Marine Policy 122 (2020) 104244

Contents lists available at ScienceDirect

Marine Policy

journal homepage: http://www.elsevier.com/locate/marpol

Full length article

Enabling conditions for community-based comanagement of marine protected areas in the United States

Chantal E. Collier [a, b, *]

[a] Duke University, Nicholas School of the Environment, 9 Circuit Drive, Durham, NC 27710, USA
[b] The Nature Conservancy, 55 Church Street, New Haven, CT 06510, USA

ARTICLE INFO

Keywords:
Comanagement
Marine protected areas
Enabling conditions
Collaborative governance
Community-based management
United States

ABSTRACT

Comanagement is recognized, practiced, and recommended as an effective, equitable approach to place-based protection of marine resources. Despite acknowledged benefits and its potential for improved management outcomes, in the U.S., comanagement of marine protected areas (MPAs) is a relatively new approach, with limited applications. This paper reveals social, ecological and institutional conditions that enabled, or hindered, development of comanagement as an outcome of collaborative processes undertaken by community-based actors and state-based resource managers in three U.S. MPA case studies. A mixed method design, consisting of a literature review, in-depth interviews and document analysis was used to analyze MPAs in Hawai'i, California and Florida where: (1) comanagement systems have developed between state government and community-based partners, (2) protected area boundaries and objectives are clearly defined, and, (3) marine habitat protection is a primary management objective. Eight enabling conditions were present in all three cases. Four of these conditions were consistent with preconditions identified in a published conceptual framework for comanagement arrangements synthesized from the literature and direct observations – an opportunity for negotiation, a legally mandated or brokered incentive, a willingness by local users to contribute, and leadership. Four more enabling conditions emerged from this study – connection to place, a capacity crisis, government willingness to partner, and a clear and just process. As managers strive to protect marine ecosystem function in the face of chronic environmental stressors and limited government support for environmental protection, applying these findings to leverage conditions that enable comanagement can help build community-based capacity to effectively manage MPAs.

1. Introduction

Marine and coastal ecosystems and the people that depend upon them are confronted by chronic and increasing threats from the effects of climate change, nitrogen pollution, physical destruction and other stressors, resulting in habitat loss, declining biodiversity, lost livelihoods, diminished well-being, and compromised resilience. These synergistic impacts have caused cumulative damages to marine systems and human communities over protracted timelines [1–3]. Consequently, ecosystem protection and recovery require effective, adaptive conservation and management strategies that will endure over long-term horizons [4,5]. Unfortunately, short-term, volatile political funding cycles and conflicting government priorities challenge natural resource conservation and management goals and can undermine even well-crafted environmental protection policies and strategies [6]. Centralized governance and management systems are not structured to deal with local-level social and ecological system complexities and nuances, and thus, are unable to provide sufficient site-based capacity or adaptability in times of rapid change [7–9]. Alternative governance systems, locally-specific management approaches and sustained investments in marine conservation are urgently needed to halt continued marine resource diminution, avoid irreversible losses, and instead, build resilience into place-based marine social-ecological systems.

Marine protected areas (MPAs) are globally recognized as an important management tool for stemming declines in marine habitats and harvested species, mitigating the impacts of local environmental stressors, and allowing ecosystems and biodiversity to recover and thrive [10,11]. However, global assessments of MPA efficacy have identified a lack of effective management – due to financial and staff capacity deficiencies – as a primary factor impeding successful MPA

* Correspondence address: The Nature Conservancy, 55 Church Street, New Haven, CT 06510, USA
E-mail address: ccollier@tnc.org.

https://doi.org/10.1016/j.marpol.2020.104244
Received 18 February 2020; Received in revised form 1 September 2020; Accepted 30 September 2020
Available online 29 October 2020

implementation [12,13]. Regional studies spanning the Western Pacific Ocean, the Gulf of California, and the Caribbean and Mediterranean seas corroborate this finding and point to a lack of local community support or involvement as an additional cause for MPA failures [8,14,15]. In the United States (U.S.), a review of the status of 207 coral reef ecosystem MPAs found that management capacity limitations and the absence of public support impeded effective resource protection in more than half of the MPAs surveyed [16]. Consequently, our oceans abound with examples of 'paper parks' – legally mandated MPAs that have been designated in writing and delineated on maps but fail to meet resource protection and recovery objectives in the water [14,15,17].

Management of MPAs in developed countries like the U.S. is commonly led by state or federal government agencies. An examination of governance approaches in 20 MPAs for The Marine Protected Area Governance (MPAG) project found government-led management of MPAs in three developed countries, including the U.S., is moderately effective [18]. Despite strong fiscal, technical, and staff capacity in each government-managed MPA evaluated for the MPAG project, weaknesses were attributed to their complex jurisdictional and bureaucratic systems, wherein integration of local knowledge and increased public participation were identified as areas to address for improved management outcomes [18]. On the other hand, where community-based MPA management arrangements empowered local users to develop and lead locally-responsive management actions, the MPAG study found community-managed MPAs may be vulnerable to economic and political changes [18]. The MPAG project concluded that the key to social-ecological system resilience lies in the diversity of both the actors involved in MPA governance arrangements and the species in MPA ecosystems [18]. Notably, the U.S. National Marine Protected Area Center has identified increased integration of social science and more effective communication with the public about how MPA management is conducted and achieved as key opportunities to improve management effectiveness in U.S. MPAs [19].

As financially strapped and staff-limited natural resource managers strive to preserve and protect ecosystem structure and function in the face of persistent stressors, collaborative approaches to resource management offer an alternative to government-centric management arrangements. By integrating local knowledge, values, and community participation in the development and implementation of marine resource management strategies, a collaborative governance approach can generate local buy-in, empower and mobilize community-based ocean stewardship capacity, increase compliance, provide greater adaptability and build resilience that enhances socio-ecological and socio-political well-being in the process [20]. A variety of participant-negotiated, shared governance arrangements fall under the banner of comanagement. While no single definition captures the full range of systems in practice, the IUCN World Conservation Congress accounts for a broad spectrum of actors, situations and arrangements by defining comanagement as, "a partnership in which government agencies, local communities and resource users, non-governmental organizations and other stakeholders negotiate, as appropriate to each context, the authority and responsibility for the management of a specific area or set of resources" [21], underscoring the pro-social aspects of collaboration among stakeholders.

Case studies in comanagement offer contextual examples of shared authority, decision-making, and duties regarding the use of marine resources in many countries [22–26]. In these and other studies [27–30], comanagement is recognized and practiced as a beneficial alternative to top-down, centralized management of fisheries, coral reefs, mangroves, wetlands and protected areas. Moreover, comanagement is increasingly recommended as an appropriate, equitable and effective approach to place-based, natural resource management, including MPA management [20,31–34]. Despite widespread adoption of comanagement approaches in fisheries [35] and MPA management [36] globally, in the U.S., there are relatively few examples. This is particularly the case for management of U.S. MPAs; and provides a compelling rationale for examining U.S. MPAs where comanagement has emerged to determine the key enabling circumstances in those instances.

Comanagement arrangements can be challenging and take time to establish, making it important to elucidate the conditions and processes whereby these governance arrangements have developed. Comanagement advances in stages as levels of understanding, trust, collaboration and success progress. Pomeroy [37] described these stages as a pre-implementation phase, in which negotiated arrangements develop, progress to trials and adjustments during the implementation phase, and are then sustained through maintenance activities during the post-implementation phase. Comanagement partners may spend several years in each stage. Efforts may begin with comanagement of a single function and be expanded later to include additional tasks as actors in the system gain experience, build trust and strengthen institutional capacity. Comanagement arrangements also exist on a continuum, from consultative to collaborative to delegated, depending on the extent to which management tasks are shared [38]. At the consultative end of the spectrum, government exercises the greatest control and retains decision-making authority, but interacts with local communities to share information. At the opposite end, local control is maximized when government formally delegates decision-making to a community or place-based, non-governmental group. When government and local communities work and make decisions together, a collaborative comanagement partnership exists. Adaptive comanagement, then, evolves as a process involving collaboration among a flexible network of stakeholders, ranging from local communities, organizations and municipalities to state, national or international government agencies and organizations [32,39,40]. Through this lens, shared governance of natural resources may emerge as a result, rather than the starting point, of comanagement, whereby successful implementation depends upon the enabling conditions [32,39].

This paper examines the ecological, social, and institutional conditions that enabled, or hindered, the emergence of comanagement in three U.S. MPA case studies. In exploring the enabling conditions, consideration is given to the potential for comanagement arrangements to foster local stewardship, build community support and resilience, and enhance management capacity and efficacy for other MPAs. By extracting common themes that contribute to successfully comanaged MPAs, where social and ecological management objectives have been attained, this paper provides insights that may be applicable across multiple sites and transferable to MPA designation, governance and management in other states and communities.

2. Methods

A qualitative, case study-based approach was used to conduct a comparative analysis of comanaged MPAs at three U.S. sites and reveal the conditions that led to, or hindered, comanagement arrangements from establishing in each case.

2.1. Case study selection

Scientific literature, grey literature, and queries with marine resource managers and scientists were used to identify MPAs in the U.S. where: (1) comanagement systems have developed between the state government and community-based partners, (2) protected area boundaries and objectives are clearly defined, and, (3) marine habitat protection is a primary management objective. Literature sources were drawn from research, legislation, policy documents and reports on collaborative management of U.S. MPAs [33,41–52]. From these sources, sites meeting the selected criteria were identified in the states of Hawai'i, California and Florida (Table 1). In Hawai'i, only one actively comanaged MPA match was found. Among numerous MPAs with active collaborative management arrangements in California and Florida, potential cases were further narrowed through queries with marine resource managers and scientists to identify sites where collaborative

Table 1
Sites with marine protected areas (MPAs) meeting the selection criteria from which the three case study sites (*) were selected.

