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Ma Kahana ka 'Ike: Lessons for Community-Based Fisheries Management

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Received: 3 August 2018; Accepted: 17 October 2018; Published: 20 October 2018



Abstract: Indigenous and place-based communities worldwide have self-organized to develop effective local-level institutions to conserve biocultural diversity. How communities maintain and adapt these institutions over time offers lessons for fostering more balanced human–environment relationships—an increasingly critical need as centralized governance systems struggle to manage declining fisheries. In this study, we focus on one long-enduring case of local level fisheries management, in Kahana, on the most populated Hawaiian island of O'ahu. We used a mixed-methods approach including in-depth interviews, archival research, and participation in community gatherings to understand how relationships with place and local governance have endured despite changes in land and sea tenure, and what lessons this case offers for other communities engaged in restoring local-level governance. We detail the changing role of konohiki (head fishermen) in modern times (1850–1965) when they were managing local fisheries, not just for local subsistence but for larger commercial harvests. We also highlight ways in which families are reclaiming their role as caretakers following decades of state mismanagement. Considerations for fisheries co-management emerging from this research include the importance of (1) understanding historical contexts for enhancing institutional fit, (2) enduring community leadership, (3) balancing rights and responsibilities, and (4) fostering community ability to manage coastal resources through both formal and informal processes.

Keywords: traditional resource management; konohiki; co-management; institutional fit; social-ecological systems; biocultural restoration; fisheries; Hawai'i

1. Introduction

Societies settled in a particular place for an extended period of time tend to co-evolve with their environment, adjusting resource use to ecological variability and social changes [1–3]. Accumulated knowledge of place informs collective decision-making, which over time shapes institutions, or rules-in-use, that are compatible with local social–ecological systems [4,5]. Local level institutions and the generations of knowledge that inform them are critical to achieving sustainable fisheries [6–8]. Due to colonial and economic influences, these time-tested systems have become fragmented or displaced in many parts of the world [7,9,10]. However, many rural and Indigenous communities, with growing support from governing bodies and resource managers, are reviving and adapting Indigenous and place-based resource management systems to fit contemporary contexts, often through collaborative partnerships [11–14].

Community-based collaborative management, or co-management, is the sharing of management authority and responsibility, often between local communities and government agencies [15]. Through co-management, community groups can exercise greater autonomy and decision-making

power, support short-staffed and underfunded government agencies, apply traditional and place-based knowledge, and tailor management to local social–ecological contexts [16–19]. Co-management is an ongoing process that evolves through practice and social learning [19]. This joint learning-by-doing process offers a promising institutional framework through which communities can exercise greater influence while enhancing the adaptive capacity of coastal social–ecological systems [19,20].

Hawai'i's *konohiki* system is an example of a community-based co-management institution that adapted to social–ecological change. Understanding how locally managed *konohiki* fisheries continued to operate under the territory and later state of Hawai'i can inform community efforts to restore local level fisheries governance within contemporary centralized state management systems. In the *ahupua'a* of Kahana, *konohiki* fishing rights, which were terminated throughout most of Hawai'i in 1900, were officially recognized through the mid-1960s. As one of the longest lasting *konohiki* fisheries in Hawai'i, Kahana offers insights into how features of this Hawaiian biocultural resource management system endured in modern times (1850–1965). Current community efforts to adapt features of this system to contemporary contexts also provide important considerations for collaborative management and biocultural restoration. Using a mixed-methods approach, we explore how relationships with place and local governance endure despite changes in land and sea tenure, and what lessons this case offers for other communities engaged in restoring local level fisheries governance.

2. Background

2.1. History of Hawaiian Fisheries Management

Hawaiian fisheries management is based on familial and reciprocal relationships with marine resources [21,22]. The land and sea were not owned but communally accessed and cared for at the local level, within *moku* (districts) or *ahupua'a*, defined as “culturally appropriate, ecologically aligned, and place specific [land divisions] with access to diverse resources” [23] (p. 71). Within *ahupua'a*, residents and *konohiki* shared both stewardship responsibilities and exclusive harvest rights [24].

Konohiki, or local headmen, were traditionally appointed by ruling chiefs to oversee the well-being of *ahupua'a* resources and residents [24,25]. *Konohiki* held extensive knowledge of the local ecology and natural cycles in order to effectively monitor fishery health [24–26]. Through consultation with local elders and expert fishermen, *konohiki* determined when it was appropriate to place restrictions on certain species or areas to protect their replenishment [26]. Adherence to these restrictions was motivated by strict enforcement as well as shared cultural, social, and spiritual values [26,27]. *Konohiki*, which translates to “to invite ability,” also had to earn and maintain the respect of *ahupua'a* residents in order to mobilize participation in communal caretaking and harvesting efforts [28]. If *konohiki* did not treat the people fairly, residents, who tended the land and sea, were free to move to a different *ahupua'a* [24,25]. Thus *'āina momona*, or abundant lands, was an indication of balance and harmony between *konohiki* and *ahupua'a* residents [24].

