data, we developed a heuristic transaction and transformation cost framework (Figure 2) to illustrate these issues and how they relate to governance transitions. Below, we discuss our findings within the context of this framework, consider management implications, and means of reducing these costs and barriers. We also consider why communities would persevere in pursuing co-management in spite of them.

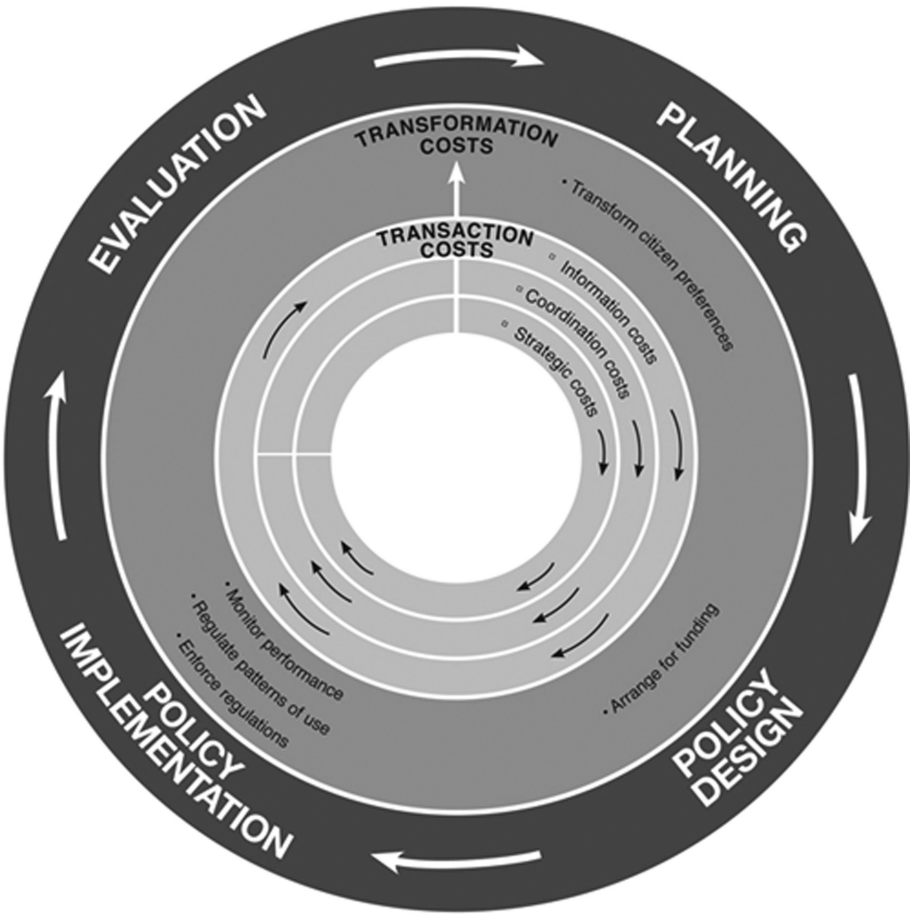


*Figure 2: The transformation and transaction costs associated with governance transitions.*

### 5.1. A framework for examining the transformation and transaction costs

Figure 2 summarizes the framework that emerged from our analysis of the transformation and transformation costs identified in this case study. A wide range of transaction costs (or benefits) occurred during the different stages of the governance transition process – planning, policy design, implementation, and evaluation (Ostrom et al. 1993; Imperial 1999). Information costs occur throughout the co-management life cycle, whereas coordination costs and strategic costs only occur from planning through implementation. There are also transformation costs that occur during each stage of the transition process except evaluation (Ostrom et al. 1993). During the planning stage there are costs to change citizen preferences so that the new governance system is viewed as being a legitimate, appropriate, and better system for managing the problem(s) than the status quo arrangement.

During the policy design stage, transformation costs are also associated with the design of the new governance arrangement. This might involve changes in how the system is funded or allocates resources. It could also change who has the burden (i.e. cost) and authority to develop rules. New policies may generate a different set of transformation costs during the implementation stage by changing the allocation of costs to administer the program, collecting monitoring information, changing and enhancing enforcement mechanisms, or shifting resource allocations. The upward arrow in Figure 2 between transaction and transformation costs denotes a positive relationship, whereby higher transaction costs generate higher transformation costs during institutional change.

### 5.2. The configurational nature of transformation and transaction costs and benefits

Theories of institutional change postulate that when costs of institutional change exceed potential benefits, there is no incentive for individuals to change rules, so the rules will likely remain unchanged (Basurto and Ostrom 2009). This idea is also captured in one of Ostrom's design principles for enduring common pool resource institutions: "congruence between appropriation and provision rules and local conditions" (Ostrom 1990, 90), which was later divided into two parts by other commons scholars to more accurately reflect the complexity of its two component parts: 1) tailoring rules to local conditions; and 2) the benefits received by resource appropriators are proportional to the costs incurred (Cox et al. 2010). This is sometimes termed the configurational nature of transformation and transaction costs or the combinations of costs and benefits incurred by different stakeholders. The ability to transition from one governance arrangement to another is influenced by how the pattern of costs and benefits shapes perceptions among stakeholders about the efficacy of the proposed governance arrangement, which in turn influences decisions about whether to participate, support, or oppose the governance transition.

Conversely, the distributional consequences of certain configurations can also create strong incentives for participants to work cooperatively to craft new governance arrangements that are win-win or at least win-no-lose in nature (Imperial and Kauneckis 2003; Kauneckis and Imperial 2007). In this case, the distributional pattern associated with the transition to co-management systems in Hawai‘i creates formidable obstacles. For example, one of the problems with the design of the 1994 enabling legislation is that it shifts almost all of the cost associated with developing a CBSFA to the community partners. Communities pursuing co-management in Hawai‘i are faced with the burden of gathering scientific and socio-economic information on their fishery, engaging stakeholders, navigating a complex administrative and political process, and securing a broad base of public support. Many of these communities are experiencing their own economic hardships. However, all residents of the state share the benefits of improved fisheries management over the long-term.