Site Name	State	Number of MPAs
Hā'ena*	Hawai'i	1
Del Norte	California	5
Humboldt	California	10
Mendocino	California	15
Sonoma	California	9
Golden Gate	California	21
Sat Mateo	California	5
Santa Cruz	California	3
Monterey	California	16
San Luis Obispo	California	8
Santa Barbara Channel	California	22
Catalina Island*	California	9
Los Angeles	California	4
Orange County	California	7
San Diego	California	11
Northwest Florida	Florida	4
Apalachicola	Florida	2
St. Joseph Bay	Florida	1
Charlotte Harbor	Florida	5
Estero Bay	Florida	1
Rookery Bay*	Florida	3
Biscayne Bay	Florida	2
Guana Tolomata Matanzas	Florida	3

management efforts have been most effective. Using these criteria, three cases were selected – the Hā'ena Community-Based Subsistence Fishing Area on the north coast of Kaua'i, Hawai'i, the State Marine Reserve and Marine Conservation Area network around Catalina Island, California, and, the Rookery Bay National Estuarine Research Reserve and State Aquatic Preserve system encircling Marco Island, Florida – where institutional, social and ecological conditions contributed to the emergence of community-based comanagement.

2.2. Data collection

A mixed-method design, consisting of in-depth, semi-structured interviews (Appendix A) and unstructured document analysis, was used to gather data about the development of comanagement in each case study. Prospective interviewees with acknowledged MPA comanagement experience in the selected case studies were identified between July and November 2015 by reviewing grey literature, internet sources and through outreach to local community leaders, environmental organizations and government agency representatives. Individuals who were consistently named by different sources as people with expertise in the selected cases relevant to the research objectives were invited to participate in an interview. A recruitment script was used to contact fifteen prospective participants by email. The response rate to this initial solicitation was 66.7%, with all responses affirmative. Respondents were then provided with an informed consent form outlining the purpose and procedures of the study, including financial, confidentiality and voluntary participation considerations, and how participant responses would be used. Respondents were also encouraged to ask questions about the study to further inform their decision to participate before, during, and after the interview. All respondents to the initial recruitment participated and completed semi-structured interviews lasting 50–90 min each, conducted between December 2015 and February 2016. A range of perspectives was captured by interviewing individuals representing different stakeholder sectors, including state governments (n = 3), community organizations or businesses (n = 4), and non-governmental organizations (n = 3). At least one individual affiliated with each stakeholder category was interviewed for each case study. Interviews were digitally recorded and then manually transcribed using f4 transcription software. Primary data from the key respondent interviews was supplemented with a review of secondary sources including relevant peer-reviewed literature, legislation, government publications, institutional reports, management plans, and policy documents for each case [33,41–47,49–59]. Primary and secondary data were combined for all three comanagement cases to comparatively analyze enabling conditions and linkages or divergences among them.

2.3. Data analyses

Analysis of the conditions that enabled or constrained development of comanagement in the selected cases drew upon an established evaluative framework developed by Plummer and Fitzgibbon [60], where key elements of comanagement organizational structure were gleaned and synthesized from a range of experiences and the literature. This framework was chosen because it identifies six enabling conditions consistently observed in other comanagement arrangements: (1) a real or imagined natural resource crisis, (2) willingness of local users to contribute, (3) an opportunity for negotiation, (4) a legally mandated or brokered incentive, (5) leadership or an energy center, and (6) a common vision and existing networks [60]. These foundational elements of comanagement were used to code interview responses and reviewed documents into recognized categories of conceptual enabling conditions. Respondents were coded numerically to protect the identity of individual participants. Interview transcripts were coded and analyzed using NVivo 11 Pro (QSR International) qualitative analysis software. Documents were coded manually. The coding approach was both inductive and deductive, allowing for grounded coding – the integration of supplemental themes that emerged – during the analytical process. Supplemental themes were incorporated into the coding system.

Analysis of each comanagement case began with a review and coding of relevant documents and literature to uncover the MPA enabling policies and legislation, enabling MPA designation processes and challenges, and the development of associated comanagement agreements. Then, coded documents and interview responses were examined and compared to determine the social and environmental conditions that had set the stage for comanagement in each case. Coding and the use of themes were important techniques for identifying enabling or hindering conditions for comanagement, and for illuminating similar and conflicting perspectives among sources. Attention was given to identify contrasting perspectives among primary sources, to characterize both positive and negative views of comanagement, and to note instances where secondary sources corroborated or differed from interviewee responses. Findings from the three case studies were collated to explore and reveal linkages and differences among them. Quotes from primary sources are presented to illustrate nuanced insights useful for consideration in other MPA comanagement endeavors.

3. Case studies of comanaged U.S. marine protected areas

3.1. Hā'ena Community-Based Subsistence Fishing Area, Hawai'i

Many Hawaiians rely on marine resources, habitats and fishing for subsistence, recreation and cultural practices; and, the State of Hawai'i has begun taking steps to uphold its 1978 constitutional provision to protect customary and cultural Hawaiian rights [49,50,61]. Towards that end, in 1994, the State passed legislation authorizing the designation of Community-Based Subsistence Fishing Areas (CBSFAs) to promote fisheries comanagement by the State in partnership with Native Hawaiian communities [41]. Hawaiian communities can pursue CBSFA designations via one of two mechanisms: (1) working with the Hawai'i Department of Land and Natural Resources (DLNR) through its rule-making authority, or, (2) working through the legislative process to pass a separate, place-based bill [49]. In the latter method, after a CBSFA is designated, communities still need to follow the State's administrative rule-making process to develop a comanagement plan for the area [49].

A desire to reclaim their *ahupua'a* system – the traditional Hawaiian system of watershed-based natural resource management – and their customary Hawaiian practices has led more than 20 communities to

pursue CBSFA designation and comanagement of marine resources with the State. However, only two CBSFAs have been designated, including Hā'ena in 2006, through separate legislation; and, until 2014, when the State approved the Hā'ena CBSFA rules, state approval of community-based management plans had faltered [49,52,62]. The Hā'ena CBSFA encompasses, and was designed to protect, coral reef and lagoonal estuarine habitats. It includes a no-entry area, the Makua Pu'uhonua, a special *ōpihi*, or limpet, management area, and a vessel transit area (Fig. 1a).

For a core group of Hawaiian families residing in Hā'ena for generations pre-dating Hawai'i's annexation by the U.S. in 1898, ocean fishing, taro cultivation and cooperation among fishermen, fisherwomen and farmers have long been a way of life. Intergenerational transmission of these customary practices and traditional ecological knowledge has persisted in Hā'ena and, in 1998, led to the formation of the non-profit Hui Maka'āinana o Makana organization by community members, with the goal of working with the State to restore Hawaiian stewardship practices in the area [58].

Following passage of Act 241 by the Hawai'i Legislature, designating the Hā'ena CBSFA in 2006, and with help from Kua'āina Ulu 'Auamo, a non-governmental organization that supports Hawaiian community-based initiatives, the Hui Maka'āinana o Makana spent five years developing a proposed management plan for the area. With confirmation of the CBSFA management plan, in 2016, the community, in cooperation with DLNR, began actively protecting and managing the area's marine resources, based on its traditional practices [62] (Table 2). The Hui Maka'āinana o Makana is governed by a board of directors and a family advisory board. The community also maintains a formal agreement with the adjacent, coastal Hā'ena State Park to manage cultural resources, such as an ancient burial area, and restore customary *lo'i*, or taro, cultivation practices within the park boundaries [47]. The State of Hawai'i's Makai Watch program supports community engagement in monitoring and enforcement of the Hā'ena CBSFA management plan.

3.2. Catalina Island Marine Reserve and Marine Conservation Area network, California

In 1974, state designation of three Areas of Special Biological Significance (ASBS) created the first MPAs around Catalina Island [54]. In 1999, the California Legislature passed the Marine Life Protection Act (MLPA) directing the California Department of Fish and Wildlife (CDFW) to redesign and designate a network of MPAs to protect ecosystem integrity and sustain marine life [55]. A multi-year process followed, resulting in the designation of 124 MPAs statewide, including six new MPAs around Catalina Island and incorporation of the three original ASBS into the new network, increasing the total number of Catalina's MPAs to nine (Fig. 1b). The Catalina MPA network is characterized by rocky reefs, kelp forests, sea mounts and seagrass meadows with varying levels of protection from one State Marine Reserve (SMR) to eight State Marine Conservation Areas (SMCAs), including one no-take SMCA.

The MLPA Master Plan provides a basis for MPA implementation, including the role of communities engaged through collaborative management partnerships [45,46]. In 2013, the California Ocean Protection Council (OPC), the State's MPA leadership team, agreed on a partnership-based model, the *California Collaborative Approach* – a comanagement framework – to govern the statewide network. Fourteen regional MPA collaboratives have been established, bringing community and government representatives together to address locally-specific management needs including outreach and education, enforcement and compliance, research and monitoring of the MPAs [51]. MPA Watch programs, led by non-governmental organizations and sanctioned by the State, engage community members in monitoring human uses of MPAs to inform enforcement; and, the collaboratives are expected to play an