Konohiki fishing rights were first written into law in 1839 with Hawai'i's Declaration of Rights, and later codified with the passage of the Civil Code of 1859. These laws designated fishing grounds for the exclusive access of *konohiki* and *ahupua'a* residents, “but not for others” [29] (p. 2). The *konohiki* could legally regulate the fishery by either placing a restriction each year on one species for personal use, or by prohibiting all fishing during certain months, then exacting one-third of the catch upon reopening the fishery [29].

Western encroachment transformed Hawaiian land and sea tenure in the mid- to late-19th century. Transition from a communal land tenure system to a private property regime began with Hawai'i's land division process in 1846–1855, which apportioned the land among the King, ruling chiefs or *konohiki*, and *ahupua'a* residents. Although intended to secure Native Hawaiian rights to ancestral lands and resources, creation of fee simple land titles instead paved the way for dispossession [30]. Following the overthrow of the Hawaiian monarchy, the Organic Act of 1900 established Hawai'i as a USA territory and required registration of all *konohiki* fisheries. Only 101 of the estimated 300 to 400

known *konohiki* fisheries were successfully registered [29]. From 1900 through the 1970s, the Hawai'i territorial and later state governments sought to systematically condemn even these remaining local fisheries, opening them for public access [29,31].

Today, the State of Hawai'i's Department of Land and Natural Resources exercises authority over Hawai'i's 750 m of coastline and 1.3 million acres of state lands and coastal waters, which extend 3 m offshore [32]. Fisheries regulations based on size and bag limits, seasonal closures, and gear restrictions are administered statewide through the department's Division of Aquatic Resources. This centralized, top-down management contrasts the community-based *konohiki* system that maintained fishery abundance in past generations [26,33]. Hawai'i's fisheries have considerably declined under state management [34] due to insufficient funds, staffing, and place-based knowledge tailored to address local social-ecological complexities [26,33,35]. In response, communities across Hawai'i, including fishing families of Kahana on the island of O'ahu, are working to restore local level governance through reviving traditional knowledge and place-based caretaking.

2.2. Study Site: Kahana, Ko'olauloa, O'ahu

The *ahupua'a* of Kahana is located within the *moku* (district) of Ko'olauloa on the windward side of O'ahu, Hawai'i's most developed island (Figure 1). This rural *ahupua'a* encompasses a single watershed (5228.7 acres) that empties into Kahana Bay, an important spawning and nursery ground for many native aquatic species. Kahana's nearshore fishery sustained a thriving Native Hawaiian population prior to Western contact [36], and continues to be important for the cultural identity and subsistence of area families. Kahana has a long history of Native Hawaiian presence, with archaeological research indicating habitation for over 800 years [37]. Historical continuity is further evidenced by Kahana's many *mo'olelo* (oral stories) of Hawaiian deities dating from time immemorial, and by its cultural landscapes and seascapes [38–41], including Huilua Fishpond, a stone wall enclosure traditionally used for aquaculture.

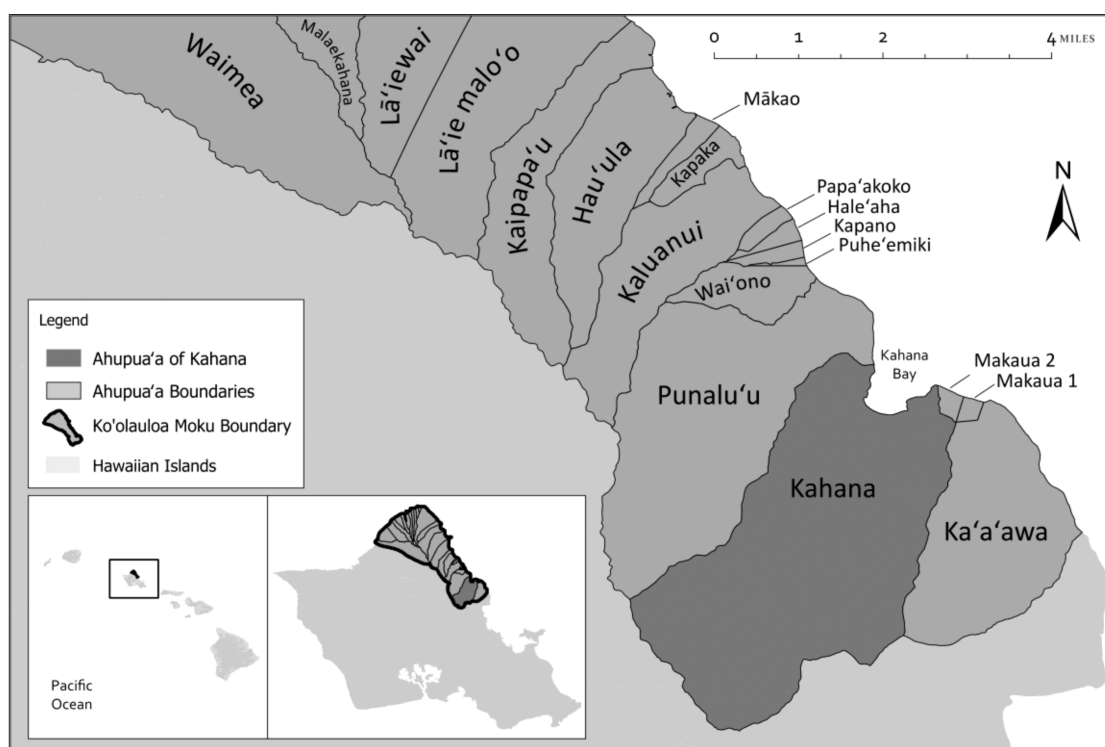


Figure 1. Location of the *ahupua'a* of Kahana within the *moku* (district) of Ko'olauloa on the island of O'ahu. Geographic Information System (GIS) boundaries and names are delineated by the "Ahupua'a" layer provided by the Office of Hawaiian Affairs and distributed by the Hawai'i Statewide GIS Program.