Why do communities persist when theory says they should quit? Ethnographic and interview evidence suggest that a cultural, spiritual, and social connection may be a wellspring from which no matter the barrier or the cost, people will continue efforts to care for their areas (Vaughan and Vitousek 2013; Vaughan and Caldwell 2015). Hā‘ena, Mo‘omomi, and Miloli‘i communities each share a deep cultural connection to place which facilitates absorption of costs (Matsuoka et al. 1998; Vaughan and Caldwell 2015). For these communities, connection to the land and sea reproduces a sense of cultural identity and provides a purpose for action that is guided by *kuleana* or a deep responsibility to care for place (Vaughan et al. 2016). Second, many communities in Hawai‘i are dependent on the resources, but not in the economic sense. For example, a recent study of a similar-sized reef area (Kīholo Bay on Hawai‘i island) found that the annual non-commercial value of consumed or shared coral reef resources totaled $80,000 or more than 30,000 meals (Kittinger et al. 2015). Coral reef fisheries do contribute to sustenance, but not at a full subsistence level for most communities. Although the contribution to sustenance should not be understated, communities are primarily dependent on these resources for cultural, spiritual and social purposes (Vaughan and Ayers 2016). At this time, many Hawai‘i communities seem to expend almost unending effort to gain authority to care for place.

Some Hawai‘i communities also have supporters in NGOs and Foundations that are willing to absorb some of the information and coordination costs. Otherwise, it is possible that even less progress in co-management transitions would have occurred. Co-management is supposed to be a partnership between a community or a group of resource users and the government. In this case, most progress has been supported by NGOs/Foundations that are not explicit partners in the co-management partnership. However, not all communities may share this NGO/Foundation support or wellspring of cultural motivation. If other communities are going to be successful in partnering with the state, these uncompensated costs must be reduced or redistributed to create stronger incentives for community participation.

### 5.3. Perceptions of costs and benefits

Many of these transaction costs could be expressed in terms of person-days or person-hours but would be difficult to monetize. In Hā‘ena for instance, beach surveys documenting the frequency and location of tourists and recreational users in the area took two full summers to complete. These surveys involved several graduate students and community members. Data collection took substantial time and expertise was needed to analyze data and present findings. In another summer, a reef fish census survey was commissioned to document the numbers and types of fish present in a suspected juvenile fish nursery and habitat (Friedlander et al. 2013). Again, the community was forced to ask scientific experts from outside the community to conduct the study. Since it was conducted using existing funding sources by University of Hawai‘i faculty and students, the community did

not have to fund this particular study out of pocket. Although the community did not fund this work, the study required the part-time effort of three students and one faculty member over several months. Co-management planning in Hā‘ena occupied a substantial amount of time for many members of Hui Maka‘āinana o Makana in addition to a large portion of time for a state-level planning position funded by The H.K.L. Castle Foundation, and several staff members of KUA. The actual cost investment in time and expertise needed to establish a single co-management area for a two-mile swath of coast in Hā‘ena, Kaua‘i was significant, with very little funded by DLNR budgets. With some effort, these costs could be collected.

However, *perceived* costs and benefits are also important drivers in the transition process because they provide strong incentives or disincentives to participate, support, or oppose the governance transition. In Hawai‘i, interview data suggests that opportunistic behavior is prevalent in areas under centralized management across the archipelago. Respondents shared a perception that many fishers take advantage of minimal enforcement presence by not complying with resource rules. Those that benefit from the current institutional arrangement are largely opposed to the development of CBSFAs because they fear that new systems will impose costs or constraints that interfere with their current use of marine resources. Alternatively, supporters of CBFSAs hope that the Hā‘ena community will provide social pressure on users to comply with rules, report incident violations to the state, and engage the community and DLNR to monitor resource users. As a result, they hope that the opportunistic behavior common in the current system will decrease, regulatory compliance would then improve, and better management of marine resources will result. While there is little direct evidence as to whether either set of perceptions is correct, the combination of perceptions have framed the governance transition as a win-lose situation with those in favor of the status quo mounting well-orchestrated opposition to co-management.

### 5.4. Accrual of costs and benefits over time

Our analysis also suggests it matters when costs (and benefits) occur over time. Generally speaking, it is difficult to develop and implement policies when great costs are incurred today for vague or unspecified gains in the future. Participants can also use very different discount rates, which mean that the costs (or benefits) viewed in very different ways as a result of history, culture, or different worldviews. Without understanding these different discount rates, it is difficult to make accurate predictions about the interactions among actors (e.g. the ability to absorb high transformation costs) or the outcomes for governance change (e.g. the adoption of new rules systems) (Gelcich et al. 2006; Raemaekers et al. 2011; Hauck and Gallardo-Fernández 2013). The case illustrates this point. Communities engaged in co-management planning have persisted for a decade or longer in spite of significant costs and seemingly few immediate benefits. However, many Native Hawaiians consider the health of local fisheries as an ancestral respon-

sibility. Their motivation is to perpetuate key cultural practices and maintain a Hawaiian way of life for future generations (McGregor 2007) despite significant social, economic, and technological change. Their use of a very low discount rate attaches importance to the long-term benefits and creates a willingness to incur larger upfront change costs. This is consistent with findings from elsewhere in the Pacific (Teh et al. 2011). The pursuit of rights to manage local resources is also congruent with historical marine tenure regimes in Hawai‘i that devolved management to local and regional scales (Beamer 2014; Gonschor and Beamer 2014). Even though current co-management systems in Hawai‘i devolve little in the way of rights to resources (Ayers et al., in preparation), the ability to advance place-based rules is congruent with historical management approaches. Alternatively, the stakeholders involved in organized opposition may use much larger discount rates – or do not perceive the resource to be threatened – which attaches much larger value to the current gains that result from the lack of enforcement and their exploitation of marine resources.