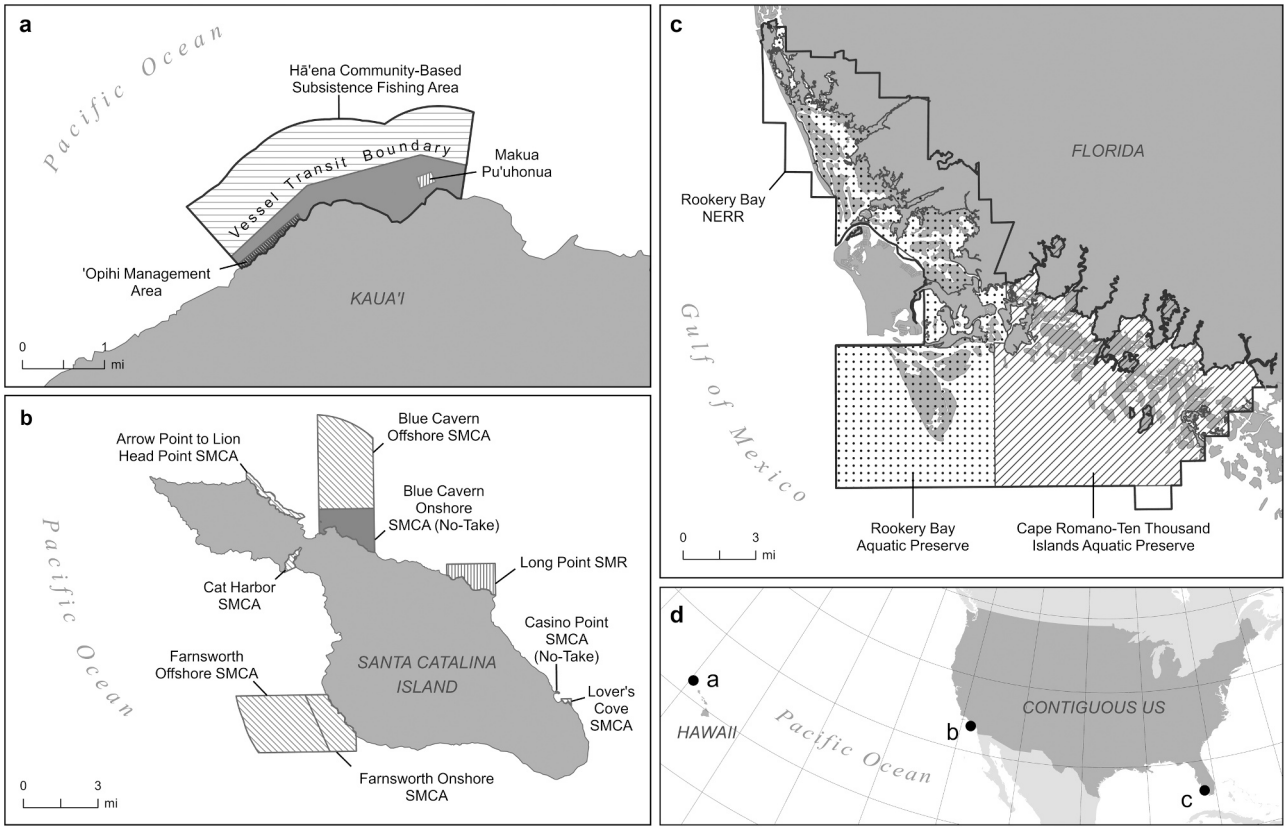

Fig. 1. Map of the three case study sites, (a) Hā'ena, Hawai'i, (b) Catalina Island, California, (c) Rookery Bay, Florida, and (d) their locations within the contiguous United States and Hawai'i.

Table 2
Features of three comanaged marine protected area case studies in the United States.

Feature	Hā'ena, Hawai'i	Catalina, California	Rookery Bay, Florida
Ecological system	Tropical coral reef – lagoonal estuary system	Temperate system with rocky reefs, kelp forests and seamounts	Sub-tropical mangrove – lagoonal estuary system
Type of marine protected area (year designated)	1 Community-Based Subsistence Fishing Area (2006)	8 State Marine Conservation Areas (incl. 1 no-take area), 1 State Marine Reserve (2012) [incorporated 3 existing Areas of Special Biological Significance (1974)]	2 State Aquatic Preserves (1969, 1977); 1 National Estuarine Research Reserve (1978)
Total area (mi^2)	3.56	22.22	152.34
State management agency	Hawai'i Department of Land and Natural Resources	California Department of Fish and Wildlife	Florida Department of Environmental Protection
Community-based management organization (year established)	Hui Maka 'āinana o Makana (1998)	Catalina Island Marine Protected Area Collaborative (2014)	Friends of Rookery Bay Citizen Support Organization (1987)
Type of comanagement	Collaborative; challenged by bureaucratic process and limited community capacity to self-organize	Consultative; elements of collaboration in some activities	Consultative; elements of collaboration in some activities
Phase of comanagement	Transitioning from pre-implementation to implementation; negotiating management plan	Pre-implementation; meeting, discussing and developing new management capacity and projects	Implementation; adjusting and open to opportunities for expanded roles for community and user groups

important role in mandatory, 5-year adaptive management assessments of the MPAs. MPA collaboratives are also applying for and managing grants to support management activities, such as developing educational materials and conducting local enforcement training.

In keeping with the *California Collaborative Approach*, in 2014, the Catalina Island MPA Collaborative was established to raise awareness of the island's MPAs and promote compliance with MPA regulations [43] (Table 2). Participants in the Catalina Island MPA Collaborative include representatives from the Catalina Island Conservancy, the University of Southern California's Wrigley Institute and Sea Grant program, Pennington Marine Science Center the CDFW, the City of Avalon Harbor Master, Descanso Beach Ocean Sports, Los Angeles County Sheriff and Lifeguards, the Catalina Chamber of Commerce, the U.S. Department of Defense, Marine Animal Rescue, and five island-based youth camps.

3.3. Rookery Bay National Estuarine Research Reserve and Aquatic Preserve system, Florida

Adoption of a resolution by the Governor and Cabinet of the State of Florida to protect 18 water bodies as aquatic preserves in 1969 led to passage of Florida's Aquatic Preserve Act in 1975, to affirm and protect the aesthetic, biological, and scientific value of state waters in their natural condition [44]. Florida's aquatic preserves recognize threats to natural resources associated with growing human populations and emphasize protection of aquatic habitats to sustain the wildlife species that depend upon them, Florida's cultural heritage and recreational opportunities. Designated in 1969, the Cape Romano-Ten Thousand Islands Aquatic Preserve spans coastal backwater flats, bays, mangrove islands and open water adjacent to the undeveloped western edge of the Florida Everglades. West of Cape Romano-Ten Thousand Islands, the Rookery Bay Aquatic Preserve, established in 1977, is comprised of three lagoonal bays and barrier islands opening to the Gulf of Mexico and flanked by the urban populaces of Marco Island and Naples. In 1978, establishment of the Rookery Bay National Estuarine Research Reserve (Rookery Bay NERR) encompassed the two aquatic preserves, as well as additional lands and waters (Fig. 1c).

The Florida Department of Environmental Protection (FDEP) is charged with protecting and managing Florida's natural resources and enforcing the State's environmental laws, inclusive of its current 41 aquatic preserves, and coordinating management of its three NERRs with the National Oceanic and Atmospheric Administration (NOAA). An important factor in the dual designation of Rookery Bay is that the NERR designation was made through the Coastal Zone Management Act (CZMA). Under the CZMA, the federal role is to support the state's lead in managing its coastal resources; the state must provide enforcement authority and management capacity within the boundaries of the NERR.

Since 1985, the FDEP has formally collaborated with local communities through agreements with voluntarily established citizen support organizations (CSOs), sanctioned and incorporated by the State as non-profit organizations, to support the management goals of Florida's parks and aquatic preserves. CSOs conduct programs and activities, raise and administer funds, and make expenditures for the benefit of aquatic preserves and parks [53]. The relationship is a partnership, wherein the CSOs and state resource managers work together to accomplish the management goals of these protected areas (Table 2). The Friends of Rookery Bay, a coalition of Marco Island and Naples community members, gained state recognition as a CSO in 1987, when a CSO agreement was signed by its president and the state manager of the Rookery Bay NERR/Aquatic Preserve system during the incorporation process. The provisions of the agreement outline the roles and expectations of how the partners will work together. The Friends of Rookery Bay contribute to management capacity through volunteer and financial support but do not have authority to direct management of these MPAs. Rookery Bay NERR's Team Ocean program staff and community volunteers promote safe and enjoyable public use of the Bay, advocate for protection of is natural resources, and collect information to support effective management.

3.4. Types and phases of comanagement

Table 2 sets forth the current types [38] and phases [37] of comanagement in each case study.

In Hawai'i, the stated purpose of the Hā'ena CBSFA legislation is to enable "culturally-rooted community-based management" and "substantive involvement of the community in resource management decisions" [42]. However, while both the State and the Hā'ena community have expressed their commitment to collaborative comanagement, interview respondents reported that collaboration is still more conceptual than practical.

> "Well, the people of the place are working with government to make the rules together - kind of. There is a [state employee] coordinating, that has developed and written a management plan which we had no part of… that is going to come back to us and say, 'Okay, here it is.'… So, it hasn't been as collaborative as it needs to be" (Participant 3). *Hawai'i*

Florida's CSO and California's MPA collaborative policies have both taken a consultative approach to comanagement. However, in Florida, many financial, administrative and outreach functions essential to the management of the Rookery Bay reserve system are, in practice, being conducted by the CSO, in collaboration with local state managers. Similarly, while the CDFW is charged with enforcing California's MPA

rules, the Catalina MPA Collaborative has taken the lead on local enforcement training, outreach activities, and raising funds for community-based management tasks.

> "The expectation is that the CSOs really don't get involved in day-to-day management of a protected area. That's the formal agreement. In reality, a lot of CSOs… have helped support policy decisions and strategic direction for sites." (Participant 10). *Florida*

> "The idea is less helping to manage the resource and more trying to get people to know about [the MPAs] and comply with them" (Participant 8). *California*

Developing a shared vision has been an essential factor in the shift from consultative to collaborative action in both California and Florida. In Florida, representatives of the CSO and the FDEP expressed interest in formally moving from a consultative approach to shared governance to one that is more collaborative.

> "We ultimately have to rely on public and private sector partnerships and raising awareness in these coastal communities because …. they are the boaters; they are the people that get out and utilize these resources. They are the folks that are making decisions outside of our [MPA] boundaries that ultimately have influence within the Reserve. It would have to happen under a different [Governor's] administration, but if the opportunity comes along with a change in [state] leadership, I definitely think the Friends of Rookery Bay would be an organization that could step in and play a stronger role for the Reserve" (Participant 10). *Florida*

4. Results: comanagement enabling conditions

4.1. Hā'ena Community-Based Subsistence Fishing Area, Hawai'i

4.1.1. A real or perceived natural resource crisis

Escalating concerns about the declining condition of nearshore fisheries and coral reefs – stemming from overharvesting, recreational overuse and misuse, development and associated water quality impacts – were a major driver for the Hā'ena community to pursue a CBSFA designation [47]. However, the displacement of customary resource management practices by contemporary, western management approaches and a growing recognition that communities needed to take steps to protect their marine resources were also key, contributing factors (Participants 2 and 3).

4.1.2. Willingness of local users to contribute

The Hā'ena community's leadership and perseverance in the CBSFA designation and comanagement development process were attributed to deep-seated values rooted in Hawaiian culture, customary practices and the community's relationship to the environment and itself (Participants 2 and 3). The community's recognition and appreciation of its local knowledge and how this expertise can contribute to more effective marine resource management was an important factor supporting local participation.

> "The communities… are really trying to change a broader ethical issue in the way our community and our government operates and bring back a sense of place to the way we manage resources. … [Native Hawaiian] people describe the *konohiki* as a person who knew about fishing, but who also knew what the entire community was up to and was able to organize them, such that their relationship with their place was much healthier than it is today" (Participant 2).