Konohiki fishing rights were officially recognized in Kahana until 1965–1969, when the State of Hawai‘i acquired the *ahupua‘a* and opened its fishery for public access. Today, the *ahupua‘a* is established as a recreational state park offering ten beach campsites, two designated hiking trails, and interpretive programs for visitors to learn about Hawaiian culture. Kahana families, many with multigenerational and genealogical ties to the area, continue to reside in the park on long-term leases with the state. Despite nearly half a century of planning efforts, there is no master plan or shared state and community vision for managing the *ahupua‘a* and its resources, including the nearshore fishery.

3. Methods

For this study, the lead author conducted 19 in-depth interviews, 9 with elders and fishers of Kahana and 10 with state resource management personnel, along with informal discussions and time spent between June 2015 and April 2017 participating in community events and workdays. Using a snowball sampling method [42], community members identified elders and fishers’ (subsistence and commercial) extensive knowledge of the history related to Kahana’s fishery. Semi-structured interviews focused on stories of place, stewardship practices, perceived changes and threats to coastal resources, and recommendations for improving management, capturing personal recollections from as early as the 1930s. State resource management personnel representing different agencies in the Department of Land and Natural Resources were identified by community members, as well as other personnel [42], based on having worked with the Kahana community or their familiarity with community concerns and caretaking efforts. Semi-structured interviews with state resource management personnel addressed management approaches in Kahana, as well as agency efforts and experiences working with community.

Secondary data include Kahana-related research publications such as scientific studies, state government documents including master plans and environmental impact statements, and transcripts from previous collections of interviews [21,43–46] with 23 community members from across the district of Ko‘olauloa (Table 1). The lead author also searched archival records such as English language newspapers, correspondence by historic land owners, photos and maps from the Hawai‘i State Archives, Bishop Museum, and Brigham Young University–Hawai‘i. Newspaper articles were also accessed from online repositories, dating from as early as 1852. A constructivist grounded theory approach guided collection and analysis of qualitative data in this study [47]. Codes derived from interview transcripts, field notes, and secondary data were used to develop conceptual categories related to *konohiki* and community caretaking.

Table 1. Number of individuals interviewed (primary interviews, N = 19; secondary interviews, N = 23).

Primary Interviews	Total: 19
State Resource Management Personnel	
Department of Land and Natural Resources	2
Division of State Parks	3
Division of Aquatic Resources	3
Division of Boating and Ocean Recreation	1
Division of Conservation and Resource Enforcement	1
Community Members	
Elders (Born 1930s–1940s)	7
Younger fishers (Born 1960s)	2
Secondary Interviews	Total: 23
Community Members	
Elders (Born 1900–1951)	23

4. Results

Although Kahana formally maintained local level *konohiki* fishing rights through the mid-1960s, over half a century longer than most communities in Hawai'i, the modern *konohiki* system detailed in this case study operated within a very different context than during pre-contact times (Table 2). The *konohiki*, who are remembered by community elders, operated between the 1920s and mid-1960s within a changed system of Western land privatization, commercial use of the nearshore fishery, and the ability to lease *konohiki* fishing rights. Transition to a private property regime following the land division process of 1846–1858 brought new interpretations of the role and responsibilities of *konohiki* [26]. Once a position held by well-respected individuals appointed to oversee the well-being of *ahupua'a* residents and resources, *konohiki* of the late 19th and early 20th centuries enjoyed the benefits of owning particular lands while no longer accountable for ensuring their provision of abundance. According to certified deeds, purchase of Kahana's *konohiki* land came with the rights to the *konohiki* fishery (and fishponds) [48]. Thus, Kahana's *konohiki* fishing rights exchanged hands with new landowners, from Caesar Kapa'akea and Chiefess Keohokālole in 1850, to three different Chinese businessmen, and finally to Ka Hui Kū'ai i Ka 'Āina o Kahana (Hui of Kahana, or Hui) in 1874 [36,48]. The Hui was a group of 95 mostly Native Hawaiians from Kahana and surrounding *ahupua'a* who collectively purchased back the land and divided it among 115 shares [36]. However, with Hawai'i's increasingly foreign-controlled government and new laws enabling wealthy foreigners to acquire Hawaiian lands, Hui shares and other land parcels were eventually sold outside of the Kahana community. By 1903, the majority of Hui shares were owned by Mary Foster, a wealthy part Hawaiian businesswoman with no known connection to Kahana [36], and by 1930, she owned 99% of the *ahupua'a* [49].