## 6. Management implications

### 6.1. Resolve asymmetric cost distributions to streamline governance transitions

If co-management is to fulfill its promise, there must be better understanding of the barriers associated with making governance transitions. The transformation and transaction cost framework presented in Figure 2 provides a means of identifying potential barriers. Our framework can also be used to identify and evaluate strategies for modifying the configuration of transaction costs in ways that create greater incentives for participation by alleviating perceived inequities in the distribution of costs and benefits. One obstacle is clearly the asymmetries of information and coordination costs. Communities have the burden for the information and coordination costs needed to develop the CBFSA. The state, which is the other partner in the co-management arrangement, is a free rider in the transition process because it shifted almost all of the developmental cost to the communities, but will be one of the main beneficiaries of the transition once it shifts implementation costs to the communities. Fortunately, a wellspring of dedicated community effort is available in many areas along with strong support from foundations and NGOs offset the asymmetric cost allocation. However, if the state really wanted to encourage CBFSA development it should provide greater support for the transition process that helps offset the high costs at the community level. This could be achieved through planning grants, subsidizing scientific studies, or modifying the information or regulatory requirements that create high transaction costs.

The development of collaborative agreements like co-management systems also works best when all parties affected by the agreement lack a better alternative to the negotiated agreement (BATNA) (Fisher and Ury 1991). This causes participants to negotiate in good faith and seek win-win or at least win-no-lose arrangements (Imperial and Kauneckis 2003; Kauneckis and Imperial 2007). However,

approval of a CBFSA using normal environmental rulemaking creates an alternative to a negotiated agreement. Stakeholders opposed to CBSFA development do not have to bargain in good faith. If they fail to get their preferred negotiated agreement, they can exit negotiations and use the rulemaking procedures to prolong the process and exacerbate local coordination costs. However, local communities and stakeholders supportive of a CBSFA have no equivalent alternative other than a negotiated agreement. This power asymmetry allows a small group of stakeholders to block CBSFA development while they continue to engage in other costly forms of strategic behavior (e.g. illegal fishing) because the state does not invest in monitoring or enforcement.

Accordingly, if Hawai‘i wants to encourage co-management, it needs to modify the administrative rulemaking process or perhaps create a separate CBSFA approval process designed to minimize transaction costs. It could also minimize the opportunities for stakeholders to exit the transition process, which will encourage stakeholders to bargain in good faith. There are successful examples of transition processes that could serve as possible models including territorial user rights for fishing (TURFs) in Chile (Gelcich et al. 2010), community development quota funds used in Alaska (Ginter 1995); fisher-government coalitions in the co-management of the lobster fishery in Maine (Acheson 2003); and culturally-based co-management in *Aotearoa* (New Zealand) (Memon et al. 2003). Each of these examples is different in terms of goals, the rights shared with resource users, geographic location, and stakeholders involved. However, they share an important similarity: a government mandate or a clear recognition of the need to cooperate. In areas of Hawai‘i where communities have demonstrated stewardship capability and public support for co-management, a separate CBSFA approval process and dedicated agency positions mandated to collaborate with communities could lower the burden of transaction costs on communities and make governance transitions more efficient. A separate CBSFA approval process for qualifying communities would also compel opposing interests to bargain in better faith instead of devoting time and resources to obstruct the process.

### 6.2. Build public support for co-management

An overall change in community strategy may also be needed. A major challenge is clearly transforming citizen preferences, particularly among those lacking Native Hawaiian ancestry. One way to do this is by using demonstration projects and phasing in CBSFA implementation by focusing on selected communities where strong support exists. Indeed, some community leaders and practitioners described the need to start small with successful demonstration projects in order to reopen this pathway and create a precedent for other communities. Since the state currently lacks the resources to support broader implementation of CBSFAs, this strategy would also focus limited resources in a few selected communities to test whether co-management systems actually improve marine resource management. Implementation experience will also help all stakeholders to better

understand whether the perceived costs and benefits are realized. Over time, if the demonstration projects are successful it could help change citizen perceptions. If they are unsuccessful, the state could pursue a different institutional arrangement to improve the management of its marine resources.

The results also demonstrate that changing citizen perceptions during governance transitions is critical when organized opposition from special interests is entrenched, politically powerful, and the transition process provides points of leverage that can be used to prolong the process. In Washington State, co-management agreements between Indian tribes and the State were facilitated by issue networks, advocacy coalitions or alliances, legislation, threat of court action, and citizen-led initiatives to prevent further environmental degradation (Pinkerton 1992; Pinkerton et al. 2014). Similar initiatives were integral to success in Hā‘ena, Kaua‘i. Building a broad base of support at the multiple scales – both at the community level and statewide – was critical in breaking two decades of path dependence and lock-in in Hawai‘i. The results also demonstrate that effective organizing and advocacy coalitions led by the Hā‘ena community and their NGO and Foundation partners could overcome significant transaction and transformation costs. The Ka‘ūpūlehu community on Hawai‘i Island recently employed similar strategies to successfully pass regulations prohibiting fishing for ten years in their adjacent marine area to allow the recovery of key species. As previously evidenced in British Columbia and Washington State (Pinkerton 1992; Pinkerton et al. 2014), recent successes in Hā‘ena and Ka‘ūpūlehu demonstrate that specific, targeted strategies can overcome many of the barriers to co-management transitions.

### 6.3. Manage conflict to avoid conservation stalemates

While collaboration and co-management are often viewed in positive terms, it is important to remember that these governance strategies are not appropriate for addressing all resource management problems (Imperial and Yandle 2005). For example, Wondolleck and Yaffee (2000, 58) examined nearly 200 contentious collaborative decision making processes and observed many of the same barriers observed in this study. Similarly, many Hawai‘i communities have had limited success in achieving the prerequisites for successful collaboration noted by Wondolleck and Yaffee (2000). In Hawai‘i, many of the stakeholders still have difficulty working together and problems and policy solutions are framed largely in terms of win-lose situations rather than win-win or win-no-lose situations that are more likely to encourage cooperative solutions (Imperial and Kauneckis 2003; Kauneckis and Imperial 2007).