There is a strong desire to keep these values alive today and for the next generation based on "a common value, a common motivation, and a common experience of the place" (Participant 3). One respondent extended these place-based values to the community's non-Hawaiian, part-time residents and local recreational users as well.

4.1.3. Opportunity for negotiation

The opening for the community to enter into comanagement negotiations with the State came with the passage of Act 241 [56], mandating designation of the Hā'ena CBSFA. Despite the law, interview respondents reported that DLNR leadership did not seriously come to the table until the community had drafted and submitted its own management plan.

> "I don't think the State ever wanted this to happen. I think there are people, heroic individuals in the State, who know there is a problem and that the State is having a hard time addressing it, but those tend to be younger people and they tend to be…sadly, they tend to be not in the union. So, when these laws were passed in 1994…when the broad CBSFA law was passed… for about 10 years after that, nothing kind of resulted" (Participant 2).

4.1.4. Legally mandated or brokered incentive

In this case, the legally mandated incentive for comanagement began with the State of Hawai'i's constitutional obligation to protect customary and traditional Hawaiian rights [49]. Building upon this, legislation enacted in 1994 established dual pathways for creating a CBSFA and designated authority for doing so to the DLNR [41]. This incentivized the Hā'ena community to pursue designation and comanagement of the Hā'ena CBSFA.

4.1.5. Leadership

Interview respondents consistently pointed to the leadership of a small group of community members, each with long-term ties to the area, though not all of Hawaiian descent, without whom they believed the effort to pursue CBSFA designation would not have been possible. They noted the ability of these individuals to connect with the Hā'ena community, as well as with the Governor and other state administrators, as important leadership attributes. Humility, emotional stamina, and perseverance were also cited as leadership qualities that enabled the community to sustain its efforts to work with the State over the ensuing years.

> "The issue of trying to teach government a new way to do things is not for the faint of heart…. It's not going to come from anybody but the people of that place because you need that emotional energy and emotional focus to keep you going" (Participant 3).

4.1.6. Common vision and existing networks

The vision for establishing a CBSFA in Hā'ena began to coalesce with development of the Hui Maka'āinana o Makana's mission to restore their *ahupua'a,* which specifically calls for the community to have a greater say in the management of their ocean resources [47]. While not there yet, interview respondents concurred that the relationship between the community and the State is evolving and moving toward a shared vision (Participants 1, 2 and 3).

In addition to the Hui, several existing networks aided, and are expected to continue supporting, the development of the Hā'ena CBSFA. These include community-based associations and networks, local non-governmental organizations and an academic institution.

> "When Hā'ena had its hearing last year, at least 10–20 community representatives from around the State flew in, or sent in testimony, to support Hā'ena because they want to see the same thing [happen] in their community" (Participant 2).

4.2. Catalina Island Marine Reserve and Marine Conservation Area network, California

4.2.1. A real or perceived natural resource crisis

Whereas the purpose of the MLPA was to address species declines by designating MPAs [55], the decision to pursue MPA collaboratives in California was borne out of a resource management capacity dilemma, rather than an environmental crisis. The State acknowledged it lacked sufficient resources to effectively manage all 124 of its newly designated MPAs – particularly in the areas of local outreach, education and enforcement (Participant 8).

> "The Department of Fish and Wildlife [was] saying, 'We can't do this education on our own. We need help. We don't have the resources. We don't have the personnel.' So, I think the collaboratives really came from getting that response. Whether it is MPA signage, brochures or monitoring, … the collaboratives … fill those gaps where the Department doesn't have the bandwidth to work on them, and the collaboratives have local expertise" (Participant 5).

4.2.2. Willingness of local users to contribute

On Catalina Island, a strong sense of being unique, as an island community, provided the rationale and determination for the community to form its own collaborative, rather than participate as a member of the regional Los Angeles County MPA Collaborative (Participant 6).

> "Catalina didn't want people from the mainland speaking for them. [People on Catalina] want to protect the resource – especially a lot of the multi-generational families. There are fifth generation families on this island, and they've seen the decimation of the abalone population. [Just in our] lifetime, it went from where you couldn't eat abalone because you ate so much – you just walked up to a rock and you grabbed it – to the fisheries being closed now. They've seen things like that – the decline of the sheephead, the density of fish decline. … It's our front and our back yard, so I think having seen some of the decline of things, [we] hope that we could eat abalone again in our lifetime" (Participant 8).

Interview respondents noted that the Catalina MPA Collaborative co-chairs' prior involvement in activities such as local outreach and monitoring fostered a natural interest in the collaborative process. Access to management resources and connections, and the importance of having a local voice and using local expertise in the implementation of MPA management also motivated island community members to contribute to forming their own collaborative.

> "The locals really like to take care of their resources. I call them consumptive conservationists. That's where their food comes from, so they want to make sure it's still there for them to eat. So, when we did enforcement training, [our local] Avalon Harbor Patrol was all over it" (Participant 8).

In addition to existing contributors, respondents identified the Santa Catalina Island Company, the Two Harbors Harbor Master, fishermen/fisherwomen, fishing boat charter boat operators, and the Catalina Express ferry management as additional groups the Catalina MPA Collaborative hopes to involve or deepen engagement with.

4.2.3. Opportunity for negotiation

The Orange County Marine Protected Area Council (OCMPAC), established in 2001, set a precedent for the community collaboratives that later formed in the rest of the State (Participant 5). Funding from a state legislative proposal to develop resource management signage about crab trapping regulations provided a forum for OCMPAC members and the State to come together and develop consistent outreach messages, enforcement training and docent training. Later, OCMPAC leadership's advocacy to expand the collaborative concept state-wide provided an entrée for three other counties to establish MPA collaboratives. A groundswell of interest from other coastal stakeholders, generated by word-of-mouth, eventually led to the formation of 14 collaboratives across the State. Time, the development of relationships between community members of the collaboratives and state agency representatives, and a willingness on the part of the State to let local stakeholders lead were mentioned as essential to implementation success. On Catalina, the impetus for local engagement and negotiation began even earlier, with the MPA designation process itself.

> "We knew the process of the MLPA initiative was going to happen. It was going to happen and if you wanted to have your voice heard, you needed to get involved" (Participant 8).

4.2.4. Legally mandated or brokered incentive

Interview respondents reported that the MPA collaboratives resulted directly from a brokered incentive to address the State's capacity limitations and empower community-based marine resource stewardship (Participants 5 and 8). An additional incentive for the communities was to ensure they were not left out of getting some of the available management resources, and to make sure they had input on how those resources were used. Now, an MPA Collaborative Network is in place and the Statewide MPA Leadership Team, comprised of multiple resource management agencies, has formally recognized the MPA Collaborative approach as essential to meeting the State's marine resource protection objectives [51].

4.2.5. Leadership

The impetus for establishing MPA collaboratives came from OCMPAC leaders and other non-governmental organizations who advocated for community-based management to receptive state leaders. Then, in each region, a small group of well-informed stakeholders and communicators representing varied interests – fishing, science, government, non-profit – was instrumental in bringing local stakeholders together (Participant 5). The Los Angeles County MPA Collaborative led engagement and promoted island community participation in MPA management on Catalina until island-based leaders stepped forward. Collaborative leaders see themselves as "knowledgeable doers" (Participant 6). Personal conviction, a sense of responsibility to Catalina, and multi-generational familial ties to the island were described as important leadership drivers. While participation and leadership in the collaboratives is voluntary, integrating leadership roles with individuals whose careers involve natural resources was cited as a beneficial strategy (Participants 5, 7, and 8). Island-based respondents also pointed to the essential coordination and local leadership provided by the statewide director of the MPA Collaborative Network.

4.2.6. Common vision and existing networks

The California Ocean Protection Council invited the development and implementation of a shared vision for its statewide MPA network in the *California Collaborative Approach* [51]. Interview respondents noted a general move towards a shared vision as an outcome of, rather than a precursor to, the collaborative process. They also reported that some community members still oppose MPAs because they were unhappy with the designation process. Participants credited the establishment of the island-based collaborative with enhancing communication and cooperation between the island and the CDFW.

> "Catalina is at the forefront. About 16% of the State's waters are within MPAs and here on Catalina we have 22%. We very much recognize the significance of the marine environment and appreciate the support of the State. There is definitely cohesion between the State and the local collaborative as far as what is needed in terms of enforcement, outreach and monitoring" (Participant 7).

The existing OCMPAC network served as a model for the

collaborative approach to expand to other parts of the State. Today, the statewide network of 14 collaboratives provides an opportunity for shared learning and peer-to-peer support [51]. On Catalina, a network of youth camps around the island and their marine educational programs help to foster island-wide interest and communication (Participant 7).

4.3. Rookery Bay National Estuarine Research Reserve and Aquatic Preserve system, Florida

4.3.1. A real or perceived natural resource crisis

While the aquatic preserve and research reserve designations were made in response to local concerns about increasing development pressure on Rookery Bay [57], rather than environmental crisis concerns, interview respondents conveyed that the formation of the Friends of Rookery Bay CSO was primarily driven by a need to strengthen local capacity to manage the reserve system, initially by developing public outreach and educational programs (Participants 9 and 10).

4.3.2. Willingness of local users to contribute

A small group of community leaders collaborated with the State to establish the Friends of Rookery Bay CSO (Participants 9 and 10). Already working together on local land conservation initiatives and promoting stewardship and educational use of Rookery Bay, these individuals had developed relationships within the community and with local state resource managers, gaining self-organizing experience in the process. These early cooperative experiences contributed to building trust, respect, capacity and a shared conservation vision within the community and with the FDEP.

4.3.3. Opportunity for negotiation

Florida Statutes [53] require a formal agreement and incorporation to establish a CSO. This opened the door and provided a clear and equitable process for initiating dialogue and negotiation between prospective community-based comanagement partners and the State.

4.3.4. Legally mandated or brokered incentive

By enabling and sanctioning the establishment of CSOs [53], the State of Florida provided a brokered incentive for any group of interested community members to collaborate with the State and assist the FDEP in accomplishing its aquatic resource management goals.

4.3.5. Leadership

Development of the Friends of Rookery Bay CSO originated with a small group of teachers from the local community who had been collaborating with a locally-based state employee to develop educational marine science programs for the NERR and recognized the need to address the NERR/Aquatic Preserve system's capacity shortfalls (Participant 10). Active, aligned leadership and close communication were, and continue to be, essential for the success of the CSO-FDEP partnership. Early leadership of the Friends of Rookery Bay was collegial and informal. Over time, as leadership responsibilities grew, the CSO's governance structure became formal, business-oriented, and focused.