Between 1905 to around 1965, Kahana's *konohiki* fishery appears to have operated under Mary Foster or her estate (having majority rule on Hui decisions) for commercial production, while *ahupua'a* residents continued to exercise their legal right to the fishery for subsistence. Court documents under the territory of Hawai'i reveal successful registration of Kahana's *konohiki* fishery in 1905, to the Hui of Kahana as vested owners [50]. Within the same year, archival records indicate that Mary Foster and her estate, acting on behalf of the Hui, began leasing the fishing rights for commercial operation [51]. Although newspaper advertisements announced lease of the fishing rights for the highest bidder, community interviews reveal that lessees were still expected to fulfill the traditional *konohiki* responsibility of leading communal fishing efforts. To invite community ability and bring people together for collective harvests, lessees still had to earn and maintain the respect of community members.

4.1. Persisting Role of *Konohiki* to Invite Ability

Although *konohiki* of the 19th and 20th centuries acquired their positions through new means, the role of *konohiki* remained an important aspect of life in Kahana. Community interviews recall three *konohiki* operating in Kahana, some at the same time (Table 2). The first *konohiki* people remember is Samuel Pua Ha'āheo, who held the fishing rights possibly as early as 1924, when he became the caretaker of Huilua Fishpond, through to 1946 [40]. According to interviews, Pua was not originally from Kahana but married a woman from the area. Archival records show that he rented property from Mary Foster [52]. Pua's responsibilities were to monitor the fishery, determine when it was time to collectively surround schools of fish, guide fishers from the shoreline, and oversee distribution of the catch. Interviewees expressed that Pua was beloved and well-respected because he was perceived as taking care of everyone, especially the elders.

Table 2. Changes in land and sea tenure in Kahana, O‘ahu (1200–1969).

Year	Event	Citation
≈1200	Kahana’s most recent continuous settlement began around A.D. 1200.	[37]
1778	The first European, British explorer James Cook, arrives in the Hawaiian Islands; Kahana is a thriving farming and fishing community of ≈600–1000 Native Hawaiians.	[36,49]
1839–1840	First written recognition of <i>konohiki</i> fishing rights in the Kingdom of Hawai‘i’s Declaration of Rights and later Constitution.	[29]
1846–1855	Land division process across Hawai‘i results in the award of ≈5050 acres of <i>konohiki</i> land in Kahana to Chiefess Keohokālole, and ≈200 acres of other lands to 34 Kahana residents.	[36]
1857–1872	Keohokālole sells Kahana’s <i>konohiki</i> land, with the rights to the <i>konohiki</i> fishery and fishpond, to AhSing, a Chinese businessman, who later sells to J.A. Chuck, then H. Ahmee.	[48]
1874	Ka Hui Kū‘ai i ka ‘Āina O Kahana (Hui of Kahana) initiates purchase of Kahana’s <i>konohiki</i> land from H. Ahmee, with 95 mostly Native Hawaiian members from the area holding 115 shares.	[36]
1887	The first share of the Hui of Kahana is sold outside of the Hui.	[36]
1900	The Organic Act establishes Hawai‘i as a USA territory; repeals <i>konohiki</i> laws except for registered fisheries.	[29]
1905	Kahana’s <i>konohiki</i> fishery is successfully registered to the Hui of Kahana, March 30.	[50]
1924	Pua Ha‘aheo steps into the role of fishpond caretaker (and likely also <i>konohiki</i>).	[40]
1925	Nick Peterson becomes the foreman for Mary Foster’s property holdings in Kahana.	[53]
1930	Mary Foster passes away with 99% ownership of Kahana (less six parcels), turning it over to her estate.	[49]
1946	April 1 tidal waves take the lives of Pua Ha‘aheo’s grandchildren and Pua leaves his roles as <i>konohiki</i> and fishpond caretaker; the Kamake‘eāina family assumes the role of <i>konohiki</i> .	2015–2016 Interviews
1959	Hawai‘i is admitted as the 50th state of the United States.	[30]
1960	Nick Peterson passes away.	[53]
Mid-1960s	The last collective community harvest for <i>akule</i> (big eye scad, <i>Selar crumenophthalmus</i>) is led by the Kamake‘eāina family; Kahana’s nearshore fishery begins to decline.	2015–2016 Interviews
1965–1969	Public is notified of condemnation proceedings for Kahana’s <i>konohiki</i> fishery and <i>ahupua‘a</i> ; State purchases the <i>ahupua‘a</i> and Kahana’s <i>konohiki</i> fishery is opened to the public.	[36,49]

Following Pua, most community members remember the Kamake‘eāina family, and in particular, Uncle or Papa ‘Āina Pahumoa Kamake‘eāina from Lā‘iemalo‘o, a nearby *ahupua‘a* within the same district (Figure 1). The Kamake‘eāinas are considered to be the last *konohiki* of Kahana, maintaining this role through the mid-1960s. One of the eldest interviewees described how the first time the Kamake‘eāinas surrounded *akule* (big eye scad, *Selar crumenophthalmus*) in Kahana, not a single resident went to the beach to help. However, younger interviewees only remember doing collective harvests with the Kamake‘eāinas and recall Uncle ‘Āina as a person who always gave fish. Together, these varied accounts suggest the Kamake‘eāinas were able to build their relationships with the Kahana community over time.