One notable exception is the West Hawai‘i aquarium fishery protected area process which prompted organic community involvement via a regional and diverse stakeholder council (Tissot, Walsh, and Hixon 2009; Rossiter and Levine 2014). There, the multi-stakeholder community-level council vetted rules proposals and managed conflict at lower levels prior to the rulemaking process and were

deemed a critical component of success (Maurin and Peck 2008; Stevenson and Tissot 2013). Outside of this success in West Hawai‘i, co-management transitions in Hawai‘i have largely resulted in a conservation or policy stalemate (Amy 1983). The conservation stalemate highlights the need for effective conflict resolution strategies (Ostrom 1990; Castro and Nielsen 2001; Pomeroy et al. 2001) that are built into the governance transition process in Hawai‘i similar to the West Hawai‘i Fishery Council in West Hawai‘i. In addition to dedicated staff and a separate CBSFA process, specific deliberative strategies may help manage conflict. The challenge facing the State of Hawai‘i is to develop participatory spaces where constructive deliberation is not dominated by power relations (Fung and Wright 2001), particularly given Hawai‘i’s multicultural population, diversity of cultures, and worldviews (Lowry et al. 1997; Umemoto 2001).

## 7. Conclusions

Our research was guided by three research questions: What are the barriers encountered in transitioning to a co-management governance system in Hawai‘i; What transaction and transformation costs are associated with the transition to co-management systems; and How are these costs distributed within the system? We found that the following barriers hindered Hawai‘i co-management transitions: agency relations, capacity and operations; planning and decision making processes; organized opposition from special interest groups; and consensus building processes. Our research revealed that the transaction costs associated with the transition to co-management systems could be categorized into information costs, coordination costs, and strategic costs. In Hawai‘i, information costs included the costs of gathering and organizing place-based social and biophysical data. Coordination costs included time, money, and effort expended to plan, negotiate agreements, monitor compliance, and enforce regulations. Strategic costs included free riding behavior resulting from a lack of institutionalized enforcement of Hawai‘i coral reef fisheries and rent-seeking behavior that forestalled co-management planning and rulemaking processes.

Transformation costs associated with the transition to co-management systems included the costs of changing citizen preferences during planning processes and developing funding for transformation and implementation of the new governance system during policy design. During policy implementation, transformation costs included monitoring performance, regulating patterns of use, and enforcing rules. Overall, there are high transaction costs associated with Hawai‘i co-management transitions and many of these costs persist throughout the policy process from planning, to policy design, through implementation, and program evaluation (see Figure 2). Transformation costs are high due to lack of governmental support for coordination, site assessment, and information gathering. High strategic costs occur due to the presence of organized special interest groups, and a complicated administrative rulemaking process. In terms of distributions of transaction and transformation costs in this system, these costs are asymmetrically distributed

and are mostly absorbed by communities and their NGO partners. Other than the Mo‘omomi and Hā‘ena CBSFAs, and the recent Ka‘ūpūlehu community-based no-take area, there has been little government investment to approve, support, and fund implementation of co-management transitions.

Despite the challenges noted in Hawai‘i, co-management remains a promising and appropriate alternative to address problems that top-down governance has failed to remedy. However, the governance transition process required for establishing co-management regimes creates significant transaction and transformation costs that can inhibit broader adoption. In places where co-management transitions have been successful, the process has taken a decade or longer (Yandle 2003; Gelcich et al. 2010). There is no reason to believe that the transition to widespread use of co-management systems will happen quickly without addressing the structural attributes that create these barriers. This will likely require substantial investments in the transition process that balance the current inequities in the distribution of transaction and transformation costs. Yet the perseverance of many Hawai‘i communities suggests that a cost-benefit calculation and economic dependence on the resource do not motivate communities to pursue co-management. Instead, we find that a cultural, spiritual, and social connection to place and cultural resource dependence may be a wellspring that propels community effort. These factors may be illuminating explanatory factors throughout the Pacific and other contexts where indigenous cultures persist.

## Literature cited

Abdullah, N. M. R., K. Kuperan, and R. Pomeroy. 1998. Transaction Costs and Fisheries Co-Management. *Marine Resource Economics* 13(2):103–114.

Acheson, J. M. 2003. *Capturing the Commons: Devising Institutions to Manage the Maine Lobster Industry*. Lebanon, New Hampshire: University Press of New England.

Amy, D. J. 1983. Environmental Mediation: An Alternative Approach to Policy Stalemates. *Policy Sciences* 15(8):345–365. doi:10.1007/BF00146007.

Armitage, D. R., R. Plummer, F. Berkes, R. I. Arthur, A. T. Charles, I. J. Davidson-Hunt, A. P. Diduck, N. C. Doubleday, D. S. Johnson, M. Marschke, P. McConney, E. W. Pinkerton, and E. K. Wollenberg. 2009. Adaptive Co-Management for Social–Ecological Complexity. *Frontiers in Ecology and the Environment* 7(2):95–102. doi:10.1890/070089.

Ayers, A. L. and J. N. Kittinger. 2014. Emergence of Co-Management Governance for Hawai‘i Coral Reef Fisheries. *Global Environmental Change* 28(9):251–262. doi:10.1016/j.gloenvcha.2014.07.006.

Ayers, A. L., M. B. Vaughan, and J. N. Kittinger. n.d. *Whose Right to Manage? Distribution of Property Rights Affects Equity and Power Dynamics in Co-Management*. Manuscript in preparation.

Basurto, X. and E. Ostrom. 2009. Beyond the Tragedy of the Commons. *Economia Delle Fonti Di Energia E Dell’ambiente* 52(1):35–60.

Beamer, K. 2014. *No Mākou Ka Mana: Liberating the Nation*. Honolulu, Hawai'i: Kamehameha Publishing. http://kpstore.deliveryhawaii.com/KS/product/978-0-87336-293-1.html.