> "In the 80's and early 90's, to get on the board of directors for the Friends when it was a very small grass roots group, the criteria was if you had an interest and you had the time, and that was it. As we started growing the program and realizing we had broader, bigger goals, we started being much more strategic about the individuals we recruited to the board. We started looking at leadership in the public/private sector – folks who had networks and ways that they could strategically help what the Friends of Rookery Bay was trying to accomplish" (Participant 10).

4.3.6. Common vision and existing networks

The Friends of Rookery Bay perform essential management functions – outreach and education, research support, fund raising, administrative support, and raising the MPA profile – on the basis of a shared vision and goals for Rookery Bay with the FDEP [57].

Existing networks and strategic partnerships outside of the CSO and the Rookery Bay NERR/Aquatic Preserve system have increased local support for the MPAs and enhanced management efficacy. In addition to traditional MPA partners such as local educational institutions and recreational industries, the Friends of Rookery Bay are fostering non-traditional partner networks.

> "Interestingly, the development community is becoming a lot more tuned in. … They really want their clients, who … invest in buying homes in the area, to invest in the quality of life here in southwest Florida. … As they understand a little bit more about what the Rookery Bay Reserve system is all about, and that people can come in and enjoy this, have these great experiences in Rookery Bay, they become much more interested in supporting the work that we are doing" (Participant 10).

4.4. Summary of enabling conditions for comanagement and additional findings

Table 3 summarizes the extent to which each of the six enabling conditions for comanagement in Plummer and Fitzgibbon's [60] conceptual framework were present in each case study. While none of the case studies exhibited all six preconditions, four conditions – the willingness of local users to contribute, an opportunity for negotiation, a legally mandated or brokered incentive, and leadership – were present in all three cases. Conspicuously, the precondition of a real or perceived natural resource crisis was only present in Hā'ena. Apparent regional declines notwithstanding, the primary objective of Florida's Aquatic Preserve Act and California's Marine Life Protection Act is to protect the inherent and unique diversity and integrity of these states' respective marine ecosystems. However, Rookery Bay's CSO and the Catalina MPA Collaborative were created in response to real and recognized limitations in each state agency's capacity to manage its MPAs, not because of a natural resource crisis. In Hā'ena, recognition of the need for more effective management by community members and mid-level state managers also contributed to the pursuit of cooperative efforts. Furthermore, while community-based networks existed in all three MPA case studies, a common vision was lacking at the start of the collaborative efforts in Hā'ena and Catalina Island and only began to take form as each cooperative process evolved.

In each case, a critical factor in local resource users' willingness to contribute to management functions was a strong personal connection to, or association with the unique qualities of 'their place'. Interview participants described this place-based connection as a responsibility and commitment to care for the natural environment and resources of 'their' place. Conversely, legally mandated and brokered incentives had varying degrees of enabling impact on the resultant action in each case. For example, despite the presence of a legal directive to create CBSFAs through Hawai'i's 1994 legislation, a willingness by native Hawaiian communities to contribute to management functions, and concerns about ecosystem decline, the DLNR failed to take further action beyond a short-lived pilot effort, and no CBSFAs have been designated through the original law. Even though Hā'ena achieved a CBSFA designation through separate legislation in 2006, state and the community negotiation of the management plan for this MPA still took another 10 years. These factors suggest four additional conditions – connection to place, a capacity crisis, government willingness to partner, and a clear and just process – enabled comanagement of these MPAs to develop in the U.S. (Table 3).

Table 3
Presence (+) / absence (—) of conceptual preconditions* [60] and presence (++) of additional enabling conditions** for comanagement in the three case studies of U. S. marine protected areas. Key factors, drivers and obstacles are noted in parentheses, where applicable.

Enabling condition	*Hā'ena, Hawai'i*	*Catalina Island, California*	*Rookery Bay, Florida*
* Real or imagined natural resource crisis	+ (declining fisheries and coral reefs)	—	—
* Local users willing to contribute	+ (restoration of cultural values/practices)	+ (access to resources)	+ (experienced with self-organizing)
* Opportunity for negotiation	+ (substantive community involvement in management planning and decision making codified in state statutes and administrative rules, but the State deferred action)	+ (adoption of the California Collaborative Approach/ Marine Protected Area Partnership Plan in the State's Master Plan for Marine Protected Areas)	+ (a formal agreement between the State and community during the incorporation of a citizen support organization is required by state statute0
* Legal mandate or brokered incentive	+ (legally mandated incentive for the State to consult with the community in the management of the designated area codified in state statute and administrative rule)	+ (brokered incentive for the State to build management capacity through collaborative partnerships	+ (brokered incentive for communities to establish Citizen Support Organizations)
* Leadership	+ (Hawaiian families and other local community members)	+ (statewide MPA Collaborative Network director and local collaborative co-chairs with related job objectives)	+ (a community-based state employee and local teachers)
* Common vision /Existing networks	— / +	— / +	+/+ (shared vision focused on Rookery Bay Research Reserve/Aquatic Preserves mission)
** Capacity crisis	++	++	++
** Government willingness to partner	++ (following sustained community-based pressure)	++	++
** Community connection to place	++	++	++
** Clear and just process	++	++	++

5. Discussion

Conceptual frameworks, such as Plummer and Fitzgibbon's [60], provide a useful baseline for evaluating the presence or absence of preconditions that may support the development of comanagement. However, as this study illustrates, these conceptual preconditions are not always present, necessary, or sufficient for shared governance arrangements to emerge.

Case studies offer contextual examples and deeper insights into the actual place-based conditions that lead to, or hinder, effective comanagement of marine systems. In the U.S., until recently, marine resource comanagement involving state government and community-based partners has focused on fisheries [33,52,63–65]. Are the enabling conditions for U.S. fisheries comanagement transferable to U.S. MPA comanagement?

Vaughan and Caldwell [66] looked at comanagement of the Hā'ena CBSFA in Hawai'i through a fisheries management lens and identified additional factors, such as community-based connection or responsibility to place, that contributed to early phase comanagement success. Similarly, Levine and Richmond [52] found that provision of consistent, long-term support and assistance from the collaborating government agency to the community-based partners was as important as enabling legislation for shared governance success in Hawai'i and American Samoa. Examination of the MPAs in this study supports these findings and identifies four additional factors that contributed to the emergence, or hindrance, of MPA comanagement in the U.S.

5.1. Additional enabling conditions for comanagement of U.S. MPAs

5.1.1. Connection to place

Earlier research in Hā'ena identified residents' personal sense of responsibility for 'their place' as a characteristic that may be leveraged to support local management [66]. This study corroborates that finding and expands it to additional U.S. communities. As Florida interviewees shared, the main driver of their willingness to contribute to the mission and management of Rookery Bay's aquatic preserves and NERR was borne out of their personal connection to the Bay, community values related to their way of life, and their association of the quality of that way of life with the quality of the natural resources of 'their place'.

> "First and foremost, these were individuals that … had spent enough time out on the water and they recognized the value of Rookery Bay in their own lives … What brought them to the table was that they already had their own personal connection with the area, and they knew what value it had. It's very powerful. People in this community, as they begin to understand the work that we're doing, they can draw a pretty short line between the quality of life that brings them and keeps them here and the 110,000 acres that we are managing" (Participant 10).

This research also demonstrates that effective MPA management entails more than enabling laws, rules and enforcement. It requires understanding and integrating the unique social and ecological context of that place. These findings suggest that connection to place is an essential antecedent for local users' willingness to contribute to MPA management functions, and may, therefore, be considered a stand-alone enabling condition for comanagement.

5.1.2. A 'capacity crisis'

In their proposed framework for comanagement, Plummer and Fitzgibbon [60] pointed to external environmental crisis events, such the loss or decline of natural resources, whether real or perceived, as fundamental catalysts for comanagement. The concept that crises open opportunities for transformational change in social-ecological systems is also supported in resilience thinking [67].

In this study, the Rookery Bay and Catalina Island cases illustrate that internal crisis events, such as a real or perceived inability or failure of the government to effectively manage MPAs within its jurisdiction, can also spark social mobilization, innovative management strategies and transformational change in governance arrangements. In both Florida and California, when faced with the reality of agency personnel shortages and limited management resources, these states took the initiative to partner with local communities to address MPA

management deficiencies. Instead of a real or perceived natural resource crisis, these two cases show that a 'capacity crisis' may readily serve as an alternative enabling condition for comanagement, aimed at safeguarding extant marine resources, regardless of their current status and trends. In Hawai'i, community-based perceptions of the government's failure to effectively manage marine resources , combined with resource overuse and decline, also contributed to the Hā'ena community's efforts to pursue designation and comanagement of a CBSFA.

5.1.3. Government willingness to partner

The Hā'ena case study demonstrates that a local community's willingness to lead and contribute to MPA management and the existence of a legal mandate for the State agency may not be enough to foster collaboration, even in response to a natural resource crisis. State managers may be reluctant to devolve responsibilities to community groups with limited marine resource management experience. Alternatively, if trust between a government agency and a community is compromised, or, if government agency representatives perceive community-based management as a challenge to their authority rather than as a means to achieve environmental protection objectives, comanagement is unlikely to emerge. These scenarios underscore the connection between capacity crises and government willingness to partner with community-based partners.

The Catalina Island case study illustrates how a state agency's willingness to recognize and accept its resource management limitations, especially at the local level, while also acknowledging the presence of community-based knowledge and experience, can contribute to the emergence of comanagement prompted by a capacity crisis.

> "It was the Department of Fish and Wildlife saying, 'We can't do this on our own. We don't have the resources or the personnel. We need help, and the collaboratives have local expertise'" (Participant 6).

Participatory and place-based interactions require willingness on the part of the government agency to partner with a community of resource users. As the Catalina Island case shows, CDFW warden and outreach personnel's ability and willingness to travel to the island and participate in MPA Collaborative meetings has been essential to developing state-community relationships and expediting community-based management project approval by the State.