During both Pua's and the Kamake'eāinas' tenures as *konohiki*, Nicholas Peterson, who was part Hawaiian and originally from the south side of O'ahu, served as "the caretaker of Kahana". However, as one elder clarified, "Uncle Nick wasn't really the People's *konohiki*, so they say, but [he worked] for Mary Foster ... He had to make sure that he made the bucks out of the fishing and make sure that she had revenues coming in." According to newspaper articles, Peterson worked as a foreman for Mary Foster from around 1925 through to 1960 [53]. Community interviews suggest that Peterson collected rent from the residents, made sure people were taking care of upland resources, enforced Kahana's restriction on harvesting *akule*, and sold the fish surrounded from communal harvests. Whether responsible for leading the fishing effort or ensuring reliable harvests, the 20th century *konohiki* of Kahana continued to mobilize community efforts around cultivating and harvesting abundance.

4.2. Managing Land-Sea Connectivity

One way in which Kahana's *konohiki* maintained the health of the nearshore fishery was by managing the land and streams, which affect coastal resources. According to community interviews, it was Peterson, who primarily oversaw the whole *ahupua'a*. As one long-time resident describes, Peterson would make sure people were "keeping their yards clean, make sure they came out and did what they're supposed to, make sure the rivers were clean, the stream beds, and just [responsibilities] that belong to our people anyway." Elders remember Kahana being well cared for when there was a *konohiki*, commenting in particular on how Kahana Stream was cleared of vegetation. Many interviewees recalled how the *hau* (*Hibiscus tiliaceus*), an invasive tree that has overgrown the stream in recent decades, never used to reach the water's surface. The importance of managing land–sea connectivity is emphasized in the Hui's requirement of the Kamake'eāinas, as non-residents, to cultivate one *lo'i* (flooded-field agriculture) in Kahana in order to hold the *konohiki* fishing rights. Residents also cared for their own *lo'i* and home gardens, and recall how "from time to time, everyone went up the valley to clean the [irrigation ditches]. We never let the [irrigation ditches] get dirty or blocked with rubbish. We all cleaned it together" [54] (p. 13). In these various ways, Kahana's *konohiki* and the community managed the land and sea as an integrated unit, recognizing that fisheries management begins on land.

4.3. Protecting Spawning Behavior

Kahana's *konohiki* also protected natural processes to replenish the fishery, such as spawning behavior. Kahana Bay provides important spawning and nursery habitat for many of Hawai'i's native aquatic species, including hammerhead sharks, manta rays, *moi* (*Polydactylus sexfilis*; Pacific threadfin), *āholehole* (*Kuhlia xenura*; Hawaiian flagtail), and 'ama'ama (striped mullet, *Mugil cephalus*). However, Kahana is most famed for the large schools of *akule* (big eye scad, *Selar crumenophthalmus*) that aggregated in the center of its bay to spawn [39]. From as early as 1852, lasting into the mid-1960s, Kahana's *konohiki* actively claimed exclusive rights to harvest *akule* [50,55]. This restriction on harvesting *akule* additionally meant that no one except the *konohiki* could even enter the center of the bay. As one elder explained, "If you want to go fishing, we got to stick to the side of the bay and then go out. They don't like us in the middle, because we're going to chase the *akule* away. Chase the fish away." *Ahupua'a* residents could still exercise their right to the *konohiki* fishery by accessing the edges of the bay and its fringing reefs to fish and gather for home consumption. Elders attribute a productive nearshore fishery—with schools of fish visiting the bay more frequently, in greater numbers, and with larger individuals—to *konohiki* management. Kahana Bay's establishment as a *konohiki* fishery protected it from overuse by prohibiting entry of non-residents, and the restriction on harvesting *akule* further protected replenishment of fish stocks by ensuring that spawning behaviors were not disrupted.

4.4. Sharing Responsibility

Another enduring feature of *konohiki* was the sharing of responsibility, exemplified through the continued practice of *hukilau*. *Hukilau* is a communal surround net fishing method in which *lau* (ti leaf) is intertwined with rope and used to guide schools of fish towards the shore. In modern practice, nets were also used and attached to the rope. Nearly every community member interviewed in this study, and in previous studies, discussed *hukilau* for *akule*. This Hawaiian fishing method required the help of the whole community to contribute various skills and labor including spotting the school of fish, rowing the boat, diving to check the net, pulling the net in, and loading baskets full of fish to sell at the market. Once a school of fish was surrounded, the work continued with everyone helping to clean the boats and nets, patch up holes in the nets, cut and gather wood to build racks for the nets to dry on, and store everything back in Kahana's net and boat houses, ready for the next surround. All of this shared responsibility and work was coordinated by the *konohiki*.

4.5. Supporting Communal Benefit

Only by sharing in the work, the entire community also could share in the benefits. The *konohiki* who led the fishing effort was also responsible for overseeing the distribution of catch from each surround, making sure that everyone—workers, community members, and even visitors—had fish to bring home to their families. One resident, born and raised in Kahana, shared of Pua Ha'aheo, "No matter how big the school or how small the school . . . each resident had their share of fish to go home with. That's how it was. So that's how he maintained the fishing rights over here" [56]. In addition to their shared distribution of the catch, everyone who helped also received a share of the money earned from selling the fish. Kahana elders describe how Mary Foster and the *konohiki* would split the money fifty-fifty, then the *konohiki* "would split the money up so everybody got money . . . [Your share] would depend on how old you were and how much work you did." Pua and the Kamake'eāinas kept their roles as *konohiki* through facilitating collective ability to harvest then distributing the share to see that the community, especially elders, were well provided for.