Beamer, K. and T. Ka'eo Duarte. 2006. Mapping the Hawaiian Kingdom: A Colonial Venture. *Hawaiian Journal of Law and Politics* 2:34.

Berkes, F. 2010. Devolution of Environment and Resources Governance: Trends and Future. *Environmental Conservation* 37(4):489–500. doi:10.1017/S037689291000072X.

Bernard, H. R. 2013. *Social Research Methods: Qualitative and Quantitative Approaches*. Los Angeles: SAGE Publications.

Bernard, H. R. and G. W. Ryan. 2009. *Analyzing Qualitative Data: Systematic Approaches*. Thousand Oaks: SAGE.

Castro, A. P. and E. Nielsen. 2001. Indigenous People and Co-Management: Implications for Conflict Management. *Environmental Science & Policy* 4(4–5): 229–239. doi: 10.1016/S1462-9011(01)00022-3.

Cinner, J. E., S. G. Sutton, and T. G. Bond. 2007. Socioeconomic Thresholds That Affect Use of Customary Fisheries Management Tools. *Conservation Biology* 21(6):1603–1611. doi:10.1111/j.1523-1739.2007.00796.x.

Cinner, J. E., T. R. McClanahan, M. A. MacNeil, N. A. J. Graham, T. M. Daw, A. Mukminin, D. A. Feary, A. L. Rabearisoa, A. Wamukota, N. Jiddawi, S. J. Campbell, A. H. Baird, F. A. Januchowski-Hartley, S. Hamed, R. Lahari, T. Morove, and J. Kuange. 2012. Comanagement of Coral Reef Social-Ecological Systems. *Proceedings of the National Academy of Sciences*, *109*(14):5219–5222. https://doi.org/10.1073/pnas.1121215109.

Cinner, J. E., N. A. J. Graham, C. Huchery, and M. Aaron MacNeil. 2013. Global Effects of Local Human Population Density and Distance to Markets on the Condition of Coral Reef Fisheries. *Conservation Biology* 27(3):453–458. doi:10.1111/j.1523-1739.2012.01933.x.

Cox, M., G. Arnold, and S. V. Tomás. 2010. A Review of Design Principles for Community-Based Natural Resource Management. *Ecology and Society* 15(4):38.

Crowder, L. B., G. Osherenko, O. R. Young, S. Airame, E. A. Norse, N. Baron, J. C. Day, F. Douvere, C. N. Ehler, B. S. Halpern, S. J. Langdon, K. L. McLeod, J. C. Ogden, R. E. Peach, A. A. Rosenberg, and J. A. Wilson. 2006. Resolving Mismatches in U.S. Ocean Governance. *Science* 313(5787):617–618.

Diver, S. 2012. Columbia River Tribal Fisheries Life History Stages of a Co-Management Institution. In *Keystone Nations: Indigenous Peoples and Salmon across the North Pacific*, eds. B. J. Colombi and J. Brooks, 28. Santa Fe, New Mexico: School for Advanced Research Press.

Finkbeiner, E., A. Ayers, J. N. Kittinger, and L. Crowder. 2015. A Comparison of Small-Scale Fisheries Governability: Baja California Sur, Mexico and the Hawaiian Islands. In *Interactive Governance of Small-Scale Fisheries: Global Reflections*, eds. S. Jentoft and R. Chuenpagdee. Switzerland: Springer.

Fisher, R. and W. Ury. 1991. *Getting to Yes*. 2nd ed. New York, New York: Penguin Books.

Friedlander, A. M. and E. E. DeMartini. 2002. Contrasts in Density, Size, and Biomass of Reef Fishes between the Northwestern and the Main Hawaiian Islands: The Effects of Fishing down Apex Predators. *Marine Ecology Progress Series* 230:253–264.

Friedlander, A. M., H. Koike, L. Kekoa, and R. Sparks. 2012. Design, Development, and Implementaiton of a Survey of the Kahekili Herbivore Fisheries Management Area. Honolulu, Hawaii. http://docs.lib.noaa.gov/noaa_documents/CoRIS/kahekili-fisheries-management_2012.pdf.

Friedlander, A., W. Goodell, E. Schemmel, and K. A. Stamoulis. 2013. Marine Ecological Assessment of Hā‘ena’s Reef Habitats. Preliminary Results of July 2013 Surveys. Fisheries Ecology Research Lab: University of Hawaii at Manoa. http://dlnr.hawaii.gov/dar/files/2015/08/Haena_Ecological_Studies_Summary_Report_2013.pdf.

Friedlander, A., J. Nowlis, and H. Koike. 2014. Improving Fisheries Assessments Using Historical Data Stock Status and Catch Limits. In *Marine Historical Ecology in Conservation Applying the Past to Manage for the Future*, eds. J. N. Kittinger, L. McClenachan, K. B. Gedan, and L. Blight, 91–118. Oakland: University of California Press. http://www.ucpress.edu/book.php?isbn=9780520276949.

Fung, A. and E. O. Wright. 2001. Deepening Democracy: Innovations in Empowered Participatory Governance. *Politics & Society*, 29(1):5–41. https://doi.org/10.1177/0032329201029001002.

Gelcich, S., G. Edwards-Jones, M. Kaiser, and J. Castilla. 2006. Co-Management Policy Can Reduce Resilience in Traditionally Managed Marine Ecosystems. *Ecosystems* 9(6):951–66.

Gelcich, S., T. P. Hughes, P. Olsson, C. Folke, O. Defeo, M. Fernández, S. Foale, L. H. Gunderson, C. Rodríguez-Sickert, M. Scheffer, R. S. Steneck, and Juan C. Castilla. 2010. Navigating Transformations in Governance of Chilean Marine Coastal Resources. *Proceedings of the National Academy of Sciences* 107(39):16794–16799. doi:10.1073/pnas.1012021107.

Ginter, J. J. C. 1995. The Alaska Community Development Quota Fisheries Management Program. *Property Rights and Fisheries Management* 28(1–3):147–163. doi:10.1016/0964-5691(95)00069-0.