5.1.4. A clear and just process

Before a collaborative effort can take root, terms and processes must be well-defined and crafted so that the roles, responsibilities, and expectations of each partner are clear and access to the process is equitable. Ambiguity can stall or even derail comanagement efforts, as occurred in Hā'ena. Processes that limit access by, or to, remote communities, as experienced by Hā'ena and Catalina Island communities during their MPA designation processes, can strain community-state relationships. Management planning meetings and, whenever possible, hearings, need to occur at or near the site of a proposed or existing MPA, in locations and at times accessible to the community; and, government administrations must enable their agency employees to travel to those sites.

In each of the three cases, a small group of concerned and committed community members identified the need for a new or supplemental approach to protecting and managing their community's marine and coastal resources. These individuals came together to propose and pursue a shared governance system with state agency resource managers that incorporates local knowledge, conditions, and concerns, and in Hawai'i, indigenous rights. Each of these cases required state resource managers to recognize the limitations of centralized governance, and to consider how equity (through active stakeholder participation) and efficiency (by altering human, fiscal and technical capacity regimes) can enhance natural resource management effectiveness. With between 22 and 33 years of experience, the Hā'ena and Rookery Bay cases illustrate the evolutionary nature of comanagement and its potential to progress gradually from a community-based initiative to a mutually respected and beneficial arrangement for both partners. The Catalina Island case is in a nascent stage; however, the statewide California MPA Collaborative Network has a demonstrated model of success in the Orange County Marine Protected Area Council and provides a support system for Catalina and other emergent local MPA collaboratives.

> "We have grown from a small, sort of grass-roots organization which started back in 1987 to about 800 members now, so I think it is probably one of the largest CSOs in the State of Florida" (Participant 10). *Florida*

These U.S. MPA comanagement cases are characterized by a move away from contemporary, top-down, marine resource management practices and have led to the development of more inclusive state policies, such as the *California Collaborative Approach* [51], and legislation, as in the case of Florida's CSO statute [53] and Hawai'i's CBSFA statute and rules [42,56]. Uniquely, the Hā'ena case illustrates an opportunity to consider how traditional, customary approaches to natural resource management and the recognition of indigenous rights may enhance or improve upon western resource management models and help restore and build resilience in the community, as well as the ecosystem.

> "The Hawaiian community is already challenged by its history; and that history is one that has divided them, even among each other as family members. That has to be addressed as part of the process of getting everyone back to the table and supporting the [CBSFA] effort" (Participant 2). *Hawai'i*

In each case, interview respondents stressed that committed community and state leadership has been essential to the success of comanagement efforts. Additionally, all three cases underscore the importance of state leadership and engagement at both local and statewide administration levels. Environmental and community support organizations also have an important bridging role to play between local community and state agency representatives, in both MPA designation and comanagement implementation processes.

> "We have to build better bridges between our communities and our state, or we are never going to be able to build the kind of management we want to see happen. So, we've been helping the communities talk about how they can support each other. The Nature Conservancy also has a smaller network they facilitate" (Participant 2*). Hawai'i*

> "The Collier County Conservancy, The Nature Conservancy and Audubon were all active in the early days" (Participant 9). *Florida*

5.2. Remaining challenges: community and organizational capacity-building

Despite the enhanced capacity and value attributed to comanagement arrangements within these three U.S. MPA cases studies, participants from each partnership acknowledged that challenges, especially capacity-building needs, remain. Three areas of need emerged. These include: (1) empowering local communities to take management action, (2) building and sustaining local management capacity, and, (3) incorporating adaptive management into comanagement. Some of the problems identified are associated with factors currently beyond the control of the partnership participants.

5.2.1. Empowering local communities to take management action

In Hā'ena, the high cost of living, limited local educational and employment opportunities, and uneasiness with participating in natural resource education and outreach roles were identified as barriers to community participation in comanagement efforts.

> "There is a lot of potential within the community to be more engaged with the State… it's hard when you have such a big socio-economic divide for there not to be any kind of jobs within the community outside of mowing lawns and cleaning vacation rentals" (Participant 1). *High cost of living, limited local opportunities, Hawai'i*

> "The management challenge to me is the people that know stuff need to talk about it and teach it. And local people, native people, don't do that. They just don't. They talk among themselves and they're just dumb founded that the rest of us don't just know that. 'What do you mean you don't know that?' And, 'I just don't have time for you'" (Participant 3). *Uneasiness with education and outreach roles, Hawai'i*

California and Florida respondents also cited hesitation by some community members to lead or conduct some management tasks. California-based respondents noted the benefit of pairing MPA Collaborative co-chair responsibilities with individuals who had related job functions, such as conducting environmental research or educational programs. In Florida, the presence of dedicated, onsite state management staff who actively promote and support community-based stewardship opportunities has effectively addressed this need.

5.2.2. Building and sustaining local management capacity

Despite collaborative intentions, some interviewees revealed they felt challenged by the limited amount of time, budgets, skilled individuals, MPA information, and training available to support local management efforts and efficacy. The most pressing needs identified by community members were public information about MPAs and skill-specific training to develop local management capacity.

> "I hate signs, but I know we need signs. It's not right for me to go to somebody and say, 'Hey, you're not supposed to do that there. Don't you know that?' And they're going to go, 'No. I don't know that. How would I know that?'" (Participant 3). *MPA information to support education, outreach and compliance, Hawai'i*

> "Prior to the recession, when we had a pretty good state budget, there were actually a couple of paid ranger positions [for Rookery Bay]. These were non-law enforcement positions and at that time we were using these rangers to help engage the boating community and those were some of the first positions, unfortunately, that we lost" (Participant 10). *Budget and skilled individuals to support education, outreach and enforcement, Florida*

5.2.3. Adaptive comanagement

Processes to facilitate review and adaptation of MPA management in response to new or changing environmental and social conditions were also identified as a management need.

> "That's one of the frustrations. As the regulations currently exist, we can't take anything within some of our MPAs – particularly the no-take State Marine Conservation Areas – and that includes invasive species. So, there are [local] groups that would love to go in and remove the [invasive] *Sargassum*, but since it's a species within an MPA, they can't. It's a weird clause that got written in without a lot of foresight" (Participant 7). *Adaptive management, California*

6. Conclusion

Increasingly, the United Nations Environment Program, the International Union for the Conservation of Nature, the Parties to the Convention on Biological Diversity, environmental non-governmental organizations and others are calling for strengthened and expanded ocean protection targets to sustain people and nature. Effectively managed MPAs are an essential marine conservation tool for achieving these targets; and, the importance of engaging local stakeholders from the start of an MPA designation process to secure local community support for marine protection and conservation objectives is well recognized [68,69].

The U.S. claims protected area designations, with varying levels of protection, in 42% of its waters [36], but many of these MPAs lack the staff, funding or community support needed to effectively and equitably meet management objectives. To meet the challenge of scaling up ocean protection, then, states must invest in place-based capacity development to improve management outcomes.

This study contributes to understanding how collaborative approaches to solving natural resource management problems may develop, evolve and enhance both socio-ecological and socio-political well-being by integrating local knowledge, values, and participation into MPA management. Furthermore, this analysis reveals that collaborative capacity building and decision-making by state and local actors are important factors for successful place-based marine conservation initiatives. Developing collaborative governance systems, then, is foundational to achieving ocean protection outcomes. Comanagement can help overcome capacity shortfalls and optimize protected area performance by tapping local knowledge and mobilizing community-based stewardship of marine social-ecological systems. Understanding and leveraging the enabling conditions for existing models of comanagement provides lessons that can shape and enhance both the development and efficacy of U.S. MPAs and the well-being and resilience of local communities. State governments and local communities each have unique knowledge, perspectives and expectations of proposed or designated MPAs. By aligning and sharing their resources and working together, community-based comanagement partnerships are capable of more than government-led or community-based management can achieve alone.

Funding

Support for this study was provided by The Nature Conservancy, the Nicholas School of the Environment at Duke University, and the author. Except for the author, the funders of this work had no role in the study design, data collection and analyses, decision to publish, or preparation of the manuscript.

CRediT authorship contribution statement

Chantal Collier: Conceptualization, Methodology, Investigation, Formal analysis, Writing – Original Draft; Writing – Review & Editing, Visualization, Funding Acquisition.

Declaration of interest

None.

Acknowledgments

To the community members of Hā'ena, Catalina Island, Marco Island and others who were willing to participate in interviews, thank you for contributing to this study by sharing your thoughts and experiences. For constructive comments and suggestions on this manuscript, I thank A. Bartlett, J.M. Burt, L.M. Campbell, and K.E. France. Thank you to S. Thol and K. Leu for assistance with map design and production.

Appendix A. Semi-structured interview protocol

1. What does the term "marine resources" mean to you and can you give local examples?
2. What does the term "marine habitat" mean to you and can you give local examples?
3. What human uses or activities have you observed occurring in or near marine resources present at (*the study location*)?

4. Do you think there are negative impacts occurring near the (*study location's*) marine habitats? If so, what are the most significant negative impacts?
   a) What are the main problems contributing to these impacts that need to be solved?
   b) What are the essential management activities/tasks that must be performed to address these or other problems?
5. How are the natural marine resources of (*study location*) currently managed and who is involved in managing them? How are management decisions made and who is entitled to make them?
6. Is it important for the (*study location*) community to be involved in managing its marine resources? If yes, why? If no, why not?
7. What prompted the (*study location*) community or the state agency to initiate discussions with each other about sharing the management of local marine resources? Was there a particular concern about the local marine resources, the community or the state agency?
8. What opportunity opened the door for the community and the state to discuss the possibility of comanagement and how it might work?
9. Which community groups or individuals were/are involved in discussions about comanaging the marine resources at (*study location*)?
   a) Why do you think they were/are willing to contribute their time or funding toward a shared management arrangement for local marine resources?
   b) Did a particular individual or group in the community lead the effort or advocate for comanagement?
   c) How was that individual or group selected or accepted to lead by the community?
10. *HI question:* How has, or will, integrating traditional ecological knowledge (TEK) into contemporary (i.e. western) marine resource management improve the condition of the resource?
    a) How is the community working with the state to reintroduce TEK in marine resource management?
    b) Is the community engaging local non-native Hawaiians residents or property owners, or seasonal residents in the management of (*study location's*) marine resources? If so, how are they involved?
11. What are some important factors in the (*community/agency*) that have contributed or may contribute to successful protection and management of marine resources?
    a) Is there a shared vision within the community or between the community and the state?
    b) What existing relationships or networks in the community can support marine resource management efforts?
12. What are some important factors in the (*community/agency*) that have created or may create challenges to protecting and managing marine resources?
    a) How were/could these challenges be addressed? What was/is needed to enhance (*community/agency*) capacity to resolve these problems?
13. Do conflicts exist between the local community and state resource management agencies? If so, what are they?
14. Please describe the nature of interactions between the local community and the (*state natural resource agency*), including a brief description of any partnership objectives and activities.
    a) Please rate how successful comanagement efforts have been thus far in engaging the local community in marine resource management, on a scale of 1–5, with 1 being "Not successful, our community is not engaged at all" and 5 being "Completely successful, our community has been fully engaged."
15. Who are the key 2–3 people you think I should be talking to?
16. Is there any additional information you would like to share or discuss that you think is relevant to this study?