4.6. Limited State Capacity to Manage Ahupua'a Resources

Kahana's elders shared how their nearshore fishery, even as it was being used for both subsistence and commercial purposes, was well cared for and abundant under *konohiki* management. However, with the loss of *konohiki* fishing rights, interviewees began to see the fishery decline. Between 1965 and 1969, the State of Hawai'i acquired Kahana through eminent domain, establishing the *ahupua'a* as a recreational state park and opening its *konohiki* fishery for public access. Facing eviction, Kahana families protested and successfully lobbied the state legislature to remain on the land [49]. Today, just 28 households, many with multi-generational and genealogical ties to Kahana, have secured 65-year leases with the state [57]. Per lease terms, residents are required to provide 25 hours each month of cultural activities and interpretive services for park visitors, as part of the state's "living park" concept. Since Kahana became a state park, residents have endured decades of meetings, interviews, and surveys involved in state-funded studies, legislative reports, environmental impact assessments, at least eight master planning efforts and numerous park program proposals [49,58]. Yet there is no master plan for Kahana and the majority of State Parks and community interviewees agree the "living park" concept is no longer viable.

Community interviewees also expressed that the state has poorly addressed threats to coastal resources, including intensive commercial fishing, disruptive recreational uses such as jet skis, invasive species introductions, and habitat change. State Parks interviewees expressed they lack the capacity and expertise to manage ecological function. Though State Parks is tasked to manage Kahana's natural and cultural resources, their efforts largely focus on creating public recreational opportunities. Additionally, State Parks does not have jurisdiction over the nearshore fishery. Interviews with personnel from Aquatic Resources, Boating and Ocean Recreation, and Conservation and Resources

Enforcement highlight their responsibility to the whole archipelago, and therefore their inability to focus limited resources on any one community's concerns. Following decades of failed planning efforts, mismanagement and fishery decline, the Kahana community, including residents and fishers from across the district of Ko'olauloa, is strengthening local governance to improve coastal resource health.

4.7. Reviving and Strengthening Local Fisheries Institutions

Kahana families are finding creative ways to manage their coastal resources through reviving *ahupua'a* health and food systems, restoring customary harvesting practices, teaching across generations, and building community relationships and management capacity. With the help of younger residents and Ko'olauloa families, elders have restored and continue to maintain *lo'i* (flooded-field agriculture) that were cared for within their families for generations. These farmers also work together to maintain the traditional irrigation ditch that feeds their *lo'i* with stream water. These traditional food systems have become features of the park, where visitors from schools and organizations across the island visit to learn and contribute through workdays.

Huilua Fishpond, which once functioned as a community food source, also fell into disuse under state ownership. In 2015, young leaders worked with State Parks to obtain a master permit, in compliance with state and federal regulations, to begin restoring the fishpond's 1000-foot wall. Although the permit determines the extent of activities that can be performed, fishpond caretakers lead the restoration effort and design best-management practices based on traditional environmental and cultural protocol [59].

Other young community members created the community-based nonprofit organization, Kahana Kilo Kai, in 2014 to steward the bay. They formally enrolled in the "Adopt-a-Harbor" program their first year to restore area facilities long neglected by Boating and Ocean Recreation. They also worked with the agency to post signage reminding jet skiers of Hawai'i's "slow-no-wake" laws, to minimize disturbance to fish spawning behavior. Along with these efforts, three youth completed training in identifying and reporting violations of fishing regulations through the Conservation and Resources Enforcement agency's Makai Watch program. Over the course of this study, Kahana families gathered at the pier regularly to monitor recreational activities, record fish catches and spawning times, build relationships with fishers, and educate the public about both state regulations and local values for using area resources responsibly. In recognition of these collective efforts by Kahana's young leaders, one state resource manager stated, "They don't just suggest things, they don't just plan things. They're doing it. They're working in the taro patches, they're carrying [rocks] at the fishpond . . . they can walk their talk." Through restoring traditional agriculture and aquaculture, and promoting responsible use of the nearshore fishery, the Kahana community is reintegrating land and sea management, while reasserting their role as caretakers.

Kahana fishing families are also reviving other customary nearshore management and fishing practices, such as *hukilau* or communal surround net fishing. Though *hukilau* ended in Kahana in the mid-1960s, community members revived the practice for *'ama'ama*, a native mullet, with guidance from one particular elder over the past ten years. While *hukilau* requires substantial effort, this harvesting practice, in which everyone who participates can contribute, strengthens community through relearning, reconnecting, and working together.

Community interviews also highlight potential rules for future local-level fisheries management that draw upon customary practices. The majority of community interviews expressed interest in introducing a new state law to place an island-wide seasonal restriction on harvesting *akule*, as well as placing a ban on disruptive recreational uses in Kahana, such as jet skis, to protect fish spawning behaviors. Many, including commercial fishers within the community, also share a desire to limit commercial fishing. Guided by elder knowledge and recommendations, the Kahana community is relearning harvesting and caretaking practices of *konohiki* to improve management of their nearshore fishery.