Glazier, E., C. Carothers, N. Milne, and M. Iwamoto. 2013. “Seafood and Society on O’ahu in the Main Hawaiian Islands1.” *Pacific Science* 67(3):345–359. doi:10.2984/67.3.4.

Gonschor, L. and K. Beamer. 2014. Toward an Inventory of Ahupua‘a in the Hawaiian Kingdom: A Survey of Nineteenth- and Early Twentieth-Century Cartographic and Archival Records of the Island of Hawai‘i. *Hawaiian Journal of History* 48:53–87.

Hauck, M. and G. L. Gallardo-Fernández. 2013. Crises in the South African Abalone and Chilean Loco Fisheries: Shared Challenges and Prospects. *Maritime Studies* 12(1):1–20.

Hawaii State Legislature. 1994. *Act 271*.
Higuchi, J. 2008. Propogating Cultural Kipuka. *University of Hawaii Law Review* 31:193–224.
Imperial, M. T. 1999. Institutional Analysis and Ecosystem-Based Management: The Institutional Analysis and Development Framework. *Environmental Management* 24(4):449–465.
Imperial, M. T. and D. Kauneckis. 2003. Moving from Conflict to Collaboration: Watershed Governance in Lake Tahoe. *Natural Resources Journal* 43:1009.
Imperial, M. and T. Yandle. 2005. Taking Institutions Seriously: Using the IAD Framework to Analyze Fisheries Policy. *Society & Natural Resources* 18(6):493–509. doi:10.1080/08941920590947922.
Jentoft, S., B. J. McCay, and D. C. Wilson. 1998. Social Theory and Fisheries Co-Management. *Marine Policy* 22(4–5):423–436. doi:10.1016/S0308-597X(97)00040-7.
Jokiel, P. L., K. S. Rodgers, W. J. Walsh, D. A. Polhemus, and T. A. Wilhelm. 2011. Marine Resource Management in the Hawaiian Archipelago: The Traditional Hawaiian System in Relation to the Western Approach. *Journal of Marine Biology* 2011(Article ID 151682):1–16. doi:10.1155/2011/151682.
Kauneckis, D. and M. T. Imperial. 2007. Collaborative Watershed Governance in Lake Tahoe: An Institutional Analysis. *International Journal of Organization Theory and Behavior* 10(4):503–546.
Kirch, P. V. 2010. *How Chiefs Became Kings: Divine Kingship and the Rise of Archaic States in Ancient Hawai'i*. Oakland: University of California Press.
Kittinger, J. N., J. M. Pandolfi, J. H. Blodgett, T. L. Hunt, H. Jiang, K. Maly, L. E. McClenachan, J. K. Schultz, and B. A. Wilcox. 2011. Historical Reconstruction Reveals Recovery in Hawaiian Coral Reefs. *PLoS One* 6(10):e25460. doi:10.1371/journal.pone.0025460.
Kittinger, J. N., A. L. Ayers, and E. E. Prahler. 2012. Policy Briefing: Co-Management of Coastal Fisheries in Hawaii: Overview and Prospects for Implementation. Policy Briefing. Social Science Research Network. http://dx.doi.org/10.2139/ssrn.2590207.
Kittinger, J. N., E. M. Finkbeiner, E. W. Glazier, and L. B. Crowder. 2012. Human Dimensions of Coral Reef Social-Ecological Systems. *Ecology and Society* 17(4):17.
Kittinger, J. N., J. E. Cinner, S. Aswani, and A. T. White. 2015. Back to the Future. Integrating Customary Practices and Institutions into Comanagement of Small-Scale Fisheries. In *Marine Historical Ecology in Conservation*, eds. J. N. Kittinger, L. McClenachan, K. B. Gedan, and L. Blight, 135–160. Oakland: University of California Press. http://www.ucpress.edu/book.php?isbn=9780520276949.
Kittinger, J. N., L. T. Teneva, H. Koike, K. A. Stamoulis, D. S. Kittinger, K. L. L. Oleson, E. Conklin, M. Gomes, B. Wilcox, and A. M. Friedlander. 2015. From Reef to Table: Social and Ecological Factors Affecting Coral Reef

Fisheries, Artisanal Seafood Supply Chains, and Seafood Security. *PLoS One* 10(8):e0123856. doi:10.1371/journal.pone.0123856.

Kuperan, K., N. M. R. Abdullah, R. S. Pomeroy, E. L. Genio, and A. M. Salamanca. 2008. Measuring Transaction Costs of Fisheries Co-Management. *Coastal Management* 36(3):225–240.

Levine, A. S. and L. S. Richmond. 2014. Examining Enabling Conditions for Community-Based Fisheries Comanagement: Comparing Efforts in Hawai'i and American Samoa. *Ecology and Society* 19(1):24. doi:10.5751/ES-06191-190124.

Lowry, K., P. Adler, and N. Milner. 1997. Participating the Public: Group Process, Politics, and Planning. *Journal of Planning Education and Research* 16(3):177–187. doi:10.1177/0739456X9701600302.

Matsuoka, J., D. McGregor, and L. Minerbi. 1994. Governor's Molokai Subsistence Task Force Final Report. Honolulu, Hawaii: The Department of Business, Economic Development & Tourism.

Matsuoka, J., D. McGregor, and L. Minerbi. 1998. Molokai: A Study of Hawaiian Subsistence and Community Sustainability. In *Sustainable Community Development*. Studies in Economic, Environmental, and Cultural Revitalization. Boca Raton, Florida: CRC Press LLC.

Maurin, P. and S. Peck. 2008. The West Hawaii Fisheries Council Case Study Report. *University of Hawaii Sea Grant College Program. 32pp*. Available Online: http://www.Soest.Hawaii.edu/SEAGRANT/communication/pdf/West%20Hawaii%20Fisheries%20Council.Pdf.

Maxwell, J. A. 1998. Designing a Qualitative Study. *Handbook of Applied Social Research Methods*, 69–100.