References

[1] J.M. Pandolfi, R.H. Bradbury, E. Sala, T.P. Hughes, K.A. Bjorndal, R.G. Cooke, D. McArdle, L. McClenachan, M.J.H. Newman, G. Paredes, R.R. Warner, J.B. C. Jackson, Global trajectories of the long-term decline of coral reef ecosystems, Science (80-.) 301 (2003) 955–958, https://doi.org/10.1126/science.1085706.

[2] R.J. Orth, T.J.B. Carruthers, W.C. Dennison, C.M. Duarte, J.W. Fourqurean, K. L. Heck, A.R. Hughes, G.A. Kendrick, W.J.J. Kenworthy, S. Olyarnik, F.T. Short, M. Waycott, S.L. Williams, A global crisis for seagrass ecosystems, Bioscience 56 (2006) 987–996, https://doi.org/10.1641/0006-3568(2006)56[987:agcfse]2.0.co;2.

[3] B.E. Lapointe, R.A. Brewton, L.W. Herren, J.W. Porter, C. Hu, Nitrogen enrichment, altered stoichiometry, and coral reef decline at Looe Key, Florida Keys, USA: a 3-decade study, Mar. Biol. (2019) 1–31, https://doi.org/10.1007/s00227-019-3538-9.

[4] H.S. Greening, L.M. Cross, E.T. Sherwood, A multiscale approach to seagrass recovery in Tampa Bay, Florida, Ecol. Restor. 29 (2011) 82–93, https://doi.org/10.3368/er.29.1-2.82.

[5] G.J. Edgar, R.D. Stuart-Smith, T.J. Willis, S. Kininmonth, S.C. Baker, S. Banks, N. S. Barrett, M.A. Becerro, A.T.F. Bernard, J. Berkhout, C.D. Buxton, S.J. Campbell, A.T. Cooper, M. Davey, S.C. Edgar, G. Försterra, D.E. Galván, A.J. Irigoyen, D. J. Kushner, R. Moura, P.E. Parnell, N.T. Shears, G. Soler, E.M.A. Strain, R. J. Thomson, Global conservation outcomes depend on marine protected areas with five key features, Nature 506 (2014) 216–220, https://doi.org/10.1038/nature13022.

[6] H.I. Browman, K.I. Stergiou, Politics and socio-economics of ecosystem-based management of marine resources, Mar. Ecol. Prog. Ser. 300 (2005) 241–242, https://doi.org/10.3354/meps300241.

[7] T. Agardy, Global marine conservation policy versus site-level implementation: the mismatch of scale and its implications, Mar. Ecol. Prog. Ser. 300 (2005) 242–248, https://doi.org/10.3354/meps300242.

[8] P. Christie, R.B. Pollnac, E.G. Oracion, A. Sabonsolin, R. Diaz, D. Pietri, Back to basics: an empirical study demonstrating the importance of local-level dynamics for the success of tropical marine ecosystem-based management, Coast. Manag. 37 (2009) 349–373, https://doi.org/10.1080/08920750902851740.

[9] B.J. McCay, P.J.S. Jones, Marine protected areas and the governance of marine ecosystems and fisheries, Conserv. Biol. 25 (2011) 1130–1133, https://doi.org/10.1111/j.1523-1739.2011.01771.x.

[10] B.S. Halpern, The impact of marine reserves: do reserves work and does reserve size matter? Ecol. Appl. 13 (2003) 117–137, https://doi.org/10.1890/1051-0761(2003)013[0117:tiomrd]2.0.co;2.

[11] E.R. Selig, J.F. Bruno, A global analysis of the effectiveness of marine protected areas in preventing coral loss, PLoS One 5 (2010), https://doi.org/10.1371/journal.pone.0009278.

[12] D. Juffe-Bignoli, N.D. Burgess, H. Bingham, E.M.S. Belle, M.G. de Lima, M. Deguignet, B. Bertzky, A.N. Milam, J. Martinez-Lopez, E. Lewis, A. Eassom, S. Wicander, J. Geldmann, A. van Soesbergen, A.P. Arnell, B. O'Connor, S. Park, Y.N. Shi, F.S. Danks, B. MacSharry, N. Kingston, Protected Planet Report 2014, 2014. ⟨http://wdpa.s3.amazonaws.com/WPC2014/protected_planet_report.pdf⟩ (Accessed 14 February 2020).

[13] D.A. Gill, M.B. Mascia, G.N. Ahmadia, L. Glew, S.E. Lester, M. Barnes, I. Craigie, E. S. Darling, C.M. Free, J. Geldmann, S. Holst, O.P. Jensen, A.T. White, X. Basurto, L. Coad, R.D. Gates, G. Guannel, P.J. Mumby, H. Thomas, S. Whitmee, S. Woodley, H.E. Fox, Capacity shortfalls hinder the performance of marine protected areas globally, Nature 543 (2017) 665–669, https://doi.org/10.1038/nature21708.

[14] A.N. Rife, B. Erisman, A. Sanchez, O. Aburto-Oropeza, When good intentions are not enough…Insights on networks of "paper park" marine protected areas, Conserv. Lett. 6 (2013) 200–212, https://doi.org/10.1111/j.1755-263X.2012.00303.x.

[15] G. Bustamante, P. Canals, G. Di Carlo, M. Gomei, M. Romani, H. Souan, A. Vanzella-Khouri, Marine protected areas management in the Caribbean and Mediterranean seas: making them more than paper parks, Aquat. Conserv. Mar. Freshw. Ecosyst. 24 (2014) 153–165, https://doi.org/10.1002/aqc.2503.

[16] D. Wusinich-Mendez, C.A. Trappe, Coral Reef Conservation Program (U.S.), Report on the status of marine protected areas in coral reef ecosystems of the United States. Vol. 1, Marine protected areas managed by U.S. states, territories, and commonwealths, 2007. ⟨http://permanent.access.gpo.gov/lps83936/cr_mpa_report_vol_1.pdf%5Cnhttp://permanent.access.gpo.gov/lps83936/cr_mpa_report_vol_1.pdf⟩ Online version in PDF (PURL) (Accessed 14 February 2020).

[17] E. Sala, J. Lubchenco, K. Grorud-Colvert, C. Novelli, C. Roberts, U.R. Sumaila, Assessing real progress towards effective ocean protection, Mar. Policy 91 (2018) 11–13, https://doi.org/10.1016/j.marpol.2018.02.004.

[18] P.J.S. Jones, W. Qiu, E.M. De Santo, Governing marine protected areas: Social-ecological resilience through institutional diversity, Mar. Policy 41 (2013) 5–13, https://doi.org/10.1016/j.marpol.2012.12.026.

[19] L. Wenzel, M. D'Iorio, C. Wahle, G. Cid, Z. Canizzo, K. Darr, Marine Protected Areas 2020: Building effective conservation networks, 2020. ⟨https://nmsmarineprotectedareas.blob.core.windows.net/marineprotectedareas-prod/media/docs/2020-mpa-building-effective-conservation-networks.pdf⟩ (Accessed 28 August 2020).

[20] D. Armitage, A. Charles, F. Berkes, Towards transformative change in the coastal commons, in: D. Armitage, A. Charles, F. Berkes (Eds.), Gov. Coast. Commons, Routledge, 2018, pp. 1–22, https://doi.org/10.4324/9781315688480-1.

[21] International Union for the Conservation of Nature and Natural Resources, Resolutions and Recommendations. World Conservation Congress, Montreal, Canada, 1996, 1997. ⟨https://portals.iucn.org/library/sites/library/files/documents/WCC-1st-002.pdf⟩ (Accessed 14 February 2020).