Another way in which Kahana families are strengthening local influence is through teaching across generations. Over the past several years, young community members have organized fishing camps, held for multiple days each summer, to educate area families and especially youth about ecosystem health and function, caretaking values, and responsible harvesting practices. The camps integrate Indigenous and Western knowledge systems through activities such as sewing and patching fishing nets, monitoring changing ecological conditions according to the Hawaiian moon calendar, and analyzing fish gonads to document spawning times. Many community elders and longtime fisher men and women informally teach at the camps, but also, learn. One Kahana elder shared, “A lot of the things that I’ve been taught today [through fishing camps and community gatherings] was never ever taught to our young ones or even to our old ones.” Logistically, hosting the camps in Kahana requires Special Use permits to be filed with State Parks at least 45 days in advance. Aside from general rules for using the area, these permits secure space for families, many of whom no longer live in Kahana, to gather, teach, and learn together on the land. These camps also strengthen relationships with nonprofit and state resource management personnel, who are also invited to participate in and help conduct activities.

Kahana families are also building their capacity to manage coastal resources through participating in local and global community partnerships and knowledge sharing networks. As a member of the nonprofit organization, Kua‘āina Ulu ‘Auamo (KUA), Kahana families are connected to more than 33 communities across Hawai‘i working to protect and steward their lands and fisheries, including the restoration of 38 fishponds. In 2016, Kahana families expanded this network internationally, hosting a fishpond workday with over 100 Indigenous and community leaders, practitioners, and supporters from 35 nations. The global gathering was organized by KUA to build solidarity among individuals engaged in community grassroots efforts prior to attending the IUCN (International Union for Conservation of Nature) World Conservation Congress in Honolulu.

Although the Kahana community lacks formal government recognition of local management rights or co-management agreements, these informal efforts demonstrate community action and commitment. State resource management personnel across agencies have begun to take notice and lend their support. Within the timeframe of this study, state personnel attended fishing camp activities to give talks to the youth, helped to pull *hukilau* nets in to shore, and passed rocks at the fishpond alongside community members. These means of informal engagement are beginning to repair state–community relationships, while also building community confidence, connections, and ability. Here, informal caretaking efforts hold promise for collaborative management driven by community objectives and needs.

5. Discussion

Understanding how Indigenous and place-based institutions historically operated and adapted to social–ecological change, and how they can fit within contemporary contexts is essential for biocultural restoration [6,60,61]. We use a case study approach focused on one Hawai‘i fishing community reclaiming their role as caretakers despite changes in land and sea tenure, governance, access, and use. Emerging from this research are key considerations for community-based collaborative management. These include: (1) understanding historical context for enhancing institutional fit, (2) enduring community leadership, (3) balancing rights and responsibilities, and (4) fostering community ability to manage coastal resources through both formal and informal processes.

5.1. Understanding Historical Context for Enhancing Institutional Fit

Understanding social–ecological systems from a historical perspective is critical in designing effective collaborative fisheries management institutions. Institutions are systems of rights, formal and informal rules, and decision-making procedures that guide human–environment interactions [62]. Institutional fit refers to how well institutions match a particular social–ecological system, often in terms of their spatial, temporal, and functional contexts [63–65]. Findings from this research emphasize that

design of fisheries institutions must also factor in the historical contexts of a social–ecological system, specifically the traditional and place-based institutions historically in place. *Konohiki* management was tailored to local socio–cultural contexts and ecological systems, including prime spawning habitat and the impacts of land-based activities on the nearshore fishery. The experience of coastal resource decline is not unique to Kahana, but is shared across Hawai‘i [21,26], the Pacific [7,11], and other parts of the world [5,9] where Western models and concepts of resource management have replaced Indigenous and place-based institutions. Still, a wealth and diversity of traditional and place-based knowledge systems endure, and can be adapted within contemporary contexts to improve coastal resource management [3,5,11–13,66]. Rather than simply replicating specific practices of these time-tested institutions, it is important to understand their foundational principles, the key functions they fulfilled, and how they can be adapted to foster future biocultural restoration.

5.2. Enduring Community Leadership

Hawai‘i’s *konohiki* system is an example of a community-based collaborative management institution that endured by maintaining key features within a changing social–ecological context. One enduring feature was *konohiki* facilitation of community caretaking and harvesting efforts, which depended upon in-depth knowledge of the local ecology, exceptional fishing skills, and ability to earn and maintain the respect of the community [28,67]. Such leadership roles are increasingly recognized as important attributes contributing to sustainable fisheries [20,68–70], specifically when leadership is perceived to be legitimate and highly engaged [71]. A recent analysis of 130 co-managed fisheries worldwide identified leadership—the presence of at least one respected individual with entrepreneurial skills, who is driven by collective interests and committed to the co-management process—as the most important feature for successful co-management [68]. The Kahana case study provides an example in which leadership emerges through a community as a collective in the context of perceived government inaction and resource decline. In this case, leadership is dispersed among elders as knowledge holders and young adults who mobilize community around various caretaking activities. These collective efforts demonstrate how multiple sources of leadership can be complementary, interact through mutual support, and coexist within community, adding to a pluralistic conceptualization of environmental leadership [70].