McCay, B. and S. Jentoft. 1998. Market or Community Failure? Critical Perspectives on Common Property Research. *Human Organization* 57(1):21–29. doi:10.17730/humo.57.1.372712415k227u25.

McCoy, K. 2015. Estimating Nearshore Fisheries Catch for the Main Hawaiian Islands. Master's Thesis, Honolulu, Hawai'i: University of Hawai'i at Manoa.

McGinnis, M. D. 2011. An Introduction to IAD and the Language of the Ostrom Workshop: A Simple Guide to a Complex Framework. *Policy Studies Journal* 39(1):169–183.

McGregor, D. 2007. *Na Kua'aina: Living Hawaiian Culture*. Honolulu: University of Hawaii Press.

Memon, P. A., B. Sheeran, and T. Ririnui. 2003. Strategies for Rebuilding Closer Links between Local Indigenous Communities and Their Customary Fisheries in Aotearoa/New Zealand. *Local Environment* 8(2):205–219. doi:10.1080/1354983032000048505.

Miles, M. and A. M. Huberman. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd ed. Thousand Oaks, CA: Sage Publications.

Nadasdy, P. 2003. Reevaluating the Co-Management Success Story. *Arctic* 56(4):367–380. doi:10.2307/40513076.

Nadon, M. O., J. S. Ault, I. D. Williams, S. G. Smith, and G. T. DiNardo. 2015. Length-Based Assessment of Coral Reef Fish Populations in the Main and Northwestern Hawaiian Islands. *PLoS One* 10(8):e0133960. doi:10.1371/journal.pone.0133960.

North, D. C. 1990. *Institutions, Institutional Change and Economic Performance*. New York: Cambridge University Press.

Noy, C. 2008. Sampling Knowledge: The Hermeneutics of Snowball Sampling in Qualitative Research. *International Journal of Social Research Methodology* 11(4):327–344. doi:10.1080/13645570701401305.

Olsson, P., V. Galaz, and W. J. Boonstra. 2014. Sustainability Transformations: A Resilience Perspective. *Ecology and Society* 19(4):1. doi:10.5751/ES-06799-190401.

Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action.* New York: Cambridge University Press.

Ostrom, E. 2005. *Understanding Insitutional Diversity*. New Jersey: Princeton University Press.

Ostrom, E. 2009. A General Framework for Analyzing Sustainability of Social-Ecological Systems. *Science* 325(5939):419–422. doi:10.1126/science.1172133.

Ostrom, E. 2011. "Background on the Institutional Analysis and Development Framework." *Policy Studies Journal* 39(1):7–27. doi:10.1111/j.1541-0072.2010.00394.x.

Ostrom, E., L. Schroeder, and S. Wynne. 1993. *Institutional Incentives and Sustainable Development*. Boulder: Westview Press.

Page, G. G., A. Swanenberg, and T. Maddalene. 2013. An Analysis of Issues Affecting the Management of Coral Reefs and the Associated Capacity Building Needs in the Main Hawaiian Islands. Baltimore, MD: Sustainametrix. http://docs.lib.noaa.gov/noaa_documents/CoRIS/Hawaii_Capacity_Assessment_2013.pdf.

Patton, M. Q. 2002. *Qualitative Research & Evaluation Methods*. 3rd ed. Thousand Oaks, CA: Sage Publications, Inc.

Pinkerton, E. 1989. *Cooperative Management of Local Fisheries*. Vancouver: University of British Columbia Press.

Pinkerton, E. 1992. Translating Legal Rights into Management Practice: Overcoming Barriers to the Exercise of Co-Management. *Human Organization* 51(4):330–341.

Pinkerton, E. 1999. Directions, Principles, and Practice in the Shared Governance of Canadian Marine Fisheries. *Fishing Places, Fishing People: Traditions and Issues in Small-Scale Fisheries*. Toronto: University of Toronto Press, 340–354.

Pinkerton, E. 1999. Factors in Overcoming Barriers to Implementing Co-Management in British Columbia Salmon Fisheries. *Conservation Ecology* 3(2):2.

Pinkerton, E. and M. Weinstein. 1995. *Fisheries That Work: Sustainability through Community-Based Management*. Vancouver, Canada: The David Suzuki Foundation. http://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/4487/Fisheries_that_work_sustainability_through_community-based_management.pdf?sequence=1&isAllowed=y.

Pinkerton, E., E. Angel, N. Ladell, P. Williams, M. Nicolson, J. Thorkelson, and H. Clifton. 2014. Local and Regional Strategies for Rebuilding Fisheries Management Institutions in Coastal British Columbia: What Components of Comanagement Are Most Critical? *Ecology and Society* 19(2):72. doi:10.5751/ES-06489-190272.

Pomeroy, R. S. and R. Rivera-Guieb. 2006. *Fishery Co-Management: A Practical Handbook*. Cambridge, MA: CABI.

Pomeroy, R. S., B. M. Katon, and I. Harkes. 2001. Conditions Affecting the Success of Fisheries Co-Management: Lessons from Asia. *Marine Policy* 25(3): 197–208. doi: 10.1016/S0308-597X(01)00010-0.

Prystupa, M. 1998. Barriers and Strategies to the Development of Co-Management Regimes in New Zealand: The Case of Te Waihora. *Human Organization* 57(2):134–144.

Raemaekers, S., M. Hauck, M. Bürgener, A. Mackenzie, G. Maharaj, É. E. Plagányi, and P. J. Britz. 2011. Review of the Causes of the Rise of the Illegal South African Abalone Fishery and Consequent Closure of the Rights-Based Fishery. *Ocean & Coastal Management* 54(6):433–445.

Rossiter, J. S. and A. Levine. 2014. What Makes a 'successful' Marine Protected Area? The Unique Context of Hawaii's Fish Replenishment Areas. *Marine Policy* 44(2):196–203. doi:10.1016/j.marpol.2013.08.022.

Rotmans, J., R. Kemp, and M. Asselt. 2001. More Evolution than Revolution: Transition Management in Public Policy. *Foresight* 3(1):15–31. doi:10.1108/14636680110803003.