[22] B.M. Katon, R.S. Pomeroy, L.R. Garces, M.W. Ring, Rehabilitating the mangrove resources of Cogtong Bay, Philippines: a comanagement perspective, Coast. Manag. 28 (2000) 29–37, https://doi.org/10.1080/089207500263620.
[23] H.T. Sandersen, S. Koester, Co-management of tropical coastal zones: the case of the Soufriere Marine Management Area, St. Lucia, WI, Coast. Manag. 28 (2000) 87–97, https://doi.org/10.1080/089207500263675.
[24] R.S. Pomeroy, P. McConney, R. Mahon, Comparative analysis of coastal resource co-management in the Caribbean, Ocean Coast. Manag. 47 (2004) 429–447, https://doi.org/10.1016/j.ocecoaman.2004.09.005.
[25] M. Makino, H. Matsuda, Co-management in Japanese coastal fisheries: institutional features and transaction costs, Mar. Policy 29 (2005) 441–450, https://doi.org/10.1016/j.marpol.2004.07.005.
[26] R. Weeks, S.D. Jupiter, Adaptive comanagement of a marine protected area network in Fiji, Conserv. Biol. 27 (2013) 1234–1244, https://doi.org/10.1111/cobi.12153.
[27] E. Pinkerton, Introduction: Attaining better fisheries management through co-management - prospects, problems and propositions, in: E. Pinkerton (Ed.), Co-Op. Manag. Local Fish. New Dir. Improv. Manag. Community Dev., University of British Columbia Press, 1989, pp. 3–33.
[28] E.E. Granek, M.A. Brown, Co-management approach to marine conservation in Mohéli, Comoros Islands, Conserv. Biol. 19 (2005) 1724–1732, https://doi.org/10.1111/j.1523-1739.2005.00301.x.
[29] F. Berkes, Devolution of environment and resources governance: trends and future, Environ. Conserv. 37 (2010) 489–500, https://doi.org/10.1017/S037689291000072X.
[30] R.L. Gruby, X. Basurto, Multi-level governance for large marine commons: politics and polycentricity in Palau's protected area network, Environ. Sci. Policy 33 (2013) 260–272, https://doi.org/10.1016/j.envsci.2013.06.006.
[31] M.B. Lane, Affirming new directions in planning theory: comanagement of protected areas, Soc. Nat. Resour. 14 (2001) 657–671, https://doi.org/10.1080/08941920118212.
[32] F. Berkes, Evolution of co-management: role of knowledge generation, bridging organizations and social learning, J. Environ. Manag. 90 (2009) 1692–1702, https://doi.org/10.1016/j.jenvman.2008.12.001.
[33] A.L. Ayers, J.N. Kittinger, Emergence of co-management governance for Hawai'i coral reef fisheries, Glob. Environ. Change 28 (2014) 251–262, https://doi.org/10.1016/j.gloenvcha.2014.07.006.
[34] D. Armitage, F. Berkes, N. Doubleday, Introduction: Moving beyond co-management, in: D. Armitage, F. Berkes, N. Doubleday (Eds.), Adapt. Co-Management Collab. Learn. Multi-Level Gov., UBC Press, 2007, pp. 1–15.
[35] N.L. Gutiérrez, R. Hilborn, O. Defeo, Leadership, social capital and incentives promote successful fisheries, Nature 470 (2011) 386–389, https://doi.org/10.1038/nature09689.
[36] United Nations Environmental Program-World Conservation Monitoring Centre and International Union for the Conservation of Nature, Marine Protected Planet: The World Database on Protected Areas (WDPA)/OECM Database [On-line] [February, 2020], Cambridge, UK UNEP-WCMC IUCN. (2020). ⟨https://www.protectedplanet.net/⟩ (Accessed 17 February 2020).
[37] R.S. Pomeroy, A process for community-based fisheries co-management, Naga 21 (1998) 71–76.
[38] P. McConney, R. Mahon, R. Pomeroy, Challenges facing coastal resource co-management in the Caribbean, in: D. Armitage, F. Berkes, N. Doubleday (Eds.), Adapt. Co-Management Collab. Learn. Multi-Level Gov., UBC Press, 2007, pp. 105–124.
[39] L. Carlsson, F. Berkes, Co-management: concepts and methodological implications, J. Environ. Manag. 75 (2005) 65–76, https://doi.org/10.1016/j.jenvman.2004.11.008.
[40] F. Berkes, Adaptive co-management and complexity: exploring the many faces of co-management, in: D. Armitage, F. Berkes, N. Doubleday (Eds.), Adapt. Co-Management Collab. Learn. Multi-Level Gov., UBC Press, 2007, pp. 19–37.
[41] Hawai'i Revised Statutes, Designation of community-based subsistence fishing area. Chapter 91, §188–22.6, 1994. ⟨https://www.capitol.hawaii.gov/hrscurrent/Vol03_Ch0121–0200D/HRS0188/HRS_0188–0022_0006.htm⟩ (Accessed 17 February 2020).
[42] Hawai'i Administrative Rules, Hā'ena community-based subsistence fishing area, Kaua'i. §13–60.8, 2015. ⟨http://dlnr.hawaii.gov/dar/files/2015/08/ch60.8.pdf⟩ (Accessed 17 February 2020).
[43] MPA Collaborative Network, Collaboratives, (2020). ⟨http://www.mpacollaborative.org/collaboratives/⟩ (Accessed 17 February 2020).
[44] Florida State Statutes, Florida Aquatic Preserve Act of 1975, 1975. ⟨http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0200–0299/0258/0258PARTIIContentsIndex.html⟩ (Accessed 14 February 2020).
[45] California Department of Fish and Game, California Marine Life Protection Act, Master Plan for Marine Protected Areas, Revised Draft, 2008. ⟨https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=113006&inline⟩ (Accessed 14 February 2020).
[46] California Department of Fish and Wildlife, California Marine Life Protection Act, Master Plan for Marine Protected Areas, Final, 2016. ⟨https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=133535&inline⟩ (Accessed 14 February 2020).
[47] Hā'ena Fisheries Committee, Proposed Management Plan and Fishing Regulations for the Hā'ena Community-Based Subsistence Fising Area, Kaua'i, 2011. ⟨http://dlnr.hawaii.gov/dar/files/2015/08/Haena_Mgmt_Plan_6.1.11.pdf⟩ (Accessed 17 February 2020).
[48] J.N. Kittinger, J.Z. Koehn, E. Le Cornu, N.C. Ban, M. Gopnik, M. Armsby, C. Brooks, M.H. Carr, J.E. Cinner, A. Cravens, M. D'Iorio, A. Erickson, E.M. Finkbeiner, M. M. Foley, R. Fujita, S. Gelcich, K.S. Martin, E. Prahler, D.R. Reineman, J. Shackeroff, C. White, M.R. Caldwell, L.B. Crowder, A practical approach for putting people in ecosystem-based ocean planning, Front. Ecol. Environ. 12 (2014) 448–456, https://doi.org/10.1890/130267.
[49] J.N. Kittinger, A. Ayers, E.E. Prahler, Policy briefing, Co-management of coastal fisheries in Hawai'i: Overview and prospects for implementation, 2015 ⟨https://doi.org/10.2139/ssrn.2590207⟩.
[50] M.D.B.B. Vaughan, Holoholo i ka la'i o makua, Collaborative community care and management of coastal resources: Creating state law based on customary rules to manage a near shore fishery in Hawai'i, Stanford University, 2012. ⟨http://purl.stanford.edu/xb334mj6645⟩ (Accessed 14 February 2020).
[51] California Ocean Protection Council, The California Collaborative Approach: Marine Protected Areas Partnership Plan, 2014. ⟨http://www.opc.ca.gov/webmaster/ftp/pdf/docs/mpa/APPROVED_FINAL_MPA_Partnership_Plan_12022014.pdf⟩ (Accessed 17 February 2020).
[52] A.S. Levine, L.S. Richmond, Examining enabling conditions for community-based fisheries comanagement: comparing efforts in Hawai'i and American Samoa, Ecol. Soc. 19 (2014) 24, https://doi.org/10.5751/ES-06191-190124.
[53] Florida State Statutes, Citizen support organizations; use of property; audit, 1985. ⟨http://www.flsenate.gov/Laws/Statutes/2017/0258.015⟩ (Accessed 14 February 2020).
[54] State Water Resources Control Board, Areas of Special Biological Significance: California's Marine State Water Quality Protection Areas, 1974. ⟨https://www.waterboards.ca.gov/water_issues/programs/ocean/docs/asbs/asbs_areas/asbs_swqpa_publication03.pdf⟩ (Accessed 14 February 2020).
[55] California Law, Marine Life Protection Act of 1999, 1999. ⟨https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=FGC&division=3.&title=&part=&chapter=10.5.&article=⟩ (Accessed 17 February 2020).
[56] Session Laws of Hawai'i, Act 241, A Bill for an Act Relating to Fishing, Legislature of the State of Hawai'i, 2006. ⟨https://www.capitol.hawaii.gov/slh/Years/SLH2006/SLH2006_Act241.pdf⟩ (Accessed 17 February 2020).
[57] Florida Department of Environmental Protection, Rookery Bay National Estuarine Research Reserve Management Plan, 2013. ⟨http://publicfiles.dep.state.fl.us/cama/plans/aquatic/Rookery-Bay-NERR-Management-Plan.pdf⟩ (Accessed 17 February 2020).
[58] A.M. Friedlander, J.M. Shackeroff, J.N. Kittinger, Customary marine resource knowledge and use in contemporary Hawai'i, Pac. Sci. 67 (2013) 441–460, https://doi.org/10.2984/67.3.10.
[59] State of Hawai'i Division of Aquatic Resources, Regulated Fishing Areas on Kaua'i, 2020. ⟨https://dlnr.hawaii.gov/dar/fishing/fishing-regulations/regulated-areas/regulated-fishing-areas-on-kauai/⟩ (Accessed 17 February 2020).
[60] R. Plummer, J. Fitzgibbon, Co-management of natural resources. A proposed framework, Environ. Manag. 33 (2004) 876–885, https://doi.org/10.1007/s00267-003-3038-y.
[61] L. Richmond, A. Levine, NOAA Technical Memorandum NMFS-PIFSC-35: Institutional analysis of community-based marine resource management initiatives in Hawai'i and American Samoa, 2012, 1–65. ⟨https://repository.library.noaa.gov/view/noaa/4324⟩ (Accessed 14 February 2020).
[62] State of Hawai'i Division of Aquatic Resources, Hā'ena Community-Based Subsistence Fishing Area rule signed by Governor, 2020. ⟨http://dlnr.hawaii.gov/dar/announcements/haena-community-based-subsistence-fishing-area-rule-signed-by-governor/⟩ (Accessed 14 February 2020).
[63] J.M. Acheson, L. Taylor, The anatomy of the Maine lobster comanagement law, Soc. Nat. Resour. 14 (2001) 425–441, https://doi.org/10.1080/08941920120781.
[64] C.K. May, Achieving sustainability in US fisheries: community engagement in co-management, Sustain. Dev. 16 (2008) 390–400, https://doi.org/10.1002/sd.355.
[65] P. Pinto da Silva, A. Kitts, Collaborative fisheries management in the Northeast US: emerging initiatives and future directions, Mar. Policy 30 (2006) 832–841, https://doi.org/10.1016/j.marpol.2006.04.003.
[66] M.B. Vaughan, M.R. Caldwell, Hana Pa'a: challenges and lessons for early phases of co-management, Mar. Policy 62 (2015) 51–62, https://doi.org/10.1016/j.marpol.2015.07.005.
[67] C. Folke, S.R. Carpenter, B. Walker, M. Scheffer, T. Chapin, J. Rockström, Resilience thinking: integrating resilience, adaptability and transformability, Ecol. Soc. 15 (2010) 20, https://doi.org/10.5751/ES-03610-150420.
[68] P. Kareiva, Conservation biology: beyond marine protected areas, Curr. Biol. 16 (2006) R533–R535, https://doi.org/10.1016/j.cub.2006.06.043.
[69] R. Chuenpagdee, J.J. Pascual-Fernández, E. Szeliánszky, J. Luis Alegret, J. Fraga, S. Jentoft, Marine protected areas: re-thinking their inception, Mar. Policy 39 (2013) 234–240, https://doi.org/10.1016/j.marpol.2012.10.016.