5.3. Balancing Rights and Responsibilities

Maintaining collective benefit through balancing rights and responsibilities was another enduring feature of *konohiki* management. *Konohiki* carried unique responsibility to oversee harvests, facilitating a system in which everyone who contributed to collective work would in turn receive the benefits of reliable harvests [24,25,67]. Rights and responsibilities for all resource users need to be balanced and based upon contributions to collective efforts and caretaking [60]. One key challenge to fisheries co-management in Hawai‘i is that traditional management rested upon reserving distinct rights for area residents [13,29]. Under the state, open access allows the public to use and harvest coastal resources with no expectation to care for them, cultivate their abundance, or give back in any way. This decoupling of rights and responsibility has resulted in coastal resource decline worldwide [7,14,72]. Displacement of Indigenous people throughout the world for the purpose of establishing national parks, uninhabited wilderness [9], and marine protected areas [7] violates their customary rights and prevents them from exercising their distinct responsibilities to care for their homelands. Managing natural areas for public benefit limits community ability to continually interact with, eat from, perpetuate knowledge of, and govern coastal resources for which they are responsible. Emerging literature on co-management emphasizes the need to maintain a balanced distribution of rights and responsibilities, obligations, and benefits amongst all resource users [60,61,67].

5.4. Fostering Community Ability to Manage Coastal Resources through Both Formal and Informal Processes

This case study also highlights the power of informal fisheries co-management as a means to foster community ability to lead caretaking efforts. Co-management comprises a variety of institutional arrangements shaped by different goals, partners, knowledge systems, and degrees of power sharing [15–20]. Such arrangements are negotiated and acknowledged through a formal (e.g., officially recognized by law) or informal (e.g., verbally accepted) agreement among partners [18]. In Kahana, the fishery has been minimally managed with archipelago-wide species-specific regulations administered by the state. Formal state park leases focus only on community service to educate visitors. However, within the last decade, Kahana families have been reclaiming their role as caretakers through informal means of managing coastal resources. Many of these caretaking activities require state approval (e.g., through special permits) and increasingly engage state resource management personnel, for example, to give invited talks to youth at fishing camps.

Through informal co-management, communities have the flexibility to self-organize, determine their own management objectives, and act upon them within their own time frames. By working within informal co-management systems, collective governance of fisheries, along with feelings of empowerment and shared responsibility, can be achieved and lead to effective management practices [73]. Informal caretaking efforts in Kahana also highlight the importance of creating protected spaces for families and community to spend time together and build upon generational knowledge of place and practice. Traditional activities provide not only a gathering space for renewing relationships with family, community, and place, but also a foundation for cultural resurgence and resilience [74]. Adaptive community-led management can guide progress towards more just and effective conservation solutions, restoring coastal resources along with Indigenous and place-based communities' rights and responsibilities [60].

Still, this study recognizes the need for higher levels of governance to formally complement and support community caretaking efforts [19,20,69]. Informal co-management can be limited in confronting unsustainable fishing and recreational activity, and may require legal backing [19]. Long-term sustainability requires place-specific rules, the ability of communities to recognize and respond to change, and support from higher levels of organization [12,69]. In this case, as in others, informal efforts can strengthen relationships that pave the way for more formal co-management agreements [16,67].

6. Conclusions

Understanding how Indigenous and place-based institutions historically operated and adapted to social–ecological change, and how they can be reinvigorated within contemporary contexts, is essential for biocultural restoration [6,60,61]. This study provides a historical perspective of fisheries governance within one rural Hawaiian fishing community, covering the transition from local to state level fisheries management, to an emerging collaborative arrangement led by community. This study also demonstrates how informal community initiative *ma ka hana ka 'ike*, to learn by doing the work [75], can be more powerful than formal co-management arrangements for building community ability [67,74]. Findings also emphasize the value of understanding historical institutions that adapted to local socio-cultural and ecological contexts, building collective leadership that fulfills traditional functions, and balancing rights and responsibilities amongst all resource users. Effective fisheries governance requires true partnerships, formal and informal, that value Indigenous and place-based knowledge systems and while creating the space for communities to build enduring relationships among people, place and practice.

Author Contributions: Both authors were involved in the design of this research. M.M. wrote the initial draft manuscript and carried out the field research. Both authors contributed to analysis and writing the paper. Both authors read and approved the final manuscript.

Funding: The APC was funded by Hawai'i Community Foundation.

Acknowledgments: Mahalo first and foremost to the Kahana elders and fishers who shared their stories, knowledge of place, and recommendations for Kahana’s people, fishery, and future. We also thank the state resource management personnel who took time to share their thoughts and efforts moving forward. A special thanks to Shaelene Kamaka’ala, who has been a tremendous support and guiding light in this work. We also thank Hō’ala ‘Āina Kūpono, the Kū’oko’a Strategic Initiative, the Hawai’i Community Foundation, Malia Akutagawa, Kirsten Oleson, Heather McMillen, and the Ko’olauloa families who continue to care for this place. Credit goes to Kalani Quicho for the title, meaning “Through Kahana, one learns,” a word play on the Hawaiian proverb, “Ma ka hana ka ‘ike.”

Conflicts of Interest: The authors declare no conflict of interest.

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