Schemmel, E. 2014. Integrating Local Ecological Knowledge with Novel Scientific Tools to Refine Traditional Community Based Fishing Moon Calendars. Hawaii Department of Land & Natural Resources. http://dlnr.hawaii.gov/coralreefs/files/2014/11/HCRS_2pager_Moon-calendar_2014.pdf.

Singleton, S. 2000. Co-Operation or Capture? The Paradox of Co-Management and Community Participation in Natural Resource Management and Environmental Policy-Making. *Environmental Politics* 9(2):1–21.

Stevenson, T. C. and B. N. Tissot. 2013. Evaluating Marine Protected Areas for Managing Marine Resource Conflict in Hawaii. *Marine Policy* 39(5):215–223. doi:10.1016/j.marpol.2012.11.003.

Taiepa, T., P. Lyver, P. Horsley, J. Davis, M. Brag, and H. Moller. 1997. Co-Management of New Zealand's Conservation Estate by Maori and Pakeha: A Review. *Environmental Conservation* 24(3):236–250.

Tashakkori, A. and C. Teddlie. 2003. *Handbook of Mixed Methods in Social & Behavioral Research*. Thousand Oaks, CA: SAGE.

Teh, L. S. L., L. C. L. Teh, and U. R. Sumaila. 2011. Low Discounting Behavior among Small-Scale Fishers in Fiji and Sabah, Malaysia. *Sustainability* 3(6):897–913.

Tissot, B. N., W. J. Walsh, and M. A. Hixon. 2009. Hawaiian Islands Marine Ecosystem Case Study: Ecosystem- and Community-Based Management in Hawaii. *Coastal Management* 37(3):255–273.

Turner, M. and Q. Weninger. 2005. Meetings with Costly Participation: An Empirical Analysis. *The Review of Economic Studies* 72(1):247–268.

Umemoto, K. 2001. Walking in Another's Shoes. *Journal of Planning Education and Research* 21(1):17–31. doi:10.1177/0739456X0102100102.

Vaughan, M. B. and P. M. Vitousek. 2013. Mahele: Sustaining Communities through Small-Scale Inshore Fishery Catch and Sharing Networks. *Pacific Science* 67(3):33.

Vaughan, M. B. and M. R. Caldwell. 2015. Hana Pa'a: Challenges and Lessons for Early Phases of Co-Management. *Marine Policy* 62(12):51–62. doi:10.1016/j.marpol.2015.07.005.

Vaughan, M. B. and A. L. Ayers. 2016. Customary Access: Sustaining Local Control of Fishing and Food on Kaua'i's North Shore. *Food, Culture & Society* 19(3):517–538. doi:10.1080/15528014.2016.1208339.

Vaughan, M. B., B. Thompson, and A. L. Ayers. 2016. Pāwehe Ke Kai A'o Hā'ena: Creating State Law Based on Customary Indigenous Norms of Coastal Management. *Society & Natural Resources* 30:1–16. doi:10.1080/08941920.2016.1196406.

Wade, R. 2007. *Village Republics: Economic Conditions for Collective Action in South India* (1st ed.). Cambridge: Cambridge University Press.

Walker, R. L. 1978. A History Of The Division Of Fish And Game. Honolulu, Hawai'i: State of Hawaii Department of Land and Natural Resources. http://dlnr.hawaii.gov/dofaw/files/2014/02/Walker-DOFAW-History.pdf.

Wondolleck, J. M. and S. Yaffee. 2000. *Making Collaboration Work: Lessons from Innovation in Natural Resource Management*. Washington, D.C.: Island Press.

Yandle, T. 2003. The Challenge of Building Successful Stakeholder Organizations: New Zealand's Experience in Developing a Fisheries Co-Management Regime. *Marine Policy* 27(2):179–192. doi: 10.1016/S0308-597X(02)00071-4.

Yandle, T. and C. M. Dewees. 2008. Consolidation in an Individual Transferable Quota Regime: Lessons from New Zealand, 1986–1999. *Environmental Management* 41(6):915–928. doi:10.1007/s00267-008-9081-y.

Yandle, T. and M. T. Imperial. 2009. Using Property Rights to Better Understand the Institutional Arrangements for Fisheries Governance. *Proceedings of the Annual Association for Public Policy Analysis and Management (APPAM) Research Conference*. Washington, D.C.

Zanre, E. 2014. Community-Based Subsistence Fishing Area Designated Procedures Guide. RCUH Project Number 4500377. Prepared for the Department of Land & Natural Resources, Division of Aquatic Resources: Standardized Operating Procedures for Community-Based Subsistence Fishing Area Designation under Hawai'i Revised Statutes Section 188-22.6. Hilo, Hawaii: RCUH. file:///Users/macayers/Downloads/CBSFA%20Designation%20Procedures%20Guide_v.1.pdf.

## APPENDIX

**Barriers to Co-management Interview Questions**

1. Given the opportunity for communities to collaboratively manage fisheries with the state of Hawai‘i and significant community interest across the state, why is not co-management more prevalent across Hawai‘i?
2. Despite many attempts, no community has achieved their CBSFA designation through the DLNR process, but two others received a permanent designation via a legislative process (Hā‘ena and Miloli‘i). Do you believe that the DLNR process may be too difficult for communities to navigate? Are the requirements of the process, e.g. Management plan, too tough for them to complete on their own? Is there another reason?
3. Why have only three communities – Mo‘omomi, Hā‘ena, Miloli‘i – been designated as CBSFAs through state legislation, while many other bills drafted on behalf of other communities did not pass and become law? Are these communities uniquely positioned for co-management or is there another explanation?
4. Are you aware of any instances where stakeholder groups, organizations, or other entities– either within communities or elsewhere – worked against capacity-building efforts and self-organization in some communities? If so, please explain:
5. Communities must reach some sort of internal consensus to pursue co-management (CBSFA designation). Can you think of any factors (internal or external) that contribute to or detract from a community’s ability to build capacity and self-organize?